

THE PROPOSED ALIGNMENT FRAMEWORK IN ENTERPRISE  
ARCHITECTURE DEVELOPMENT FOR THE OMANI PUBLIC SECTOR

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requirements for the award of the degree of  
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I declare that this thesis entitled “*The Proposed Alignment Framework in Enterprise Architecture Development for the Omani Public Sector*” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in the candidature of any other degree.

Signature

:

  
A handwritten signature in black ink, appearing to read 'H. Al Kharusi', is written over a horizontal line of small, repeating characters.

Name

:

HAMOOD AL KHARUSI

Date

:

July 2018

*Dedicated to:*

*My wife and my children who have been the source of my enthusiasm and patience*

*My father and mother who injected in me the desire of learning*

*My brothers and sisters*

*Thank you for your prayers and support*

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## **ABSTRACT**

The misalignment between Enterprise Architecture (EA) development and stakeholders' goals plays a vital role in the low acceptance of EA in organizations and governments. Literature has highlighted the need for an alignment framework to support enterprise architects to align the development process of EA with the stakeholders' goals. Hence, this research developed an alignment framework to align the EA development process with the stakeholders to produce an agreed architecture that supports the architects. Multiple Perspectives Theory (MPT) was used to develop a preliminary research model that provided the initial guidance in data collection and analysis. The research employed a qualitative case study approach to build an in-depth understanding of EA development process, enterprise architects and stakeholders' roles, as well as the factors influencing the alignment between them. The Government Architecture Framework (GAF) of the Omani public sector was used as the case study that included GAF documentation review, and interviews with architects and stakeholders who participated in the development of GAF. The findings showed that twelve alignment factors influenced the development of GAF which are standardization, development scope, principles, governance, top management support, culture, commitment, awareness, communication, value of EA, change management capability and experience. These factors were used as the base to develop the alignment framework followed by a focus group session with GAF architects was organized to validate the final framework. As a conclusion, the study has shown that the alignment framework provides a comprehensive understanding for practitioners and academicians about the factors and their influences at each EA development step.

## ABSTRAK

Pelaksanaan ketidakselarasan antara matlamat pembangunan Senibina Perusahaan (EA) dan pemegang taruh memainkan peranan penting dalam memanfaatkan sepenuhnya EA dalam organisasi dan kerajaan. Kajian literatur telah menekankan tentang perlunya rangka kerja penyelarasan untuk menyokong arkitek senibina bagi menyelaraskan proses pembangunan EA dengan matlamat pemegang taruh. Oleh itu, kajian ini telah membangunkan rangka kerja penjajaran untuk menyelaraskan proses pembangunan EA dengan pihak pemegang taruh dalam menghasilkan seni bina yang menyokong para arkitek. Teori Pelbagai Perspektif (MPT) digunakan untuk membangunkan model kajian asas yang menyediakan panduan awal dalam pengumpulan dan menganalisis data. Kajian ini menggunakan pendekatan kajian kes kualitatif untuk membina pemahaman dengan lebih mendalam mengenai proses pembangunan EA, peranan arkitek senibina dan pihak pemegang taruh serta faktor-faktor yang mempengaruhi penjajaran antara mereka. Rangka Kerja Seni bina Kerajaan (GAF) dari sektor awam Oman digunakan sebagai kajian kes yang merangkumi kajian dokumentasi GAF dan temubual dengan arkitek serta pemegang taruh yang turut serta dalam pembangunan GAF. Dapatan kajian menunjukkan bahawa dua belas faktor penyesuaian mempengaruhi pembangunan GAF yang merupakan standardisasi, skop pembangunan, prinsip, tadbir urus, sokongan pengurusan teratas, budaya, komitmen, kesedaran, komunikasi, nilai EA, perubahan keupayaan dan pengalaman pengurusan. Faktor ini digunakan sebagai asas untuk membangunkan kerangka penjajaran diikuti dengan sesi kumpulan fokus dengan arkitek GAF dianjurkan untuk mengesahkan kerangka akhir. Sebagai kesimpulan, kajian ini menunjukkan bahawa rangka penjajaran menyediakan pemahaman yang komprehensif untuk pengamal dan ahli akademik tentang faktor dan pengaruh mereka pada setiap langkah pembangunan EA.

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## LIST OF ABBREVIATIONS

ARA	-	Application Reference Architecture
ADM	-	Architecture Development Management
BITA	-	Business Information Technology Alignment
BRA	-	Business Reference Architecture
CEO	-	Chief Executive Officer
CIO	-	Chief Information Officer
DC	-	Doctoral Consortium
DoDAF	-	Department of Defense Architecture Framework
EA	-	Enterprise Architecture
FEAF	-	Federal Enterprise Architecture Framework
GAF	-	Government Architecture Framework
GERAM	-	Generalized Enterprise Reference Architecture & Methodology
GT	-	Grounded Theory
ICT	-	Information and Communications Technology
IM&T	-	Information Management and Technology
IT	-	Information Technology
IRA	-	Information Reference Architecture
IS	-	Information Systems
MPT	-	Multiple Perspectives Theory
NCSI	-	National Centre of Statistics & Information
PACIS	-	Pacific Asia Conference on Information Systems
PDO	-	Petroleum Development Oman
RQ	-	Research Question
SAM	-	Strategic Alignment Model
SLR	-	Systematic Literature Review
SOA	-	Service Oriented Architecture
TOGAF	-	The Open Group Architecture Framework

TRA	-	Technology Reference Architecture
UTM	-	Universiti Teknologi Malaysia

## **CHAPTER 1**

### **INTRODUCTION OF THE RESEARCH**

#### **1.1 Overview**

The research investigates the challenge of alignment during the development process of Enterprise Architecture (EA) between the enterprise architects and the stakeholders in the public sector. This chapter introduces the research by a background about EA, definition of EA, definition of the enterprise architects and the stakeholder. Then, it discusses the gap addressed by the research and it defines the context of alignment in the research. Furthermore, it explains the research objectives and the research motivation from both academic and practice perspectives. Moreover, it conveys the significance of the study from three dimensions theoretical, methodological and practical. Finally, it describes the outline of thesis chapters and it summarizes the chapter's key messages.

#### **1.2 Background**

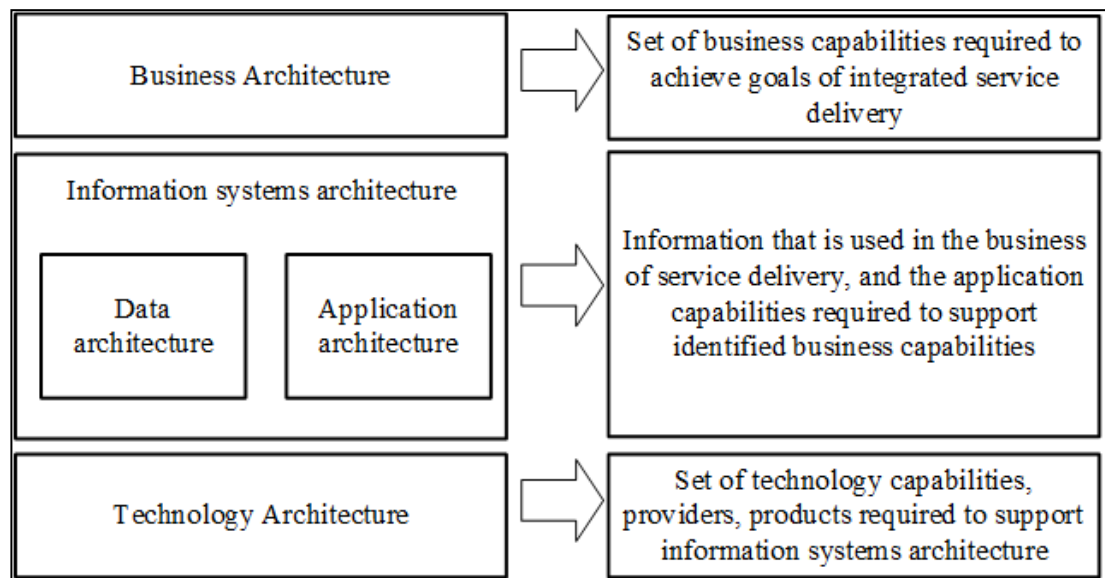
The dynamic environment and the increasing complexity of business processes cause challenges for the organizations to see the holistic view of their business. Moreover, the high turnover of IT solutions and the increased reliance of business on IT created a challenge to align business strategy with IT investment (Ask & Hedström, 2011; Birkmeier *et al.*, 2013). Based on a survey conducted by Gartner

among EA practitioners in 2012, it reported that EA practitioners are influencing \$1.1 trillion of enterprise IT spending globally (Gartner, 2014).

According to a survey conducted in 2010 by Society for Information Management among 172 organizations in USA, Business IT Alignment (BITA) ranked as one of the top five key issues facing IT executives (Luftman & Ben-Zvi, 2010). Hence, Enterprise Architecture (EA) is suggested as an approach to improve BITA (Iyamu & Mphahlele, 2014), manage organizational complexity (Korhonen & Halén, 2017), and support digital transformation (Tamm *et al.*, 2015). Korhonen & Halén (2017) explained that EA gained the attention of academics and practitioners in the recent years as a facilitator for BITA and improving organization agility. The improvement in BITA is expected to be achieved through architecting of the business processes, the information flow needed or resulting from these processes, the required applications to execute the business processes and the required IT infrastructure to run the applications and data (Alaeddini & Salekfard, 2013). These architectures are governed through a set of roles and authority to guide the decision making process that addresses various stakeholders' needs (Espinosa, Boh, & DeLone, 2011). Despite EA proposed to improve BITA, there are challenges within EA that hinder to realize this improvement which are further discussed in Section 1.5.1.

Lankhorst defined EA, as “*a coherent whole of principles, methods and models that are used in the design and realization of an enterprise's organizational structure, business processes, information systems, and infrastructure*” (Penttinen & Isomäki, 2010, p. 1), refer to Figure 1.1. EA as concept officially born in 1987 when John Zachman had applied architecture holistic planning concepts relying on his observations in airline industry and construction of buildings to publish Information Systems Architecture (Lux, Riempp, & Urbach, 2010). Later, it was improved and renamed to the Zachman architecture framework (Zachman, 1996). Zachman framework provides categorization on how to relate IT with business by representing different views for the organization (Santos, Santoro, & Cappelli, 2014). Influenced by Zachman framework, other frameworks were introduced later, examples Department of Defense framework (DoDAF), Federal Enterprise Architecture

framework (FEAF) and The Open Group Framework (TOGAF) (Bourey & Medini, 2012). These frameworks are used as a guide to develop EA for a particular organization but difficult to be applied for wide government EA. Hence, many governments customized the industrial frameworks to build their own EA e.g. AlSoufi & Ahmed (2012).



**Figure 1.1:** Enterprise architecture layers and definitions (extracted from AlSoufi & Ahmed, 2012, p.155)

Literature has discussed the existence of challenges facing the development of EA. These challenges include value demonstration challenges (Zijl & Belle, 2014), stakeholders management challenges (Nakakawa *et al.*, 2013), organizational challenges (Iyamu & Mphahlele, 2014) and technical challenges (Buckl *et al.*, 2011). Additionally, literature explained that the involvement and the fulfillment of stakeholder needs impacts the activities and the acceptance of EA (Fallmyr & Bygstad, 2014; Farwick *et al.*, 2014). The enterprise architects are responsible of collecting information about the enterprise in terms of business processes, the used applications & data and IT infrastructure (Buckl, Matthes, & Schweda, 2010a). They evolve the EA through a set of models and play the role of managing, communicating, leading and modeling (Clark *et al.*, 2014; Gotze, 2013). The Open Group define EA stakeholder as “*an individual, team, or organization (or classes thereof) with interests in, or concerns relative to, the outcome of the architecture*” (Azevedo *et al.*, 2011, p. 29). Although enterprise architects are part of EA

stakeholders but called as enterprise architects to differentiate their role of leading and managing the development process.

The concept of alignment has been discussed in the context of IS and normally refers to Business-IT Alignment whether in enterprise operational level or strategic level (Rouhani *et al.*, 2015). Luftman, Papp, and Brier (1999, p. 3) defined BITA as “*applying IT in an appropriate and timely way, in harmony with business strategies, goals and needs*”. Literature explained that the involvement and the fulfillment of stakeholder needs are the cornerstone for the success and the acceptance of EA (Buckl *et al.*, 2011; Fallmyr & Bygstad, 2014; Farwick *et al.*, 2014). In the context of this study, the alignment scope covers the enterprise architects and the stakeholders to agree on the final developed architecture. Hence, the study defines alignment as develop EA models in an appropriate and timely way in harmony with stakeholders concerns and goals.

Linstone (1989) explained that the enterprise comprises from a socio-technical system that means framed by technical and social characteristics. EA is developed within this socio-technical system which is impacted by social and technical factors as discussed by many scholars e.g. Aier and Schelp (2010) and Bernus, Noran, & Molina (2015). Hence, it is essential to empirically identify these factors that influence the alignment between the enterprise architect and the stakeholders in EA development process. Thus, the study is aiming to explore the factors influencing the alignment between the two parties (enterprise architects and stakeholders) to create an in-depth understanding to develop alignment framework that supports the EA practitioners in the development process of EA.

### **1.3 Research Problem**

Despite the interest of organizations to adopt the concept of EA, it is facing challenges to demonstrate organizational value or effective execution. Rotterdam University conducted a survey in 2008 that shows 66% failure of EA initiatives (Gosselt, 2012). In 2009, Gartner identified top 10 EA pitfalls among them wrong

selection of architect leader, lack of stakeholders understanding, enterprise architects group does most of the architecting without agreement on the architecture content (Gosselt, 2012). The enterprise architects are confronted with difficulties while involving the stakeholders to develop EA. The alignment between the enterprise architects perspective (driven by EA development process) and the stakeholders perspective (driven by needs and concerns) is one of the common difficulties in EA development because both the architects and stakeholders should have a shared understanding of the organization problem and the required solution to overcome it (Nakakawa, Proper, & Bommel, 2011). Banaeianjahromi & Smolander (2016) studied empirically the obstacles facing EA development among them; EA literature rarely addresses the issues related to enterprise architects.

The current EA frameworks lack models to support the enterprise architects to align the EA development process with the stakeholders needs (Nakakawa *et al.*, 2011). Du Preez, van der Merwe, and Matthee (2014) and Gartner (2014) discussed the important role of involving the stakeholders and addressing their concerns in the effective execution and success of EA. However, the enterprise architects are facing challenges to align the development process of EA with the stakeholders' needs that result in low utilization or no acceptance of EA (Buckl *et al.*, 2010b; Fallmyr & Bygstad, 2014; Iyamu & Mphahlele, 2014).

There is scarcity of studies that build an in-depth understanding of the alignment between the enterprise architects and the stakeholders during the development process of EA and the factors shaping this alignment (Bakhshandeh *et al.*, 2013; Du Preez *et al.*, 2014). Since the enterprise architects and stakeholders are the main actors in EA development, Buckl *et al.* (2010b) pointed out the need for a framework that guides the alignment between the enterprise architects and the stakeholders during the development process. Such framework is expected to support the enterprise architects in the EA development process by uncovering the factors influencing the alignment between the enterprise architects and the stakeholders during the development process and provide a set of recommendations to address each factor.

The development of EA for the wide government is challenging because the current popular EA frameworks e.g. TOGAF & Zackman are mostly used to develop EA for a specific organization (Langermeier *et al.* 2015). Thus, the governments worldwide tend to tailor the existing EA frameworks and IT standards to develop their own specific framework. Despite the rapid expansion of EA in public sector, the academic studies did not give enough attention towards EA in public sector (Bakar & Selamat, 2016). The government of Oman via the IT regulatory body sponsored and developed Government Architecture Framework (GAF) in 2010 to improve the integration between government entities and ease access services for the citizens (ITA, 2010). However, similar to other EA initiatives, the developed architecture framework was rarely utilized by the government entities. As highlighted earlier by practitioners and scholars, one of the reasons for the low utilization can be rooted to the misalignment between the development process with the stakeholders needs.

Hence, the research investigated the EA development alignment phenomenon in the public sector by selecting the Omani GAF as a case study. The researcher considered the context uniqueness of the public sector as many governments customize their own EA development process by understanding the development process of GAF and the roles of the enterprise architects and the stakeholders.

In particular, the research attempted to answer the question: ***How could the enterprise architects align the development process of EA with the stakeholders' goals in the public sector of Oman?*** To answer this main question, four sub-questions were created as following:

- *RQ 1: What is the development process of EA in the public sector?*
- *RQ 2: What are the roles of stakeholders and enterprise architects in the development process of EA in the public sector?*
- *RQ 3: What are the factors influencing the alignment between the enterprise architects and the stakeholders in the development process of EA in the public sector? How these factors are interrelated with the development process and the roles of stakeholders and enterprise architects?*



- *RQ 4: What framework can be used to support the alignment between enterprise architects and the stakeholders in the development process of EA in the public sector?*

To address the research questions, the researcher investigated the development process of GAF and explored the roles of the stakeholders and enterprise architects in the development process to have in-depth understanding of its settings. The researcher used project documentation and conducted interviews with the main actors of the GAF to understand and conclude the factors that influenced the alignment between the enterprise architects and the stakeholders during the development process of GAF. Furthermore, the researcher investigated the interrelationship between the alignment factors with the development process and the roles of the enterprise architects and the stakeholders.

#### **1.4 Research Objectives**

Based on the discussion of the research questions in section 1.3, the main research objective is: ***To support the enterprise architects to align the development process of EA with the stakeholders goals in the public sector of Oman.*** This objective is achieved by accomplishing four supporting objectives as follow:

- *Objective 1: To understand the development process of EA in the public sector*
- *Objective 2: To explore the stakeholders' and enterprise architects' roles in the development process of EA in the public sector*
- *Objective 3: To identify the factors influencing the alignment between the enterprise architects and the stakeholders in the development process of EA in the public sector. To explain the interrelationship between the factors and the development process as well as the roles of the architects and the stakeholders.*
- *Objective 4: To propose and validate the alignment framework for the development process of EA in the public sector*

## **1.5 Motivation of the Research**

This section explains the motivating drivers to conduct this research based on trends from practice, academic, context and researcher's background.

### **1.5.1 Practice and Academic**

Based on Gartner predictions, 40% of EA programs would be terminated by 2012 (Gosselt, 2012). Furthermore, Gartner pointed out the top 10 EA pitfalls that hinder the effectiveness of EA initiatives among them; wrong selection of architect leader, insufficient stakeholder awareness, not engage business and enterprise architects group does most of the architecting without agreement on the architecture content (Gosselt, 2012). Section 1.3 stressed on the importance role of stakeholders in the acceptance of EA. Also, it showed the scarcity of academic studies that address the alignment between the enterprise architects and the stakeholders. Thus, this study is driven by the limited academic studies that investigate the alignment between enterprise architects and stakeholders in the development process of EA. This alignment is considered as a corner stone for EA success (van der Raadt *et al.*, 2010). It is also supported by the practitioners' who explained the importance of stakeholders in the effective EA development and execution. The development of EA is costly in terms of finance and time to acquire or develop architecture skills internally and consume resources in the development and implementation. So it is expected that the research findings will contribute towards the effective execution of EA program and consequently realizing organizational value out of it.

### **1.5.2 Candidate's Background**

In the context of Oman, the government developed GAF to guide the government entities in the digital transformation through a coordinated and integrated manner. Despite the development of GAF, the usage of GAF by the

government entities is less than expected. As discussed by literature and practitioners, the misalignment between the architects' team and the stakeholders in the development of EA is one of the main pitfalls. The GAF sponsor and participants showed interest to participate in the research. Thus, the researcher studied the GAF development approach and the alignment factors influenced each development step whether a positive or a negative influence.

The researcher is TOGAF 9 certified and prior the study worked as Information Management and Technology (IM&T) Consultant under IM&T Business Alignment department at Petroleum Development Oman (PDO). As explained earlier, one of the main drivers to adopt EA is to improve business IT alignment. Taking this into consideration and the researcher professional background, the field of the study was highly related to the researcher's expertise.

## **1.6 Research Contribution**

The findings of the study are expected to contribute at three different dimensions; theoretical contribution, methodological contribution and practical contribution as follow:

### **Theoretical contribution**

The theoretical contributions of the research is two folds; academic body of knowledge contribution and theory contribution. As discussed in the previous sections that the alignment of EA stakeholders and enterprise architects during the development process of EA did not get enough attention from academic scholars. Hence, this research is contributing to the body of knowledge through addressing this gap by building an understanding on roles of enterprise architects and stakeholders, the EA development process that took place in the selected case study and the development of the alignment framework. EA is still an area, which is not explored by Omani academic researchers despite the growing interest in three leading Omani organizations. Hence, this research is creating a foundation for future academic studies in the area of EA in Oman.

Despite the emphasis of the top IS journals that IS researchers need to ground their work on theories, IS literatures are still under-theorized (Lim *et al.*, 2009). Similarly, Winter, Legner, and Fischbach (2014) and Närman *et al.* (2012) explained the limited utilization of theories in EA studies. Thus, the research contributes towards IS field by utilizing Multiple Perspective Theory (MPT) that provided initial guidance in the data collection and analysis phases.

### **Methodological contribution**

The research employed case study as a research approach to address the research questions. It provided detailed guidelines to apply them for data collection, analysis and trustworthiness in the case study approach. Furthermore, the developed alignment framework can be used as a base for future studies that tackle similar or close research problem.

### **Practical contribution**

The findings of this research are expected to contribute to the EA practitioners by building a comprehensive overview of EA literature (drivers, challenges, benefits and stakeholders). Furthermore, the research is proposing a framework for the alignment between enterprise architects and the stakeholders, which can be used as guidance to support EA practitioners (enterprise architects) to align the EA development process with the stakeholders' goals in the public sector. Additionally, it details the EA development process used by the GAF which contributes towards enhancing the understanding of EA development process in the public sector and can be used as basis to create awareness of EA development process for other governments worldwide which are planning to start similar initiative.

## **1.7 Outline of Thesis Chapters**

This section provides an overview on the rest of thesis chapters. It explains the key points covered by each chapter.

Chapter 2 builds an overview about EA in terms of definition, drivers, benefits, development, EA in public sector and key challenges facing EA. Then, it

sheds the light on the stakeholders in IS and EA context. Furthermore, it highlights the alignment concept both in IS and EA context. It discusses the findings from the studies related to the research problem and the relevant potential theories. Finally, it describes the initial theoretical model and its main components.

Chapter 3 describes the research methodology used in the research. It gives an overview on the research paradigm, qualitative research approaches, research strategy, qualitative data collection instruments and qualitative data analysis. Since the research is using case study approach, it highlights the case study design in terms of case selection, participants, case study protocol, data analysis tool and procedures and research trustworthiness. Moreover, it explains the research operational framework.

Chapter 4 discusses the preliminary study which was conducted to verify the suitability of the case to address the research questions, validate the initial case study protocol and obtain the initial insights about the case. It explains the case description, initial case design and the preliminary findings.

Chapter 5 details the case study findings. It describes the analysis of the collected data. Also, it discusses the GAF development process, roles of the enterprise architects and the stakeholders and the obtained alignment factors.

Chapter 6 describes the development of the alignment framework and its main components. It discusses the interrelationship between GAF development process and the alignment factors. Additionally, it highlights the potential interrelationship between the alignment factors. The validation of the alignment factors and their influence are discussed in this chapter. Also, it shows the considered actions during the research to ensure the research trustworthiness.

Chapter 7 presents a summary of the research findings. It explains the research contribution from theoretical, methodological and practical perspectives. It points out the research limitations and the recommendations for the future studies.

## **1.8 Summary**

The chapter has provided an overview of the research background, research problem, research objectives, motivations and contributions. Despite the importance of aligning EA development process with the stakeholders' needs, there is scarcity of academic studies that build a comprehensive view on the factors influencing the alignment between the enterprise architects and the stakeholders in the development process of EA. The researcher employed a qualitative single case study approach to answer the research questions using GAF project in the public sector of Oman.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Overview**

This chapter starts by an overview of the EA's definition, drivers, benefits, and development. It also discusses EA in the public sector and the key challenges facing EA. It highlights the concept of stakeholders in EA's context from definition, identification and management. Furthermore, it explains the alignment in IS and also in EA's context. Then, it sheds the light on the EA academic studies that addressed similar research problem and also discusses the limitation of each study. It discussed the potential relevant theories. Furthermore, it discusses the selected theory used to develop the initial theoretical model and gives a description of the different model components. Finally, it concludes the chapter by a summary of literature main points.

#### **2.2 EA from Literature Perspective**

This section is introducing the concept of EA by highlighting the emergence of EA's concept. It discusses the drivers that make the organizations to adopt the concept of EA. Furthermore, it explains the expected benefits from EA adoption and emphasize on the current key challenges facing EA. Each challenge is discussed in depth along with the suggested future studies to address it. Additionally, it discusses the well-known EA frameworks used in the development of EA.

### 2.2.1 EA Definition

The concept of EA evolved from IS strategic management as an approach to design aligned IS processes with corporation strategy (Aier & Gleichauf, 2010). The IS professionals noticed a potential of transferring the knowledge of architecture processes used in airline manufacturing to enterprise engineering (Chuang & van Loggerenberg, 2010). Similarly, the architecture concept is common in the construction where the owner discusses with the architect, the architectural requirements on how the building should look like (how many rooms, bathrooms, distribution of rooms, etc....) (Glissmann & Sanz, 2011). John Zachman used his observations in the airline manufacturing, enterprise engineering and IS to build a blueprint for the organization using a set of views (Chuang & van Loggerenberg, 2010). Zachman considered the pioneer of EA concept after introducing a framework called Information Systems Architecture in 1987 (Korpela *et al.*, 2013; Simonsson *et al.*, 2011). Though the Zachman framework was targeting the IS community but later extended for the entire enterprise (Bernus *et al.*, 2015), so later it had been renamed to Enterprise Architecture. The work of Zachman triggered the researchers and practitioners to give attention towards this new area, which resulted in an increase of publications and introducing many frameworks for EA development (Buckl, Schweda, & Matthes, 2010; Rijo, Martinho, & Ermida, 2015).

Despite the longtime of EA existence, there is no a single agreed definition for EA among academic scholars or practitioners (Du Preez *et al.*, 2014; Rajabi, Minaei, & Ali Seyyedi, 2013; Walrad *et al.*, 2014). Hence, there are many definitions proposed for EA. The most cited definitions of EA are the definitions of IEEE Std, TOGAF, Zachman, Lankhorst and Ross, Weill and Robertson. IEEE Std 1471-2000 (2007, p. 13) defines architecture as “*the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution*”. Despite the definition of IEEE Std is the highly cited definition in the literature, but there is a puzzling point surrounding the definition. The definition defines only “architecture” not “Enterprise Architecture” that could be applicable and confused with other concepts like Service Oriented Architecture (Buckow *et al.*, 2010) and Enterprise



Integration Architecture (EIA) but some authors citing it as IEEE Std definition of EA; examples (Aier & Schelp, 2010; Buckl *et al.*, 2011; Chiprianov *et al.*, 2014; Monahov, Reschenhofer, & Matthes, 2013; Šaša & Krisper, 2011). On the other hand, Zachman defines EA as “*a set of descriptive representations that are relevant for describing an Enterprise such that it can be produced to management’s requirements (quality) and maintained over the period of its useful life (change)*” (Zachman, 1996, p. 5). The Open Group presents two definitions for EA based on the context of use as “*A formal description of a system, or a detailed plan of the system at component level to guide its implementation. Or the structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time*” (Stelzer, 2010, p. 13). Another well-known definition for EA is the definition of Lankhorst “*A coherent whole of principals, methods, and models that are used in the design and realization of an enterprise’s organizational structure, business processes, information systems and infrastructure*” (Lankhorst, 2009, p. 149). Ross, Weill and Robertson defined EA as “*the organizing logic for business processes and IT-infrastructure reflecting the integration and standardization requirements of the company’s operating model*” (Fallmyr & Bygstad, 2014, p. 3789).

Because of the EA origins in IS architecture, it is confused with other known concepts like Service Oriented Architecture (SOA), software engineering and Information Architecture (Farwick *et al.*, 2013; Jahani, Javadein, & Jafari, 2010; MacLennan & Van Belle, 2014). Unlike software engineering, EA focuses on the interrelation between IT and business (Farwick *et al.*, 2013). Similarly, the aspects considered by information architecture are restricted to data but EA consider all organizational elements users, systems and business processes (Jahani *et al.*, 2010). There are some similarities between EA and SOA that lead to a confusion as well between them but they are two different things (Kistasamy, Merwe, & Harpe, 2010). SOA is a methodology that represents application and business services that aims to align business with IT (Kistasamy *et al.*, 2010). EA is targeting the alignment at strategic level but SOA focuses on the alignment at technology level (Kistasamy *et al.*, 2010). SOA tend to improve the agility by providing technology solution and defined as “*a conceptual business architecture where business functionality, or*

*application logic, is made available to SOA users, or consumers, as shared, reusable services on an IT network”* (Kistasamy *et al.*, 2010, p. 130). SOA represents the current business processes and how to implement the relevant technology but EA focus on business architecture improvement and the planning required for the improvement (Kistasamy *et al.*, 2010). SOA can contribute to EA in the modeling of the as-is applications and business architectures.

### **2.2.2 EA Drivers**

The rapid development of technology solutions and the changing nature of business created challenges for the organizations (Abraham, Aier, & Winter, 2015). Based on literature review, the most referenced drivers for EA adoption are:

- i) Improve BITA
- ii) Manage organizational complexity
- iii) Support organizational change

Improving BITA is the highest referenced driver for organizations to adopt EA in literature (Akhigbe, Amyot, & Richards, 2014; Drews & Schirmer, 2014; Jamróz, Pitulej, & Werewka, 2014; Rouhani *et al.*, 2015). In fact, BITA is ranked as a top priority in the agenda of IS management (Birkmeier *et al.*, 2013). This is driven by the evolution of IT role in the 21<sup>st</sup> century from being viewed as a commodity to create competitive advantage and support organizational strategy (Alaeddini & Salekfard, 2013). Moreover, the organizations need to have more agility to adapt with the rapid changes and the increased complexity in technology and business environment (Bourey & Medini, 2012; Brückmann, Gruhn, & Pfeiffer, 2011; Kandjani, Bernus, & Nielsen, 2013). EA creates a transparent understanding of business processes interlinks with organization goals and it shows the association of data, applications and IT infrastructure with business (Alaeddini & Salekfard, 2013; Ask & Hedström, 2011). The alignment of the organizational goals and strategy with IS landscape is the expected outcome from EA (Akhigbe *et al.*, 2014).

Managing the organizational complexity cannot be looked in separation from BITA. The challenge of misalignment between the business and IT becomes apparent in the complex business environment. The complexity is increased through the frequent changes caused by the evolution in regulations and by demolishing the boundaries between countries because of technology communication advancement and globalization (Buckl *et al.*, 2011). These challenges of IT advancements, dynamic business environment, frequent changes and competition are evident in the large organizations (Lantow, 2014). Thus, EA is seen as an approach to manage this socio technical system (Razavi, Shams Aliee, & Badie, 2011). Moreover, EA is seen as a solution to get control over the growing applications' landscape (Aier & Schelp, 2010). This control can be achieved through architecture descriptions of as-is and to-be that represent as well the stakeholders concerns (Antunes *et al.*, 2011).

The organizational changes are either driven by internal initiatives like business improvement or by external drivers like emerge of new technologies or regulations (Abraham *et al.*, 2015; Roth *et al.*, 2013). The managers and the planners are in need for a systematic approach that guides them in the transformation or changes in organizational objectives or organizational structure (Agievich & Skripkin, 2014; Akhigbe *et al.*, 2014; Kruse *et al.*, 2010). Thus, EA is suggested as a comprehensive approach to manage the heterogeneous system of the organization (Akhigbe *et al.*, 2014; Valtonen *et al.*, 2010). It guides the enterprise development from the as-is to the desired state through a roadmap of changes by improving the business processes and IT (Giachetti, 2012; Pascot, Bouslama, & Mellouli, 2011). Gill and Qureshi (2015) view EA as a mechanism to scan through the organization-operating environment to identify opportunities for improvement.

### **2.2.3 EA Benefits**

Despite the limited empirical studies in literature that discuss EA's benefits (Lange, Mendling, & Recker, 2012), scholars reported the expected benefits from EA as business IT integration (Petrikina *et al.* 2014), organization communication improvement (Antunes *et al.*, 2011), productivity improvement (Fasanghari *et al.*,

2015), cost reduction (Berrada & Bounabat, 2013), change management support (Hotti & Saarelainen, 2014) and decision making support (Hess, Lautenbacher, & Fehlner, 2013). EA improves the integration by using a common modeling language between business and IT (Drews & Schirmer, 2014) and offering a common framework for different stakeholders groups (Abraham *et al.*, 2015). Specifically, EA unifies and integrates business processes, data sources and key enterprise applications by identifying the connections between them (Espinosa *et al.*, 2011; Kang *et al.*, 2010; Zimmermann *et al.*, 2014). Furthermore, it helps to facilitate the communication between business stakeholders and IT that will be reflected in IT operations and support (Antunes *et al.*, 2011; Taleb & Cherkaoui, 2012).

The benefit of improving organization productivity can be realized through the gained learning from EA to accelerate IT response time, improve data quality and accessibility, quicker system design & management and reporting the utilization of resources (Alaeddini & Salekfard, 2013; Espinosa *et al.*, 2011; Lagerstrom *et al.*, 2011; Meyer *et al.*, 2012; Schmidt, 2010; Simon, Fischbach, & Schoder, 2014). EA helps to reduce the IT expenditure in local maintenance by standardizing technology (Buckl *et al.*, 2010), eliminating data redundancy through common data model and simplifying the technical environment (Espinosa *et al.*, 2011). It assists and supports change management by:

- Provide dependency analysis to evaluate the change impact on organization different layers (Antunes *et al.*, 2013; Farwick *et al.*, 2011; Sunkle, Kulkarni, & Roychoudhury, 2013).
- Deliver a holistic view for the organization and facilitate the risk management (Buckl *et al.*, 2010).
- Plan the transformation roadmap required from as-is to to-be architecture (Drews & Schirmer, 2014; Šaša & Krisper, 2011).
- Improve the organization agility to adopt changes through transparent business processes, standardized technologies, common data model and reuse/integrate of applications (Espinosa *et al.*, 2011).

The decision makers use EA to support them in decision-making by utilizing the documentations of as-is and to-be models (Svärd, 2013).

#### 2.2.4 EA Development

The purpose of EA framework is to guide the development and implementation of EA in the organization. EA framework is a set of guidelines, tools, models and artifacts descriptions that are used by the architects (Alaeddini & Salekfard, 2013). It provides a structure and organizing logic for the organization-captured information (Berrada & Bounabat, 2013). Bourey and Medini (2012) explained that EA frameworks provide steps on how to analyze and build the as-is architecture and actions required to reach the to-be architecture. It represents a modeling guide by expressing diagrams, rules and relating the modeled entities with each other (Chiprianov *et al.*, 2014; Vargas *et al.*, 2013). The description or the guidance of the framework in EA development differs based on the type of the used framework. As discussed earlier the first published framework was Zachman framework and later several frameworks were proposed such as The Open Group Framework (TOGAF) and Federal Enterprise Architecture (FEA) (Kloeckner & Birkmeier, 2010). These frameworks are industrial frameworks produced by the practitioners. Despite the goal is to develop EA, each framework has some uniqueness compared to each other. The below sections are discussing Zachman framework, TOGAF and FEAF in details. Finally, it summarizes the uniqueness in each framework and the similarities among the three frameworks.

This section discusses the well known EA frameworks which are utilized for EA development. The development activities that are suggested by each framework explained in depth. These frameworks normally target to guide the enterprise architects to develop EA for a particular organization. However, there is no specific framework used to develop EA for whole of government.

##### 2.2.4.1 Zachman Framework

Zachman (1996, p. 2) defines EA framework as “*the framework as it applies to Enterprises is simply a logical structure for classifying and organizing the descriptive representations of an Enterprise that are significant to the management*”

*of the Enterprise as well as to the development of the Enterprise's systems''*. Zachman framework is considered a classification of different stakeholders' views (Czarnecki, Winkelmann, & Spiliopoulou, 2013). As shown in Figure 2.1, it consists from rows (Scope contexts, business concepts, system logic, technology physics, Components assemblies and Operations classes) and columns (What, How, Where, Who, When and Why). Each row represents a perspective of the stakeholders who are (strategists, business management, architects, engineers, technicians and enterprise users) and each column represents the classification for each perspective (inventory sets, process flows, networks nodes, organization groups, timing cycles and motivations).

Compared to other frameworks, Zachman framework is a simple structure that provides taxonomy for the entire organization (Rajabi *et al.*, 2013). The perspectives should be considered in order starting top-down from business strategist to technical so the business requirements drive the adoption of the new technology (Nogueira Santos *et al.*, 2014). Zachman framework does not offer a method to guide the organization on how to use it and does not show the linkage between the cells (Nogueira Santos *et al.*, 2014). Specifically, it does not provide a solid implementation method but it gives a high flexibility for the organization by supplementing set of taxonomies (Kang *et al.*, 2010).



**Figure 2.1: Zachman framework (Zachman, 2008)**

#### 2.2.4.2 TOGAF Framework

TOGAF framework is the most comprehensive framework that has a detailed implementation and migration process (Agievich & Skripkin, 2014; Alaeddini & Salekfar, 2013). It gained popularity of IT consultants (Bernus *et al.*, 2015) and according to a survey, 82% of the organizations in the industry are utilizing TOGAF that provides a guiding process for EA development (Hess *et al.*, 2013). It is a recognized framework that integrates Business Architecture, Information Systems Architecture (Data Architecture and Application Architecture) and Technology Architecture (Barroero, Motta, & Pignatelli, 2010). TOGAF defined framework as “A foundational structure, or set of structures, which can be used for developing a broad range of different architectures” (TOGAF, 2009, p. 7). TOGAF consists from

six main parts; Architecture Development Management (ADM), ADM guidelines and techniques, Architecture Content Framework, Reference models, Enterprise Continuum and Architecture Capability framework (Antunes *et al.*, 2011; TOGAF, 2009).

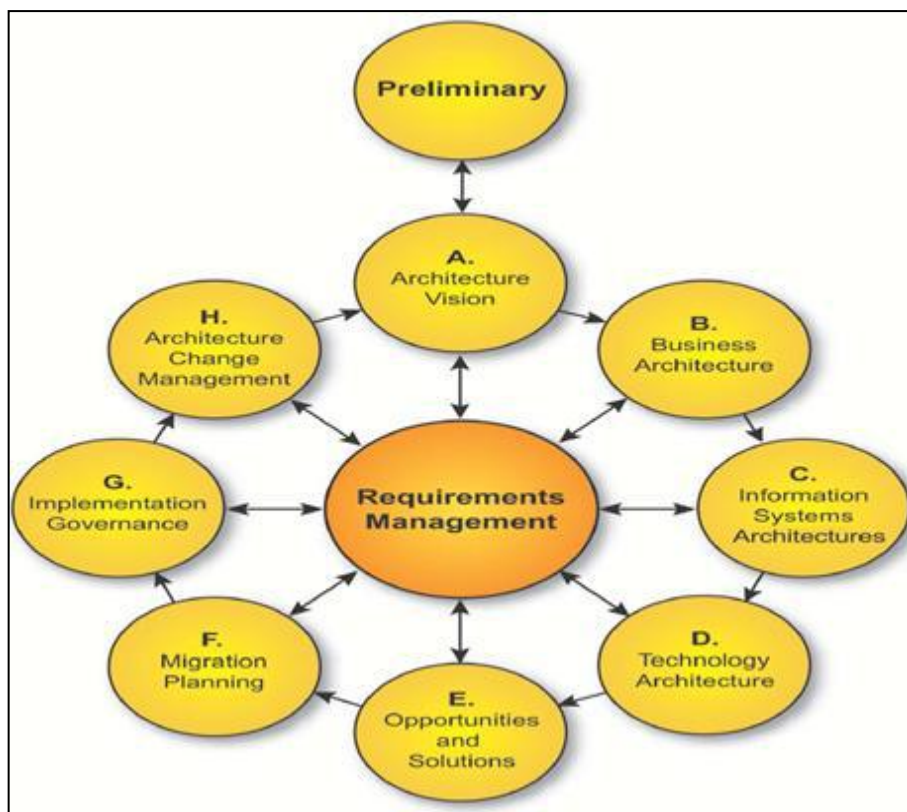
ADM is the heart of TOGAF that consists of nine cyclic phases (Speckert *et al.*, 2013) as shown in Figure 2.2. TOGAF explains the role of each phase as follow (Glissmann & Sanz, 2011; Hess *et al.*, 2013; TOGAF, 2009):

- i) **Preliminary phase:** includes review of organization context, goals, key stakeholders identification, architecture requirements, principles definition and governance.
- ii) **Architecture Vision phase (A):** includes a validation of input captured in the preliminary phase, stakeholders analysis and a comprehensive plan to address finance, resources, risks, communication and project dependencies.
- iii) **Business Architecture phase (B):** describes the baseline business architecture, target business architecture and analyzes the gap between the baseline and target business architectures and stakeholders review for the architectures.
- iv) **Information Systems Architectures phase (C):** describes the baseline data architecture, target data architecture and analyze the gap between the baseline and target data architectures. In addition, it describes baseline applications architecture, target applications architecture and analyzes the gap between the baseline and target applications architectures and the stakeholders review for the architectures.
- v) **Technology Architecture phase (D):** maps applications with the support technology infrastructure. It represents the baseline technology architecture, target technology architecture and analyzes the gap between the baseline and target technology architectures and conduct stakeholders review.
- vi) **Opportunities and Solutions phase (E):** includes determining the business constraints for implementation, review and consolidates the



gap analysis collected in phase B to D, confirm readiness and business risk and high level implementation and migration plan.

- vii) **Migration Planning phase (F):** includes confirming management interactions framework, assign business value for each project, resources and time estimation, cost/benefits analysis for projects migration, confirming transition architecture and generate architecture implementation and migration roadmap.
- viii) **Implementation Governance phase (G):** includes confirming scope and priorities for deployment, identifying deployment resources skills, guiding development of solutions, performing EA compliance review, and post implementation review.
- ix) **Architecture Change Management phase (H):** monitors the performance of the overall architecture and makes recommendations for change when necessary. Also, it operates governance framework for the architecture.
- x) **Requirements Management** is a process to collect and assess the requirements then feed them to the relevant ADM phase.



**Figure 2.2:** Architecture Development Cycle (extracted from TOGAF, 2009, p. 54)

The Architecture Content Framework “*provides a structural model for architectural content that allows the major work products that an architect creates to be consistently defined, structured, and presented*” (TOGAF, 2009, p. 361). ADM guidelines and techniques include guidelines for adapting the ADM process and techniques for architecture development (TOGAF, 2009). Enterprise Continuum is “*a view of the Architecture Repository that provides methods for classifying architecture and solution artifacts, both internal and external to the Architecture Repository, as they evolve from generic Foundation Architectures to Organization-Specific Architectures*” (TOGAF, 2009, p. 531). There are two main reference models; Technical Reference Architecture (TRA) that focuses on the application platform that provides a visual taxonomy representation of generic platform and Integrated Information Infrastructure Model which is considered part of the TRA but gives details on application software (TOGAF, 2009). Architecture capability framework provides reference materials on how to establish the architecture like architecture board, architecture compliance, architecture contracts, architecture

governance, architecture maturity models and architecture skills framework (TOGAF, 2009).

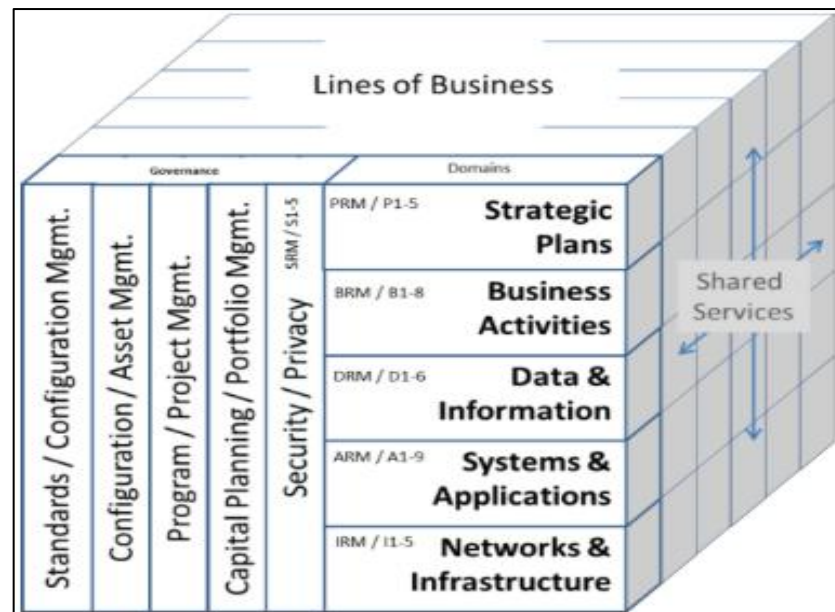
#### **2.2.4.3 FEAF Framework**

As a response to the Clinger-Cohen Act of 1996 to develop an enterprise IT architecture to promote information sharing among federal agencies, the Federal CIO established FEAF in 1999 (Sayles, 2003). The purpose of the FEAF is to optimize the performance of agencies business processes using Information Technology and to establish an agency wide roadmap that defines current agencies state and desired state (Sayles, 2003). Despite that FEAF developed for the Federal government of US but several organizations around the world utilized it to develop their own EA. The same applies to the department of defense architecture framework (DoDAF) which was developed for the department of defense in US but other organizations globally utilized it to developed their EA.

FEAF consists from six sub-architecture domains (OMB, 2012) as shown in Figure 2.3:

- Strategy architecture: includes the enterprise's goals, vision and mission. Performance Reference Model is used to represent strategy architecture.
- Business architecture: identifies the business processes and services. Business Reference Model is used to reference business architecture.
- Data architecture: includes the produced, shared or used data by business processes and services. Data Reference Model represents data architecture in FEAF.
- Application architecture: refers to all applications that used to execute business services and to generate or store the data. Application Reference Model represents the application architecture.
- Infrastructure architecture: identifies the environment required to host the applications and the network connecting them. Infrastructure Reference Model is used to represent infrastructure architecture.

- Security architecture: refers to the set of security controls across all architectures. Security Reference Model is used to support the security architecture across all the domains.

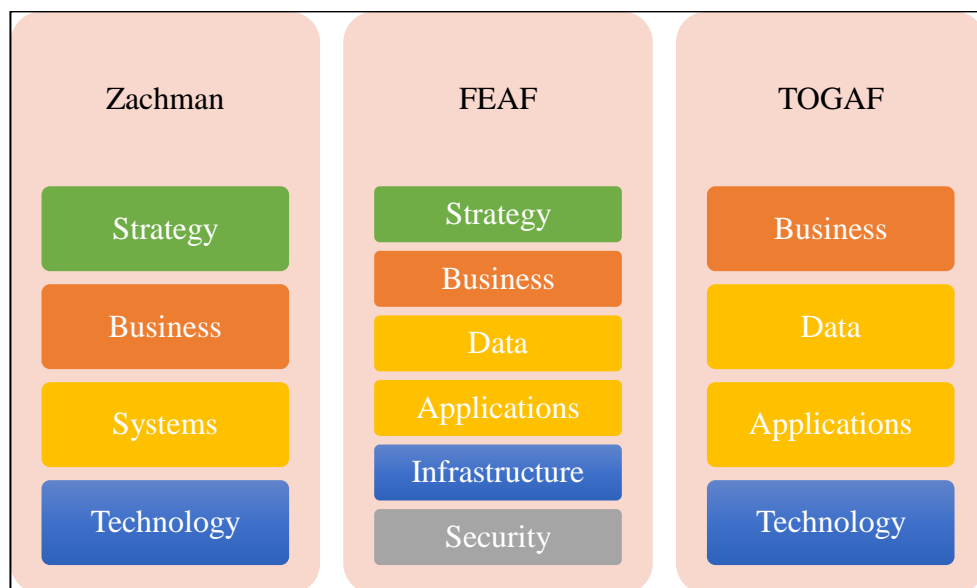


**Figure 2.3:** Federal Enterprise Architecture Framework (extracted from OMB, 2012, p. 22)

#### 2.2.4.4 Summary of Frameworks

To summarize, there are many frameworks evolved for EA development, but this section discussed in details Zachman, TOGAF and FEAF frameworks because they are the most popular and used frameworks in the industry and the highly referenced in the academic papers. Example of other frameworks that are not discussed here; Department of Defense Architecture Framework (DoDAF) (Barbau *et al.*, 2014) and GERAM (Generalized Enterprise Reference Architecture and Methodology) (Bernus *et al.*, 2015). Additionally, there are organizations that developed their own in-house EA framework. As discussed, each framework has a unique approach to develop EA as seen in Zachman framework that provides enterprise taxonomy but lacking guiding development process. On the other hand, TOGAF framework offers detailed process for EA development. Despite the

differences between the frameworks, there is sort of agreement between the practitioners and academicians that EA consists of four common main layers; business layer, application layer, data layer and infrastructure layer (Berrada & Bounabat, 2013; Chuang & van Loggerenberg, 2010). Thus, the visual models normally show the details of these four layers as illustrated in Figure 2.4. Despite these similarities, there are some unique aspects in each framework. For example, the strategy domain exists in Zachman and FEAF frameworks. However, the consideration of strategy is taking place in preliminary phase and vision architecture phase in TOGAF ADM cycle. Likewise, FEAF has security as architecture domain but did not take the same attention in TOGAF and Zachman.



**Figure 2.4:** The architecture products in Zachman, FEAF and TOGAF

Although these frameworks provide the development approach for the EA practitioners but they have a common drawback which is unavailability of means to support the practitioners to align the development approach with the stakeholders needs and concerns (Nakakawa *et al.*, 2013). Furthermore, the development approach of these frameworks focuses on developing EA for an organization (TOGAF, 2009; Langermeier *et al.*, 2015). Since the focus of these frameworks on organization level, governments tend to tailor these frameworks to develop their own wide government

EA framework, e.g. AlSoufi and Ahmed (2012). However, the development of EA in the public sector did not get sufficient attention in the academic studies (Bakar & Selamat, 2016).

### **2.2.5 EA in the Public Sector**

The concept of EA gained the attention from several governments around the world to support e-Government initiative that aims to improve the quality and speed of service to citizens (Bakar & Selamat, 2016). Around 67% of countries embarked on EA program to improve interoperability between government entities among them USA, Australia, Canada, Korea and many European countries (Bakar & Selamat, 2016; Du Lee & Kwon, 2013; Moreno *et al.*, 2014). This attention is also driven by UN e-Government evaluation in which the implementation of EA plays a role in the evaluation score (Du Lee & Kwon, 2013). Several academic studies conducted to study different aspects of EA in wide government or specific government entity. However, despite the wide temptation especially in the developed countries governments towards EA, limited literature discussed the details of the development process followed by these governments to develop their wide government EA. The development and implementation of wide EA government is challenging due to the need of the involvement of many government entities (AlSoufi & Ahmed, 2012).

AlSoufi and Ahmed (2012) investigated the first iteration that focused on EA development in Bahrain government as part of National EA framework project. The focus of the first iteration was 167 services in 26 government entities in which the scope was to develop target architecture for government services, technology standards, maturity program and governance framework to guide the development. The developed framework was based on a mix customization of TOGAF, Zachman and methodology oriented frameworks. The project was seen as a corner stone towards the successful adoption of e-Government. Moreno *et al.* (2014) & Moreno *et al.* (2016) gave a high-level description of the main components of the Colombian Government Architecture Framework that aimed to standardize IT management for the purpose of improve the interoperability between government entities. Similarly,

Lee *et al.* (2013) provided details on the Korean government Architecture Framework components that aimed to improve the interoperability, to avoid duplication of effort and to enable integration between government entities. Other EA literature addressed different challenges related to the government wide EA. Hjort-Madsen & Pries-Heje (2009) studied the drivers of using EA concept in Danish central government and it concluded that EA to a large extent driven by fashion.

On the other hand, there were studies that explored different angles of EA development or implementation in a particular entity. Seppanen, Heikkila, & Liimatainen (2009) discussed the challenges facing of establishing EA by studying EA in Finnish Road Administration and State Treasury. Bakar & Selamat (2016) studied the implementation of EA in Malaysian Ministry of Health and the critical success factors.

#### **2.2.5.1 EA in Oman**

The EA concept attracted the attention of the Omani Government. The government of Oman via its IT regulatory body initiated the development of Oman Government Architecture Framework (GAF) in March 2009 and the development of GAF was completed in March 2010 (ITA, 2010). The desired business outcomes of GAF were to ease access and faster services for the citizens as well as business by integrating government entities (ITA, 2010).

Despite the development of EA took place in Oman but its governmental entities are facing challenges to utilize it and realize benefits out of it. As highlighted in Section 2.2.6, one of the issues that hinder the acceptance and the utilization of EA is the challenge of aligning the development of EA with the stakeholders' needs. In other words, the development approaches of EA did not supply the EA architects with the alignment aspects and their influences that they need to consider while developing EA to ensure its alignment with the stakeholders needs.

### 2.2.6 EA Key Challenges

As discussed earlier, EA development and adoption are facing difficulties that lead to a high percentage of failure. This section details the challenges that hinder the success of EA. It discusses each challenge and the suggested future studies to address it as proposed by scholars.

#### 2.2.6.1 Value Demonstration Challenge

The popular EA frameworks are missing the assessment of EA capability in long term success (Aier & Schelp, 2010). Niemi and Pekkola (2013) clarified that most of the effort is concentrated on the architecting aspects and not much of attention is given to the quality of EA. There is a shortage of models that demonstrate the effective measures of organizational benefits associated with EA adoption (Espinosa *et al.*, 2011). Hence, the relationship between the architecture and the benefits needs to be understood (Quartel, Steen, & Lankhorst, 2010). EA is facing the challenge to quantify its benefits or its drawbacks, which causes difficulties in the evaluation analysis, hence raising the question of its value (Nakakawa, Bommel, & Proper, 2013; Zijl & Belle, 2014). Specifically in the initial period of EA adoption, the amount of effort and investment are not paid off equivalently (Jahani *et al.*, 2010; Löhe & Legner, 2014). Ross estimated that organizations need two to six years for full EA adoption including the technical and non-technical aspects but stakeholders are expecting short-term benefits especially during the data collection in which they are heavily involved with the architects that might lead to less satisfaction and cooperation from them (Buckl *et al.*, 2011; Buckl *et al.*, 2011). Moreover, despite BITA improvement is one of the main drivers of adopting EA, there are limited studies that assess the impact of EA on BITA (Alaeddini & Salekfard, 2013).

Espinosa *et al.* (2011) and Lange *et al.* (2012) recommended more empirical studies to assess EA benefits and to build benefits realization model.



### 2.2.6.2 Stakeholders Management

As discussed in previous sections, the stakeholders are the cornerstone in the development of EA, so the effective management of stakeholders improves the chances of successful development and adoption. There are various challenges confronting the enterprise architects in the interactions with the stakeholders. The collaboration between the enterprise architects and the stakeholders is one of the common difficulties in EA development because both the architects and stakeholders should have a shared understanding of the organization problem and the required solution to overcome it (Nakakawa *et al.*, 2011). Chuang and van Loggerenberg (2010) and Du Preez *et al.* (2014) clarified that the architects tend to use technical modeling terms but the stakeholders are expecting business-oriented discussion. So the differences between the two worldviews lead to inability to collaborate (Du Preez *et al.*, 2014). Additionally, the lack of stakeholders' awareness of EA concepts is affecting the communication flow and result in difficulties in capturing architectural info (Bakhshandeh *et al.*, 2013; Buckl *et al.*, 2011; Espinosa, Armour, & Boh, 2010). Also, the divergence between EA objectives and personal interests of stakeholders creates resistance to collaborate or accept the modeling approaches provided by EA (Nakakawa & van Bommel, 2010). Additionally, the IT root behind the EA concept makes the business management to underutilizing it (Fallmyr & Bygstad, 2014). Literature highlighted some of the key challenges that faced the enterprise architects in relation to the stakeholders as follow:

- The wrong interpretation of stakeholders concerns and requirements (Farwick *et al.*, 2014).
- Non-involvement of key stakeholders from the initiation phase that leads to lack of buy-in (Nakakawa *et al.*, 2011).
- The misalignment between EA activities with the stakeholders' interests (Buckl *et al.*, 2011).
- The balance between architecture abstraction and the detailed architecture info is a challenge for the architect that might end up in complex models as viewed by the stakeholders (Nakakawa *et al.*, 2013).

To overcome these challenges, van der Raadt *et al.* (2010) suggested conducting a research to understand in details the different stakeholders' expectations. Furthermore, Buckl *et al.* (2010b) explained the need for a systematic approach or a framework that support the alignment between the architects and the stakeholders. The social complexity issues in EA development and implementation between the architects and the stakeholders are not well addressed, so a further study is required to investigate these issues ( Nakakawa *et al.*, 2013).

### **2.2.6.3 Organizational Uniqueness**

The organizational context and uniqueness of its system require creativity from the architecture team to tailor the EA framework according to the organizational needs (Agievich & Skripkin, 2014). Due to the differences of the organizations needs, it is difficult to provide architecture descriptions that fit for all organizations (Antunes *et al.*, 2013). Furthermore, the conditions of changing organizational goals, new technologies and market changes result in a dynamic organization that impacts the development of EA (Buckl *et al.*, 2011). Iyamu and Mphahlele (2014) explained that there are political and organizational factors that influence the alignment between the architects and the stakeholders. The culture of the organization plays a key role in the interactions of stakeholders and the enterprise architects (Chuang & van Loggerenberg, 2010). Another organizational aspect that impacts the development of EA is the political view of EA by the business managers who resist the EA concept because it will threaten their involvement in making decisions related to the introduction of new technology (Zijl & Belle, 2014). These politics are fueled by the authority power that can drive the organizational structure to shift the purpose of EA and neglect the opinion of individuals with less authority power (Iyamu & Mphahlele, 2014).

Chuang and van Loggerenberg (2010) suggested future researches to study the impact of the organizational structure on shaping the architectures. Moreover, Hazen *et al.* (2014) recommended a study to investigate the role of organizational culture on EA usage and utilization.

#### 2.2.6.4 Technical Challenges

The multiple information providers may exceed the number of potential stakeholders who consume the modeling products, which leads to de-motivating the information providers, as they do not realize the value from their effort (Buckl *et al.*, 2011). The distributed information sources or inability to identify them and the vague supply and demand of architectural info create challenges in the development of EA models (Buckl *et al.*, 2011; Jahani *et al.*, 2010). The enterprise architects face difficulty to integrate data when the organization has many data types (Chuang & van Loggerenberg, 2010). Moreover, organizations are confronted with difficulties to apply the standards and principle of architecture by tailoring them to their needs (Glissmann & Sanz, 2011). The dynamic system of the organizations (change in business processes and IT landscape) creates challenges to maintain up to date architecture models and impact the quality of data that suppose to reflect the real situation (Brückmann *et al.*, 2011; Farwick *et al.*, 2011; Farwick *et al.*, 2014; Löhe & Legner, 2014). The extent of EA complexity is related to the size of the organization and in large organizations become problematic to shows all model components and their connections under one architecture (Nakakawa *et al.*, 2013; Zijl & Belle, 2014).

Farwick *et al.* (2013) and Farwick *et al.* (2014) suggested studies to look at the level of modeling abstraction and to automate the data collection required for modeling different architecture layers to improve data quality and reduce manual errors. Similarly, Holm *et al.* (2014) recommended a study that focuses on how to maintain EA models with accurate data.

#### 2.2.6.5 Other Challenges

In addition to the discussed EA challenges in previous sections, there are other challenges but less referenced in literature. The challenge of insufficient tools support for EA collaborative tasks (Nakakawa *et al.*, 2013) and their support of EA documentation automation (Farwick *et al.*, 2014). EA requires niche skills to tailor the EA high-level frameworks according to the organizational requirements (Antunes

*et al.*, 2013). So the lack of the architectural skills and experience possess problems especially for organizations that cannot afford external expertise due to financial limitations that lead to EA initiative failure (Iyamu & Mphahlele, 2014; Zijl & Belle, 2014). The governance of EA development is a critical element in the development of EA and lacking governance can cause challenges (Hauder *et al.*, 2014; Löhe & Legner, 2014). Types of challenges caused by lacking governance are stakeholders not accountable for their decisions, none compliance to architecture standards and no existence of decisions enforcement (Nakakawa *et al.*, 2013) and individual interests take priority over organizational interests (Zijl & Belle, 2014). The lack of the project management skills is also a challenge that might hinder EA success. The inability to assess staff skills causes problems in assigning the tasks (Iyamu & Mphahlele, 2014). Besides, the inappropriate scoping of the objectives and unclear business justification to describe the rationale of the architecture are considered threats for EA development (Nakakawa *et al.*, 2013).

### **2.2.7 Key Remarks**

Despite the long presence of EA but still there is no agreed definition for EA. Furthermore, the understanding of EA and its benefits are driven by the goals or the expected outcomes that the organizations seek to achieve out of EA development. This is showing that the field of EA is still immature and requires further academic studies to address different EA aspects, in particular stakeholders' management challenge, value demonstration challenge, organizational and contextual uniqueness challenges. The industrial EA frameworks provide the development approach for the practitioners to develop EA. These frameworks suffer from two main drawbacks; first the development approach scope is for an enterprise and cannot accommodate the EA development for wide government. Second, these frameworks do not give a comprehensive understanding to EA practitioners on the alignment aspects and their influences at each development step to align it with the stakeholders needs. Hence, the literature chapter sheds the light on the stakeholder concept (Section 2.3), alignment (Section 2.4), related studies (Section 2.5) and relevant potential theories (Section 2.6).

## 2.3 Stakeholders

Despite the roots of stakeholders' theory in management literature, it is attracted the attention of IS academics since twenty years. This can be related to the consideration given to the individuals, their needs and perception when developing technology solutions. The stakeholders' theory is studied in Section 2.6.2. The focus of this section is to present stakeholders' definition, identification and management as obtained from EA literature. In general, most of the EA frameworks or approaches are lacking the guidelines or models to identify and manage EA's stakeholders.

### 2.3.1 Stakeholders in EA's Context

The stakeholders play a significant role in the development of EA models (Bakhshandeh *et al.*, 2013) and miss incorporation of stakeholders' requirements or interests can result in low acceptance of the models despite the modeling effort (Buckl *et al.*, 2011). According to Antunes *et al.* (2013), the developed architecture should reflect the concerns and concepts derived from the stakeholders. Hence, one of the crucial roles of enterprise architects is addressing stakeholders' requirements and concerns (Bakhshandeh *et al.*, 2013). The concerns are defined as "*those interests that pertain to the system's development, its operation, or any other aspects that are critical or otherwise important to one or more stakeholders*" (Barateiro *et al.*, 2012, p. 3301). As discussed, the conceptualization of EA standards is centered on the stakeholders but because there are many of them with different views about the system, the architects should include the relevant stakeholders for EA development and ensure effective communication with all stakeholders (Booch, 2010; Jugel & Schweda, 2014). So the architects contribute by producing EA products (models) from the processed information obtained from the stakeholders (Buckl *et al.*, 2011). This section discusses stakeholder's definition, identification and management in the context of EA.

### 2.3.1.1 Definition of Stakeholder

EA models are a mechanism for the architects and the stakeholders to plan and communicate IT and business matters (Bernus *et al.*, 2015; Holm *et al.*, 2014). The concept of stakeholders began in the management literature and similarly got attention in the IS discipline because of its role in system success. In the context of EA studies, TOGAF defines stakeholder as “*an individual, team, or organization (or classes thereof) with interests in, or concerns relative to, the outcome of the architecture*” (Azevedo *et al.*, 2011, p. 29). Closely to the definition of TOGAF, Steenkamp *et al.* (2013) pointed that the stakeholders are the people with key roles or concerns about EA. Buschle and Quartel (2011) explained that the concept of stakeholders is used to represent the people who can influence, guide or constrain the business aspects and the consideration of their concerns in EA. According to (Farwick *et al.*, 2011, p. 342), “*EA stakeholders are the group of people who are actually using the EA data to make decisions, e.g. regarding future projects*”. Considering all of these definitions, the enterprise architects are part of EA stakeholders’ group. By studying these definitions and relating them to the research problem, this research limits the definition of the stakeholders as *individuals who are collaborating with enterprise architects to build EA models*. Despite the enterprise architects are key stakeholders but the “enterprise architect” as term is used to differentiate their role of leading and managing the development process from the normal role of stakeholders who share concern or requirement.

### 2.3.1.2 Stakeholders Identification

EA serves many stakeholders across the organization, so there is a need to identify the key stakeholders during the development of EA (Jugel & Schweda, 2014). In context of EA, there is no predefined group of stakeholders and based on literature review each study identified its stakeholders based on the case context e.g. Antunes *et al.* (2011), Postina *et al.* (2010) and Rajabi *et al.* (2013). Buckl *et al.* (2010b) and Postina *et al.* (2010) explained the availability of one approach to analyze the stakeholders in EA context which is the TOGAF guidelines which are

explained in TOGAF (2009). The TOGAF approach utilized in some studies like Postina *et al.* (2010) and Nakakawa *et al.* (2011). However, Buckl *et al.* (2011) pointed out a limitation in TOGAF approach as there is no clarification on the stakeholders who consume the information and who are the ones providing the information in EA development. Thus, the stakeholders' identification should be conducted in each organization as part of EA activities because stakeholders groups are not the same but differ based on the organization context (Buckl *et al.*, 2011). In Postina, Trefke, and Steffens (2010) study, they used TOGAF guidelines and identified eight groups of stakeholders, namely Architecture Sponsors, Business Architects, Data Architects, IT-Designers/Programmers, Project/Program Managers, Security Architects, Service Architects and Technology Architects. Pena and Villalobos (2010, p. 81) identified five groups of stakeholders "*five categories of stakeholders: those with corporate functions, the end-users organization, the project organization, the system operations and externals*". In general, there are a lack of approaches or guidelines for stakeholders identification except for TOGAF framework (Buckl *et al.*, 2010b). TOGAF (2009) provides guidelines on how to identify and manage EA stakeholders through the ADM lifecycle.

### **2.3.1.3 Management of Stakeholders**

The enterprise architects are responsible to coordinate and involve the stakeholders to produce EA models to deliver business outcomes (Espinosa *et al.*, 2010). The interactions between the architects and the stakeholders are not limited in addressing their concerns or requirements, but include EA changes and their expected impact on the business (Jugel & Schweda, 2014). In the same organization, more than one stakeholder may have different information needs, so multiple views are created to present these needs (Antunes *et al.*, 2013; Roth *et al.*, 2013). Enterprise architects should be cooperative and able to create a common understanding to reduce the chances of conflicts (Gotze, 2013). The management of conflicts among or with stakeholders in interests might be resolved by relating how the conflicted interests contribute to the organizational goals (Akhigbe *et al.*, 2014). TOGAF manages the stakeholders using a set of classifications called stakeholder power grid

where they classify the key stakeholders based on their power in influencing the activities and the required actions (keep informed, keep satisfied and key players) to manage them (Buckl *et al.*, 2011). Nakakawa *et al.* (2011) advised to improve the interactions with stakeholders by:

- Increasing the awareness of EA among the stakeholders and ensuring effective communication with them.
- Creating collaborative team with stakeholders to secure their buy-in.
- Identifying clearly the roles of stakeholders in the development of EA.

## 2.4 Alignment

With the evolving of business IT solutions and the high turnover of IT solutions, the challenge of aligning business needs with IT investment becomes apparent. BITA continue to be one of the most major worries of IT managers (Belfo, 2013). The importance of business IT alignment concept explained by (Henderson & Venkatraman, 1993) who explained that the value of IT investment cannot be realized due to the lack of alignment between business and IT strategies. The higher the alignment between business and IT, organizations are more likely to accomplish higher performance and realized value from IT (L. Chen, 2010). BITA addresses the extent of harmonization between business and IT to achieve business goals (L. Chen, 2010). Though that IT is used in almost all organizational activities, the challenge on how IT adds value and supports business processes still exist (Siurdyban, 2012). According to (L. Chen, 2010, p. 10) there are some factors hindering the alignment between IT and business which are *“lack of a close working relationship between IT and business, lack of effective prioritization of IT needs, inability of IT to meet its commitments, IT’s lack of understanding of business, lack of senior executive support of IT, and lack of leadership in IT management”*.

Though there is no exact definition for BITA, but most of authors shared the same interpretation (Gottschalk & Solli-Sæther, 2001). Luftman *et al.* (1999, p. 3) defined BITA as *“applying IT in an appropriate and timely way, in harmony with business strategies, goals and needs”*. Because the study is trying to develop an



alignment framework between enterprise architects and stakeholders in EA development, the study's alignment definition tailored based on Luftman *et al.* (1999) definition. Hence, the study's alignment definition is *developing EA in an appropriate and timely way in harmony with stakeholders concerns and needs.*

#### 2.4.1 Alignment in IS Context

Strategic Alignment Model (SAM) developed by Henderson & Venkatraman (1993) and Strategic Alignment Maturity developed by Luftman (2003) are the most models and referred by academics in BITA field. Table 2.1 below shows examples of studies that used Luftman's Strategic Alignment Maturity or Henderson & Venkatraman's Strategic Alignment Model as a core component in their BITA studies. It can be noticed that the use of Luftman maturity is dominant in recent BITA studies because it is complementary of the work done by Henderson & Venkatraman. The SAM is discussed in details in Section 2.6.1.

**Table 2.1:** Example of studies used Luftman or Henderson & Venkatraman model

Scholar	Model/Maturity Assessment
(Alaeddini & Salekfard, 2013)	Luftman's Strategic Alignment Maturity
(L. Chen, 2010)	Luftman's Strategic Alignment Maturity
(Charoensuk, Wongsurawat, & Khang, 2014)	Henderson & Venkatraman's Strategic Alignment Model
(Belfo, 2013)	Luftman's Strategic Alignment Maturity
(Sledgianowski, Luftman, & Reilly, 2006)	Luftman's Strategic Alignment Maturity
(Avison <i>et al.</i> , 2004)	Luftman's Strategic Alignment Maturity
(Sledgianowski & Luftman, 2005)	Luftman's Strategic Alignment Maturity
(Gregor, Hart, & Martin, 2007)	Henderson & Venkatraman's Strategic Alignment Model

Luftman *et al.* (1999) utilized the understanding of the twelve components in the four domains of Strategic Alignment Model components to investigate the enablers and inhibitors of BITA. They conducted a study between 1993 and 1997 that included IT and business executives from 500 firms in different industries in USA using survey and interviews to obtain top enablers and inhibitors of alignment

(Luftman *et al.*, 1999). The top ranked enablers and inhibitors are listed in Table 2.2. It can be noticed that the enablers and inhibitors are almost the same with minor difference in the ranking. Later on, Luftman used his understanding of BITA enablers and inhibitors to develop Strategic Alignment Maturity Assessment in 2000.

**Table 2.2:** BITA enablers and inhibitors (Luftman *et al.*, 1999, p. 4)

<b>Enablers</b>	<b>Inhibitors</b>
Senior executive support for IT	IT/business lack close relationships
IT involved in strategy development	IT does not prioritize well
IT understands the business	IT fails to meet its commitments
Well-prioritized IT projects	Senior executives do not support IT
IT demonstrates leadership	IT management lacks leadership

Strategic Alignment Maturity is introduced by Luftman as a assessment tool to help organizations to assess BITA maturity to identify recommendation for BITA improvement (Luftman, 2003). Luftman's assessment is one of the most BITA maturity assessment cited in literature (Alaeddini & Salekfard, 2013). Luftman, (2003, p. 7) developed the maturity assessment to assess the maturity of BITA based on 6 criteria (Communications, Value measurement, governance, partnership, technology scope and skills) utilizing the previous study findings of enablers and inhibitors. Each criterion has a set of specific attributes (total of 38 attributes for all 6 factors) measured against and stressed that the assessment need to be filled both by IT and business executives (Luftman, 2003). The overall average score of these categories define the alignment state from lowest level to highest level Initial/Ad Hoc, Committed, Established Focused, Improved/Managed, and Optimized (L. Chen, 2010, p. 10). Below is a detailed info for each criterion in Luftman assessment supported by evidences from BITA academic studies.

### **Communication**

According to Luftman, communication refers to the effective exchange of ideas and understanding between business and IT (Luftman, 2003). Several academic studies supported Luftman's argument on the importance of communication. L. Chen (2010) found that communication is the highest influencer of BITA in Chinese companies. Charoensuk *et al.* (2014) in their study of BITA in Thailand hotel

industry explained that effective communication enhances the degree of the alignment between business and IT in organization. It is an enabler of a continuous knowledge sharing between different domains across the organization (Belfo, 2013). According to Ravishankar, Pan, & Leidner (2011), the communication between business and IT executives is one of the key factors influencing BITA. Luftman used six attributes to measure communication criterion:

- Understanding of business by IT
- Understanding of IT by business
- Organizational learning
- Style and ease of access
- Leveraging intellectual assets

### **Competency/Value Measurements**

It is the ability to demonstrate IT contribution in business terms using metrics or dashboards (Luftman, 2003). Though Luftman clarified the importance of having performance measures (dashboards or metrics) of IT contribution in business terms to business but less attention was given to this factor from other authors. This is might be due to the challenge of measuring the contribution of IT. Luftman suggested seven attributes to measure IT contribution:

- IT metrics
- Business metrics
- Link between IT and business metrics
- Service level agreements
- Benchmarking
- Formally assess IT investments
- Continue improvement practices

### **Governance**

It refers to how decisions for manpower, risk, projects selection and prioritization, conflicts and responsibility for IT are shared between IT and business dashboards (Luftman, 2003). Saat *et al.* (2010) considered governance as one of the qualities contributing towards BITA. Projects selection and projects prioritization considered as one of the most important jobs of governance (Belfo, 2013). It is acknowledged that the effect of IT governance decisions are not limited to the technology aspect only (Siurdyban, 2012). Luftman used eight attributes to measure this criterion:

- Formal business strategy planning
- Formal IT strategy planning

- Organizational structure
- Reporting relationships
- How IT is budgeted
- Rationale for IT spending
- Senior level IT steering committee
- How projects are prioritized

### **Partnership**

It includes the trust relation between IT and business. Also, the extent of sharing risks, rewards and perception of business in IT contribution (Luftman, 2003). Teo & King (1997) found that the integration between IT/IS planning and business planning has positive contribution in enabling BITA. Belfo (2013) highlighted the importance of partnership through sharing risks and rewards between both business and IT. Also, he explained the role of coaching IT members by CEO as champion. Luftman used six attributes for partnership maturity:

- Business perception of IT
- IT's role in strategic business planning
- Shared risks and rewards
- Managing the IT-business relationships
- Relationship and trust style
- Business sponsors and champions

### **Technology Scope**

It refers to the flexibility of IT infrastructure to support all business partners, effectiveness of deploying new technologies, enabling business processes and ability to customize IT solutions to meet business needs (Luftman, 2003). The IT support for the business processes considered as top priority to management and can result in isolating IT use from business in case of many process disruptions (Wagner, 2014). According to Versteeg & Bouwman (2006), organizations give attention to IT and information architectures but less attention is made to integrate these architectures with business which leads to minimise the role of ICT in supporting business strategy. Luftman assessed technology scope by four attributes:

- Primary systems
- Standards
- Architectural integration
- How IT infrastructure perceived

### **Skills**

It refers to IT staff training, motivation, innovation, culture and career opportunities (Luftman, 2003). Based on surveys, it was found that some organizational culture can inhibit or even prevent the integration between business and IT (Belfo, 2013). Training, development of knowledge and capability of employees in the domain of IT and business are crucial elements in the BITA (Henderson & Venkatraman, 1993). Luftman measured the skills maturity by seven attributes:

- Innovative, entrepreneurial environment
- Key IT HR decisions made by
- Change readiness
- Career crossover opportunities
- Cross-functional training and job rotation
- Social interaction
- Attract and retain top talent

In line with Luftman *et al.* (1999) and Henderson & Venkatraman (1993), Gottschalk & Solli-Sæther (2001) & Teo & King (1997) supported the influence of integration between business planning and IS/IT planning in enabling BITA. Teo & King (1997) explained that there are organizational and environmental characteristics that influence this integration. The organizational characteristics include information intensity of products and services, information intensity of value chain, top management perception of IT and IS competence (technology knowledge and business knowledge). The environmental characteristics focus on the surrounding environment where the organization operates which incorporate the dynamism of products/services, heterogeneity of industry and hostility.

#### **2.4.2 Alignment in EA's Context**

Unlike the BITA, the alignment in EA context has different dimension. The enterprise architects and the stakeholders are the key actors interacting within a socio-technical system (organization) to develop a set of architectures e.g. business, data, and infrastructure (Barateiro *et al.*, 2012; Postina *et al.*, 2010). Literature explained that the involvement and the fulfillment of stakeholder needs are the cornerstone for the success and the acceptance of EA (Buckl *et al.*, 2011; Chuang &

van Loggerenberg, 2010; Fallmyr & Bygstad, 2014; Farwick *et al.*, 2014). The alignment scope in EA perspective covers the enterprise architects and the stakeholders to agree on the final developed architecture. Hence, the study defines alignment as *develop EA models in an appropriate and timely way in harmony with stakeholders concerns and needs*.

EA literature covered different topics e.g. critical success factors of EA (Bakar, Harihodin, & Kama, 2016; Bakar & Selamat, 2016), the challenges facing the enterprise architects (Chuang & van Loggerenberg, 2010) and the challenges hindering the adoption of EA (Olsen & Trelsgård, 2016). There were studies that explain tangentially factors influencing the alignment between the enterprise architects and the stakeholders. However, there is a scarcity of a comprehensive empirical study that investigates the alignment factors that shape the alignment between the enterprise architects and the stakeholders during the development of EA. Though these factors discussed in literature as critical success factors or challenges facing the enterprise architects, the research team used the definition of alignment to identify these as potential alignment factors which are detailed Table 2.3.

**Table 2.3:** List of potential factors influencing the alignment in EA development

Factor	Description	Scholar
<b>Organization culture</b>	The norms and values within the organization that stimulate stakeholders and enterprise architects actions	Aier (2014), Chuang and van Loggerenberg (2010), Iyamu and Mphahlele (2014)
<b>Organization dynamism</b>	The organizational changes and their influence on the interest of stakeholders and enterprise architects	Buckl <i>et al.</i> (2011), (Du Preez <i>et al.</i> , 2014), (Zijl & Belle, 2014)
<b>Governance</b>	The distribution of decision authority to manage the activities of EA	Chiprianov <i>et al.</i> (2014), Espinosa <i>et al.</i> (2011), Löhe and Legner (2014), Nakakawa and van Bommel (2010), Nakakawa <i>et al.</i> (2013), (Seppanen <i>et al.</i> , 2009)
<b>Organization politics</b>	The predominance of individuals in driving the meaning and the purpose of EA	Chuang and van Loggerenberg (2010), Iyamu and Mphahlele (2014), Zijl and Belle (2014), Nakakawa <i>et al.</i> (2013)
<b>Awareness</b>	The stakeholders knowledge of EA practices	Aier and Schelp (2010), Ask and Hedström (2011), Jahani <i>et al.</i> (2010), Löhe and Legner (2014), Saarelainen and Hotti (2011)
<b>Communication</b>	The shared understanding of	Aier and Schelp (2010), Azevedo <i>et</i>

	EA semantics, accessibility of architectural information and the dialogue between the enterprise architects and the stakeholders	<i>al.</i> (2015), Chuang and van Loggerenberg (2010), Espinosa, Armour, and Boh (2011), Hauder <i>et al.</i> (2013), Iyamu and Mphahlele (2014), Löhe and Legner (2014), van der Raadt <i>et al.</i> (2010), Winter <i>et al.</i> (2014)
<b>Conflict of interest</b>	The conflict between stakeholders interest and goals with EA	Chuang and van Loggerenberg (2010), Nakakawa <i>et al.</i> (2013), Nogueira Santos <i>et al.</i> (2014), van der Raadt <i>et al.</i> (2010), Zijl and Belle (2014)
<b>Participation</b>	The involvement of key stakeholders in EA activities	Jahani <i>et al.</i> (2010), Nakakawa and van Bommel (2010), Seppanen <i>et al.</i> (2009)
<b>Stakeholders identification</b>	The identification of the qualified stakeholders who are knowledgeable of business processes and demands	Bucklet <i>et al.</i> (2011), Löhe and Legner (2014), Nakakawa <i>et al.</i> (2013)
<b>Architectural knowledge</b>	The architectural knowledge, experience and skills of the enterprise architects	Aier and Schelp (2010), Iyamu and Mphahlele (2014), Jahani <i>et al.</i> (2010), Löhe and Legner (2014), Zijl and Belle (2014)
<b>Modeling depth</b>	The optimal level of architecture details and description required by the stakeholders	Buckl <i>et al.</i> (2011), Chuang and van Loggerenberg (2010), Glissmann and Sanz (2011), Löhe and Legner (2014), Nakakawa <i>et al.</i> (2013)
<b>Tasks nature</b>	Type of EA tasks, their duration and effort required to complete them	Holm <i>et al.</i> (2014), Aier and Schelp (2010)
<b>Principles</b>	The values that need to comply with to design and develop the architectures	Zadeh <i>et al.</i> (2014)
<b>Top management support</b>	The buy-in and empowerment of the organization leadership in support the architecture team	Seppanen <i>et al.</i> (2009), AlSoufi & Ahmed (2012), Bakar & Selamat (2016)

## 2.5 Related Work

Some studies have explained the important role of stakeholders in the effective execution and success of EA (Du Preez *et al.*, 2014; Nakakawa *et al.*, 2011). However, the enterprise architects are facing challenges to align the development process of EA with the stakeholders needs or concerns that result in low utilization, less involvement or no acceptance of EA (Buckl *et al.*, 2010b; Fallmyr & Bygstad, 2014; Iyamu & Mphahlele, 2014). Despite the stakeholders' role in EA's

effectiveness, there are scarcity of studies that build an in-depth understanding of the relationship between enterprise architects and EA stakeholders during the development of EA and the lack of comprehensive view of the factors shaping this relationship (Bakhshandeh *et al.*, 2013; Du Preez *et al.*, 2014; Nakakawa *et al.*, 2013). Furthermore, the existing industrial EA frameworks are lacking the tools or models guiding on how to manage and align the development of EA with the stakeholders (Nakakawa *et al.*, 2013). In recent years, van der Raadt *et al.* (2010), Chuang and van Loggerenberg (2010) and Nakakawa *et al.* (2013) tried to fulfill some aspects of the relationship between architects and stakeholders. This section provides an overview on literature that addressed topics close or related to the research problem and their shortcoming.

Chuang and van Loggerenberg (2010) conducted a qualitative study to investigate the role of the enterprise architects and non-technical challenges facing them in South Africa by means of interviews. The study concluded five primary challenges which were internal communication with the stakeholders, getting the buy-in from stakeholders, ownership and commitment, the pre-existing perception about the enterprise architect and organizational politics. However, the study neglected the perspective of the stakeholders since the interviews were limited to the enterprise architects. The focus of the study was exploring the influence of organization social aspects or none-technical factors on enterprise architect during the development process. Hence, they recommended that future study should shed the light on both technical and none-technical perspectives impacting the architecting team perhaps in different country to investigate the role of culture in the pre-existence of such challenges.

van der Raadt *et al.* (2010) conducted a qualitative study to explore the importance of individual benefits in architecture decisions and their mapping to the organizational goals during EA development using a case study of organization in Netherlands. The study found that the degree of stakeholders' satisfaction on EA is related to the achievement of their expectations. The enterprise architects need to work closely with the stakeholders to build a picture of their expectations.



Espinosa *et al.* (2010) investigated the coordination process and coordination challenges in EA using qualitative semi-structured interviews in some US government agencies. They concluded that the limitation of business stakeholders' awareness about EA and its benefits create difficulty for the enterprise architects to communicate with them. The benefits of EA especially at early stages are abstracted, so the enterprise architect should work very closely with the stakeholders to agree on success measures. The findings as well highlighted the need to integrate EA with the IT governance which includes senior stakeholders. Furthermore, the enterprise architects should have the business analysis skills that enable them to understand and focus on stakeholders' business needs.

Jahani *et al.* (2010) identified and evaluated factors which are used to assess the organization readiness to adopt EA using a survey with 50 experts. The formulated model is based on 9 critical success factors and using a questionnaire to measure the readiness of the organization on a five Likert scale where 5 is the highest score of the factor. If the score is above 3, that means the organization is mature enough to start EA program otherwise it needs to close the gap prior its start. The model consists of 9 factors which are senior managers, executive managers, organization strategy, change management, resource availability, organization structure, IT, organization culture and HR.

Penttinen & Isomak (2010) captured the stakeholders' views of EA using semi-structured interviews in Finnish government framework that consists of EA viewpoints business, information, IS and technology. The findings showed that the civil departments' interest was more on developing their own EA rather than wide government EA. The state administration view was wider compared to civil departments. The study pointed out the challenges of communicating and marketing EA work.

Ask and Hedstorm (2011) investigated the immature use of EA framework for local eGovernment project using a case study of Swedish local government that aimed to provide efficient services and empower citizens. The data collection was mainly through observation and complemented by interviews and project

documentation. Though the government goal of utilizing the architecture framework was to emphasis on business and information systems layers but the decisions made were influenced by individual members without connecting them to the overall architecture.

Winter and Aier (2011) conducted a study by means of questionnaire which was answered by 70 EA practitioners from Swiss and German companies that aimed to enhance the understanding of EA principles definition, use, enforcement and management. The study showed that only few companies applied and managed EA principles consistently. These designed principles were too static and developed almost in isolation from stakeholders. Additionally, the business architecture was missing such principles.

Nakakawa *et al.* (2013) explained that EA frameworks lack the detailed support that can be used by the enterprise architects in collaborative tasks. To address this gap, initially they performed an exploratory study using a sample consists from 70 enterprise architects who responded to a survey that investigated challenges associated with collaboration tasks during EA development. They used a design science approach to produce a collaboration model called CEADA that guides the execution of the collaboration tasks between the enterprise architects and the stakeholders.

In summary, the discussed studies tried to address particular aspects to support the enterprise architect in EA development with the stakeholders. However, the acceptance of the final architecture is based on how much the architecture aligned with the goals of the stakeholders. In other words, to what extent the stakeholders' views are aligned with the developed EA. What differentiate this study from other discussed studies; it is building a comprehensive picture of factors (both technical and social) that influence the alignment between the enterprise architects and the stakeholders during the development of EA.

## 2.6 Relevant Theories

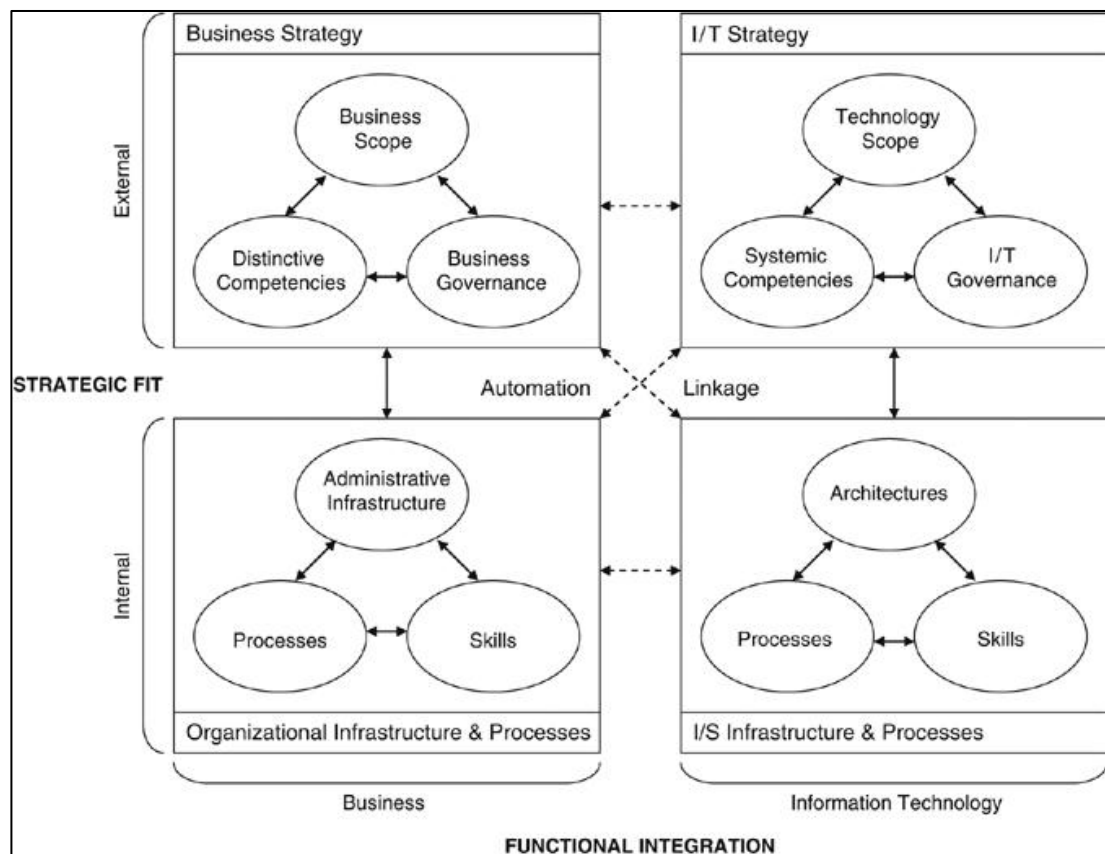
Since the research problem is focusing on the alignment between the enterprise architects and the stakeholders in the development process of EA, three theories have been identified as potential theories to enhance the understanding of stakeholders' concept and the multiple perspectives of their views. In this section, Strategic Alignment Model (SAM), stakeholders' theory and multiple perspectives theory (MPT) are discussed in details.

### 2.6.1 Strategic Alignment Model

Strategic Alignment Model was developed by (Henderson & Venkatraman, 1993) to provide strategic direction insight of IT in organizations. Though it was developed in 1993, it is still considered as one of main references in BITA (H. Chen, Kazman, & Garg, 2005; Kang *et al.*, 2010). The model explains that there are different BITA choices based on four domains; business strategy, IT strategy, organizational infrastructure & processes and IS infrastructure and processes as shown in Figure 2.5. Each domain has at least three components; for example business strategy domain consists from business scope, distinctive competencies and business governance.

The Strategic Alignment Model describes two types of integration; strategic integration and operational integration (Henderson & Venkatraman, 1993). The strategic integration explains the integration in the external domains between business and IT strategies. The operational integration is in the internal domains between the organizational infrastructure and processes with IS infrastructure and processes (Henderson & Venkatraman, 1993). According to Henderson & Venkatraman (1993), there are four common alignment perspectives can be obtained from the model which are strategy execution, technology transformation, competitive potential and service level. Strategy execution and technology transformation are driven by business strategy where in strategy execution, it influences the organizational infrastructure and processes and indirectly influencing IS

infrastructure and processes (Henderson & Venkatraman, 1993). In technology transformation, business strategy influences IT strategy and indirectly the IS infrastructure and processes domain (Henderson & Venkatraman, 1993). Competitive potential and service level are enabled by IT strategy where it is directly influencing business strategy in competitive potential case and directly impacting IS infrastructure and processes in service level case (Henderson & Venkatraman, 1993).



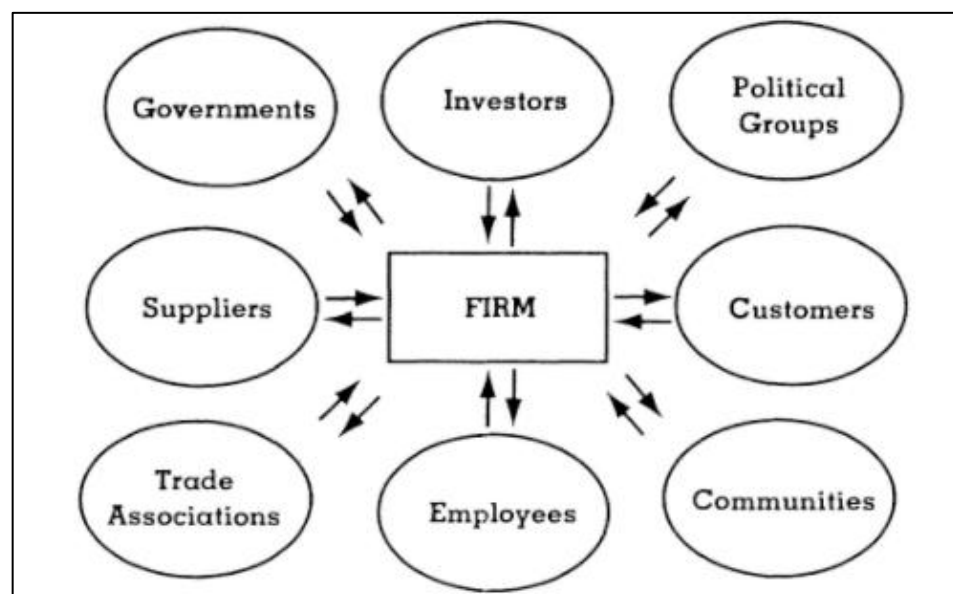
**Figure 2.5:** Strategic Alignment Model (extracted from Henderson & Venkatraman, 1993, p. 476)

## 2.6.2 Stakeholders' Theory

The stakeholders theory introduced by Freeman in 1984 to deal with the grown complexity of business and to support the organization strategic management (Barateiro, Antunes, & Borbinha, 2012). The understanding brought by Freeman is a shift from the traditional business thinking where the shareholders are placed at the

center and the focus was to maximize or create value for shareholders into a new thinking where all the stakeholders are considered (Ribeiro Soriano *et al.*, 2011). This idea is apparent in his definition of the stakeholder “*a stakeholder is any group or individual that can affect or be affected by the realization of an organization’s purpose*” (Freeman, 2007, p. 12). There are many existing definitions for stakeholders but the definition of Freeman is the most referenced one.

The stakeholders’ theory explained the relationships between the firm objectives and the stakeholders who attempt to influence the organizational decisions based on their needs and concerns (Ribeiro Soriano *et al.*, 2011). Thus, the organization should consider and balance between the needs of all stakeholders groups who have a formal relationship with the organization (primary) and the informal relationship (secondary) (Ribeiro Soriano *et al.*, 2011). Figure 2.6 below shows the stakeholders model.



**Figure 2.6:** Stakeholders model (extracted from Ribeiro Soriano *et al.*, 2011)

Though Freeman clarified the need to give attention to all stakeholders but the stakeholders’ model also shows the conflict of opinions and interests between the different stakeholders groups (Donaldson & Preston, 1995, p. 69). Freeman enlightened the importance of stakeholders management and how value created among them (Boonstra, 2009). He explained critical aspects for stakeholders’

management, which are stakeholders' identification, development of processes that address their needs and constructing relationship between these processes and the organizational goals (Freeman, 2007).

In the context of IS, the stakeholders can be classified to three groups users, IS professionals and managers but the researcher needs to study the context of the research as the groups might not be limited to these three groups (Ribeiro Soriano *et al.*, 2011). Similarly to management literature, McLeod Jr and Clark (2009) explained that the confusion about the stakeholders and who are they also exist in IS literature. Despite the variance of definitions in the IS discipline but most of these definitions centralized on people who will be affected or can affect the introduction of the new system Pouloudi (1999). Furthermore, the participation of users helps to understand the benefits and disadvantages of the system (Zhang, Dawes, & Sarkis, 2005). Hence, building trust on the system. However, neglecting users participations can lead to a system failure or creating a resistance (Boonstra, 2009). It has been shown the association between information system development implementation failure or success and the stakeholders (Pouloudi, 1999). Moreover, the importance of stakeholders is boosted due to the change in the nature of IS through the increase of cross boundaries solutions (Pouloudi, 1999). This result in a conflict among the stakeholders by taking advantage in the expense of other stakeholders (Boonstra, 2009). Hence, two concepts emerged; stakeholders' management and stakeholders' analysis as important concepts to facilitate the IS projects towards success. The stakeholders' analysis and management are aiming to assist in IS projects planning and align different organizational stakeholders (Coakes & Coakes, 2000). Pouloudi (1999) suggested 7 steps for IS stakeholders' management:

1. Identify stakeholders
2. Determine the phase of involvement
3. Determine their roles within the project
4. Determine objects of involvement and related interests
5. Determine the relative importance of stakeholders
6. Determine the degree of the involvement
7. Determine an action plan

Boonstra (2009) recommended 7 steps for stakeholders' analysis:

1. Identify a vision or objective
2. Describe a number of future states in terms of goals understandable by the stakeholder group

3. Break the goals down into the process, technology, and organization and culture steps necessary to balance the organizational equilibrium
4. Identify the stakeholder groups whose commitment is necessary to achieve each goal Step
5. For each type of stakeholder, describe the needed changes, perceived benefits, and expected kinds of resistance
6. Analyze the effort required to gain the necessary commitment from the stakeholder group
7. Develop action plans for those stakeholder groups that are not committed enough

The two approaches can be used to support the analysis and management of the IS stakeholders.

### **2.6.3 Multiple Perspectives Theory**

According to Linstone (1989), the traditional view of a problem within a complex system is dominated by the technical perspective that focuses on the technical analysis to find a solution. However, the human and organizational resources that are used to implement the solution are neglected during the problem analysis. Furthermore, Linstone (1989) explained that the enterprise comprises from a socio-technical system that means technical and social characteristics. Consequently the technical perspective alone is not sufficient to get the real picture (Linstone, 1989). Hence, he proposed MPT in assessing complex problems or systems that involve multiple actors by considering three perspectives Technical, Organizational and Personal (Benjamin & Levinson, 1993, p. 31). The technical perspective is covering the technical aspects and the organizational with the personal to cover the social aspects of the system. The technical perspective describes the technical characteristics using a technical lens, the organizational perspective discusses the organizational elements and personal perspective includes the individual related elements (Alias & Saad, 2001; Linstone, 1981). The MPT helps the practitioners to bridge the gap between the analysis to action specially after adding the perspectives of organization and personal which were rarely considered in technology assessment (Linstone, 1981). All of the three perspectives should be considered because each perspective covers different characteristics that do not exist

in other perspectives so limiting the perspective to one or two can be problematic (Linstone, 1989). Each perspective has unique features and characteristics as described in Table 2.4.

**Table 2.4:** The three multiple perspectives and their paradigms (Mitroff & Linstone, 1993, p. 108)

	<b>Technical (T)</b>	<b>Organizational (O)</b>	<b>Personal (P)</b>
<b>World view</b>	Science-technology	Social entity, small to large, informal to formal	Individual, the self
<b>Goal</b>	Problem solving, product	Action, stability, process	Power, influence, prestige
<b>Mode of inquiry</b>	Modeling, data, analysis	Consensual and adversary	Intuition, learning, experience
<b>Ethical basis</b>	Logic, Rationality	Abstract concepts of Justice, fairness	Individual values/morality
<b>Planning horizon</b>	Far	Intermediate	Short, with exceptions
<b>Other characteristics</b>	Cause and effect relationship	Agenda (problem of the moment)	Challenge and response
	Problem simplified, idealized	Problem delegated and factored	Hierarchy of individual needs
	Need for validation, replicability	Political sensitivity, loyalties	Filter out inconsistent images
	Claim of objectivity	Reasonableness	Need for beliefs
	Seek for best solution	First acceptable solution	Cope with a few alternatives
	Quantification	Incremental change	Fear of change
	Use of averages, probabilities	Compromise and bargaining	Creativity and vision by the few
	Uncertainties noted	Make use of uncertainties	Need for certainty
<b>Communication</b>	Technical report, briefing	Language differs for insiders, public	Personality important

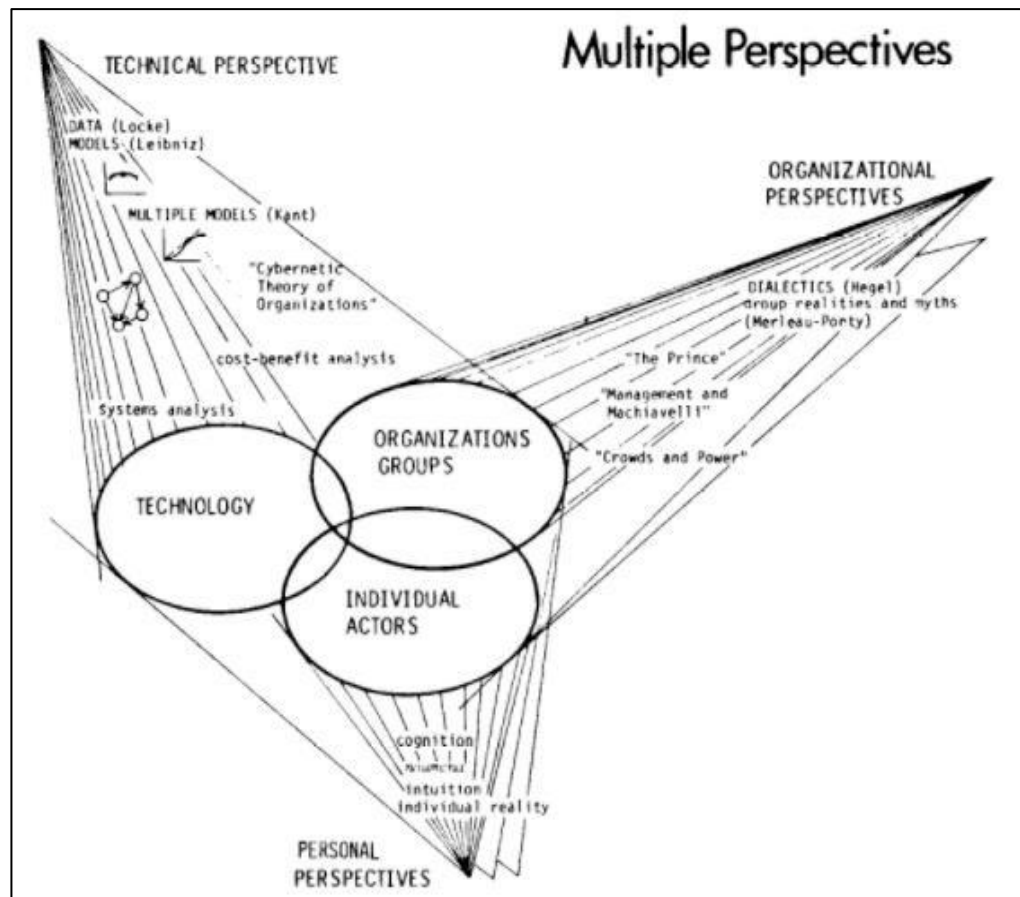
The complex problems or systems have range of actors with diverse needs and interests (Mitroff & Linstone, 1993). Hence, it is important to identify the main



stakeholders involved in the studied problem or phenomenon (Linstone, 1989). Any social system has stakeholders so it is essential to follow a systematic approach to identify the main stakeholders influencing the problem/system (Mitroff & Linstone, 1993). Because the complex problem is characterized by organizational and personal perspectives, it is expected to notice different aspects when applying the multiple perspective theory for the same problem in different organization (Mitroff & Linstone, 1993).

There are wide applications of MPT as reported by (Linstone, 1981, p. 301); to mention some:

- Strategic planning and decision making
- Risk evaluation and management
- Energy forecasting and planning
- Military systems analysis
- Technology assessment
- Cross cultural system analysis



**Figure 2.7:** Multiple Perspectives Model (Linstone, 1981, p. 301)

Mitroff and Linstone (1993) illustrated some guidelines when applying the MPT:

- Try to balance between the three perspectives without giving priority for one over another.
- Use the right judgment to study the characteristics for each perspective especially for organizational and personal perspectives.
- Use different method in obtaining information about technical perspective, which can heavily use organizational documents, and the organizational and personal perspective in which the interviews are the recommended method.
- Give attention for the integration or the interdependency between the perspectives
- Try to use dynamic thinking in dynamic environments

Alias and Wood-Harper (1997), Alias and Saad (2001) and Rahim, Alias, and Carroll (2010) are examples of IS studies that employed MPT. The MPT contributes

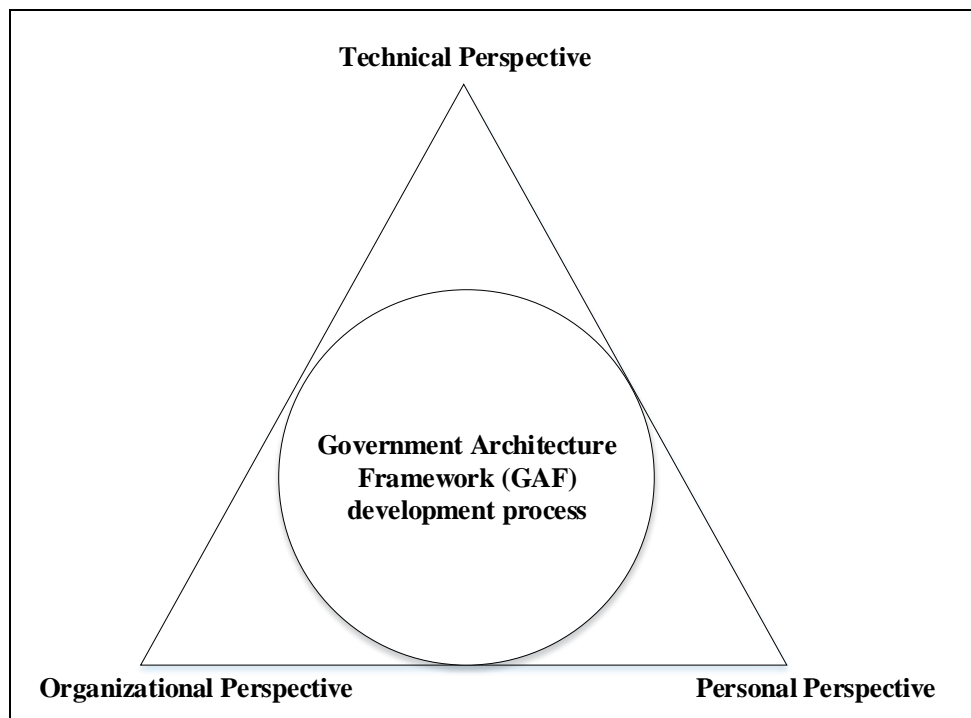
to this study by enhancing the understanding of the different aspects that need to be considered by the researcher while studying the alignment of the enterprise architects and the stakeholders. Since the enterprise architects and the stakeholders interact within a socio-technical system (which is the organization), considering the three perspectives Technical, Organizational and Personal provide a comprehensive view of the underpinning alignment factors of this interaction.

## **2.7 Initial Theoretical Model**

The initial theoretical model in qualitative studies provides initial guidance for the novice researchers by providing high-level focus areas in data collection and analysis (Miles, Huberman, & Saldaña, 2014). Thus, the researcher should explore the most relevant theory that can be employed to support addressing the research problem.

Despite the SAM from first impression might be thought related but after studying the model and its constructs (refer to Section 2.6.1), its focus is more on aligning the operations and strategies of IT with the business. Hence, it was found irrelevant to the research problem context. The stakeholders' theory (discussed in Section 2.6.2) clarified the concept of stakeholder and classified the stakeholders in the firm into groups as illustrated in Figure 2.6. In the context of this research, the definition of stakeholder as explained by the stakeholders' theory used to confirm the stakeholders groups who played a role in the development process of GAF. As pointed out in Section 2.6.3, Limestone proposed MPT in assessing complex problems or systems that involve multiple actors within socio-technical system by considering the three perspectives (Technical, Organizational and Personal). In the context of the research case study, the case study actors (enterprise architects and the stakeholders) interact within a socio-technical system which the government. MPT can provide a comprehensive view of the characteristics of this interaction and alignment phenomenon in the development process of GAF. Thus, MPT was the main employed theory to develop the initial research theoretical model. The MPT along with its main three perspectives are thorough discussed in the next sections.

In addition, Section 2.2.4.4 described two main gaps in the current EA frameworks (Zachman, TOGAF, FEAF) which are the lack of support to align the development approach with stakeholders needs and inability to use them to develop EA for wide government. Hence, the proposed initial alignment model has the development process of GAF at the center to explore the development steps that took place in GAF. Moreover, it addressed the alignment aspects by considering the MPT three perspectives; 1) Technical, 2) Organizational, and 3) Personal as shown in Figure 2.8.



**Figure 2.8:** Initial theoretical model

### 2.7.1 Technical Perspective

As explained by Linstone (1989), the technical perspective includes the technical characteristics of the system. In the context of EA, it represents all technical aspects related to the architecture and the modeling activities executed by the enterprise architects and the stakeholders. By conducting a systematic literature review (SLR), the potential characteristics considered under the technical perspectives are architectural knowledge, modeling depth and tasks duration. The

architectural knowledge describes the level of the enterprise architect skills, experience, competency in executing EA activities and the availability of expertise within the organization (Aier & Schelp, 2010; Iyamu & Mphahlele, 2014; Jahani *et al.*, 2010). The modeling depth and breadth are related to the level of model complexity or abstraction and the distribution of data sources required by the enterprise architect to build the architectures (Buckl *et al.*, 2011; Chuang & van Loggerenberg, 2010; Nakakawa *et al.*, 2013). The tasks duration describes the length and amount of modeling effort to complete the task because the duration and the complexity of tasks might impact stakeholders' involvement (Aier & Schelp, 2010; Holm *et al.*, 2014).

### **2.7.2 Organizational Perspective**

The organizational perspective covers the potential characteristics related to the organization, which are organization culture, organization dynamism, governance and organization politics. The organization culture comprises the beliefs, the values and the norms spread among the stakeholders that influence their actions and interaction (Aier, 2014; Chuang & van Loggerenberg, 2010; Iyamu & Mphahlele, 2014). The organization dynamism refers the continuous changes of the organization due to internal or external factors like introduction of new technology, business improvement and introduction of new regulation that lead to an impact on the interest of stakeholders and enterprise architects (Buckl *et al.*, 2011; Du Preez *et al.*, 2014). The governance includes the stakeholders' decision-making authority, the structure of the decision-making and the decision-making process required to manage the EA (Chiprianov *et al.*, 2014; Espinosa *et al.*, 2011; Löhe & Legner, 2014). The organization politics are related to the power and authority of individuals in influencing architectural products (Chuang & van Loggerenberg, 2010; Iyamu & Mphahlele, 2014; Nakakawa *et al.*, 2013). Also, it includes resisting the development of EA from the business managers to preserve their right of technology decision-making (Zijl & Belle, 2014).

### 2.7.3 Personal Perspective

The personal or individual perspective includes all individual characteristics. In the study context, these potential characteristics are awareness of stakeholders, communication, conflict of interest, participation and the stakeholders' identification. The awareness of stakeholders mostly refers to the training, knowledge and the understanding of EA practices, concepts and activities (Aier & Schelp, 2010; Ask & Hedström, 2011; Saarelainen & Hotti, 2011). The communication aspect here covers the communication within the enterprise architects' team, the communication of enterprise architects with the stakeholders and the communication among the stakeholders themselves to ensure the coordination and the understanding between different parties (Azevedo *et al.*, 2015; Chuang & van Loggerenberg, 2010). The conflict of interest describes the stakeholders' personal beliefs preference against the organizational interests (Nakakawa *et al.*, 2013; Zijl & Belle, 2014). The participation incorporates the involvement of the senior management to support the success of EA project (Jahani *et al.*, 2010; Nakakawa & van Bommel, 2010). Stakeholders' identification is the ability to identify the key stakeholders who will collaborate with enterprise architects and provides the as-is processes, requirements, concerns and the future outlook (Löhe & Legner, 2014; Nakakawa *et al.*, 2013).

## 2.8 Summary

In summary the chapter discussed different aspects of EA; definition, drivers, benefits, development, key challenges, stakeholders, related work, Alignment and initial theoretical model. In general, there is no single agreed definition for EA but the research employs the EA's definition described by Lankhorst (2009). The most referenced drivers for EA adoption are BITA, manage organizational complexity and support organizational change. Despite many EA benefits mentioned in literature, the empirical studies that quantify or demonstrate them are limited. There are key challenges facing EA development and implementation as discussed in Section 2.2.5. The discussed challenges cover different aspects of EA development process. It can be noticed that there is a partial relationship between these challenges. For example,

the challenge of demonstrating short-term benefits for EA can be as a result of a challenge from stakeholders' management that normally lead to none acceptance or no utilization of EA. Hence, EA fails to demonstrate its value to the organization. Another example, the organizational culture and politics can impact the interaction between the architect and stakeholders. Thus, they are playing a role in the appearance of challenges in stakeholders' management. In other words, these challenges should not be considered in silos but instead have to be studied in a holistic manner. Furthermore, the studied challenges are mostly centered around the enterprise architects, the stakeholders or the interaction between the two because they are the main actors in EA development, which demonstrates the importance of the research questions. There is a scarcity of a comprehensive study that investigates the alignment factors that shape the alignment between the enterprise architects and the stakeholders during the development of EA.

Zachman and TOGAF are the most popular EA frameworks that are used to guide the development of EA and the details on these frameworks with other development aspects are detailed in Section 2.2.4. The stakeholders are the cornerstone of EA development success nevertheless the current industrial EA frameworks are lacking the capability to support the architects in aligning EA development with the stakeholders' goals. This chapter as well discussed the alignment in IS field, the well-known IS alignment models and the alignment in the context of this research as explained in Section 2.4. In a summary from the related work discussion in Section 2.5, it can be concluded that an in-depth understanding of the alignment between the enterprise architects and stakeholder can be considered as a major step towards addressing the gap of aligning EA development with stakeholders in literature. SAM, Stakeholders and MPT theories were investigated in details in Section 2.6. The stakeholders' theory was used to clarify the definition and concept of stakeholders. On the other hand, the MPT was employed to develop the initial theoretical model to provide initial guidance especially in data collection and analysis phase by considering three perspectives (technical, organizational and personal) to investigate the alignment in EA's development.

## **CHAPTER 3**

### **RESEARCH METHODOLOGY**

#### **3.1 Overview**

This chapter describes the research methodology aspects. It provides an overview of the research guiding paradigm, research approach, case study design, and research operational framework. The research guiding paradigm explains the set of assumptions that guided the researcher's inquiries. The research approach discusses the research strategy used to address the research questions and the justification of using it. Supported by the preliminary phase findings, the chapter details the case study design. Specifically, it explains the refined research questions, overall case study design, interview participants, case study protocol design, data analysis procedures and research trustworthiness. It also provides a comprehensive plan on case study data collection procedures and analysis. Besides that, it discusses trustworthiness considerations taken to ensure the reliability and validity of findings. Additionally, the chapter shows the research operational framework and explains the carried out activities at each phase. Finally, the chapter is concluded by a summary of key chapter remarks.

#### **3.2 Research Paradigm and Goal**

The research context plays a significant role on deciding the research paradigm that guides the researcher. Creswell (1998, p. 74) defines the paradigm as



*“a basic set of beliefs or assumptions that guide their inquiries”*. These assumptions are ontological issue, epistemological assumptions, axiological assumption, rhetorical assumption and methodological assumption (Creswell, 1998). The ontological issue in qualitative research addresses the realities existing with the individuals that need to be investigated, interpreted and reported by the researcher (Creswell, 1998). The epistemological assumption is concerned on bridging the gap distance between the researcher and the phenomenon being studied through living interaction (Creswell, 1998). The axiological assumption focus on the role of value in the study where the researcher needs to discuss the biases and own interpretation (Creswell, 1998). The rhetorical assumption refers to the specific language or the qualitative terms employed which normally literary with limited definitions. The methodological assumption is related to the entire research process logic (Creswell, 1998).

Lapan, Quartaroli, and Riemer (2011) clarified the existence of five paradigms namely; positivism, interpretivism, mixed between positivism and interpretivism, critical and participatory. The positivist believed on minimizing the interaction with the phenomenon or subject being studied and preferring to test pre-existing theory using logical and replicable steps (Lapan *et al.*, 2011). The interpretivist follows an inductive approach to develop a theory or theoretical framework through the interpretation of individual views and the use of open-ended questions (Creswell, 2012). The mixed paradigm consists of both positivism and interpretivism paradigms in which the opinion of the participants on the researcher interpretations is highlighted (Lapan *et al.*, 2011). The critical researcher believes on the social and political power in affecting the lives of individuals and links their behavior within the context of the larger controlling system (Lapan *et al.*, 2011). The participatory paradigm is the mixed of the three approaches positivism, interpretivism and the critical in which the researcher joins group of participants to study social action (Lapan *et al.*, 2011).

Based on the research problem or the studied phenomenon, the research goal varies. Ruane (2005) identified four main goals from conducting the research or mix between them, which are:

- i) Exploratory: needed when the area being studied is little researched and detailed understanding is required.
- ii) Descriptive: required to build precise view that normally can be achieved through measurements.
- iii) Explanatory: necessary to understand how and why phenomena happen and investigate the challenges of the phenomenon.
- iv) Evaluation: highly related to the explanatory research but with focus on evaluating specific program or policy.

Considering the above discussion on the research paradigms in the context of this research, the interpretivism is selected as a guiding paradigm. The interpretive paradigm is the optimum for this study because the nature of the problem investigated consists of different actors who might hold different realities and perspectives that need to be captured to answer the research questions. Furthermore, the area of study is little researched and there is a lack of theories use as discussed in literature chapter. From research goal perspective, the research *explored* the development process of EA and *explained* the factors influencing the alignment between the enterprise architects and the stakeholders along with their influence.

### 3.3 Qualitative Research

Distinct from the quantitative research, the qualitative research is rarely focusing on cause and effect or describes attributes (Lapan *et al.*, 2011). The qualitative research tends to explain and explore the phenomenon based on individual experience, interactions and opinions (Lapan *et al.*, 2011). It is an enabler to provide deep insights on organizational characteristics and individual behavior using observations and interviews as main methods (Lapan *et al.*, 2011). The qualitative data are helpful to explain or improve the understanding of relationships by suggesting theoretical framework (Eisenhardt, 1989). The main feature of qualitative research is the investigation of the phenomenon in its natural settings and providing rich description about its context (Miles *et al.*, 2014).

Creswell (2012) discussed the common characteristics that shape the qualitative research. These characteristics are summarized as follow:

- The data collection is carried out in its natural context
- The key instrument for data collection is the researcher
- Rely on multiple data collection sources e.g. interviews, documents, observations, etc.
- The use of complex rationalization and explanation through the research
- The researcher is trying to interpret the views hold by the participants
- Evolving research design and not rigid that might keep changing through the research different stages
- Drawing the big picture of the problem

In addition to the above, Creswell (2012) discussed the hallmarks of the good qualitative research; thorough procedures of data collection, the use of qualitative approaches and their outlines, start of exploring single concept, reflect the culture and experience of the researcher and the use of categorization and multiple abstractions in the analysis. Moreover, he explained the situations on when to use qualitative approaches, which are:

- To explore the problem and build in depth understanding about it
- To enable the participants to share their views about the problem or the phenomenon
- To study the natural settings in which the problem exist
- To explain a connection in a theory as follow up from quantitative study
- To develop theoretical framework or theory
- To understand the uniqueness of the participants

The researcher in social sciences can rely on the qualitative approach, quantitative approach or mixed from the two approaches to collect and analyze the data. The decision of selecting the approach normally depends on the nature of the problem being investigated. When there is little knowledge about the context and difficulty of applying existing theories, the qualitative approach is preferable (Anteby, Lifshitz, & Tushman, 2014). However, when the area being studied is mature, the quantitative data and tests are favored (Russel, 2000). The selection of

the research strategy depends on the research nature, question and context. Considering the qualitative research features and characteristics as explained by Creswell (2012), Yin (2009), Lapan *et al.* (2011) and Eisenhardt (1989), the qualitative approach was chosen to answer the research questions. The justifications for this selection are summarized as follow:

- i) The need for an in-depth understanding on the interactions between the enterprise architects and the stakeholders.
- ii) The type of the main research question “How” which makes the qualitative study recommended approach to answer such question.
- iii) The need to identify the factors and their influence on the alignment between the enterprise architects and the stakeholders during the development process of EA.
- iv) The scarcity of studies that addressed the alignment of enterprise architects and the stakeholders

### **3.3.1 Qualitative Research Approaches**

The research approaches have advantages and disadvantages and the selection of the optimum approach relies on three conditions, which are research questions, the control of the researcher over the events and the importance of the real life events to the historical events (Yin, 2009). This section describes the five qualitative research approaches as described by Creswell (2012) namely narrative research, phenomenological research, grounded theory, ethnographic research, and case study as an introduction for the next section that illustrates the research strategy.

The narrative research is one of the five qualitative approaches discussed by Creswell (2012). In the narrative research, the focus is on one or two individuals through collection of their stories that are analyzed and reported by the researcher chronologically (Creswell, 2012). Narrative research uses interviews, observations and documents as main sources for data (Creswell, 2012). Narrative research is popular in a situation when there is a necessity to report individual’s (or small group) story, life or experience (Creswell, 2012).

The phenomenological research is targeting to explore a phenomenon through describing the experiences and views of participants impacted by the phenomenon (Creswell, 2012). The phenomenological research is common when there is a need to develop a policy or practice (Creswell, 2012).

The grounded theory (GT) is a theory building approach that follows iterative process between data collection to conceptualization and construction of theory (Lapan *et al.*, 2011; Orlikowski, 1993). It is targeting to develop a theory grounded from the analysis of the process and the phenomenon by following specific guidelines (Creswell, 2012). GT helps the researcher to be focus in the data analysis through different levels of coding that includes comparisons of categories, participants and sites till the analysis reach the theoretical saturation in which no new insights obtained (Lapan *et al.*, 2011; Orlikowski, 1993). Lapan *et al.* (2011) explained three stages of GT namely; initial coding, focused coding and theoretical coding. In the initial coding step, the collected data are studied for their relevancy with the research questions (Lapan *et al.*, 2011). Next, the focused coding step in which the data are navigated for the most redundant data to suggest a core category or categories that will be analyzed further to subcategories (Lapan *et al.*, 2011). The final step is the theoretical coding which is targeting to relate the categories into a theoretical framework or theory (Lapan *et al.*, 2011). The GT is used when there is no possible theory that could address the process or the experiences of individuals about the phenomenon (Creswell, 2012).

The ethnographic research is aiming to study a culture of group by reporting and interpreting their language, behavior and beliefs (Creswell, 2012). It develops a complete picture of group's culture by observing the group activities (Creswell, 2012). It is ideal if the research investigates the values, behavior and beliefs of group to understand a phenomenon related to the group (Creswell, 2012).

The case study research is the study of the phenomenon within its real life or natural settings (Benbasat, Goldstein, & Mead, 1987; Creswell, 2012). It employs multiple data source methods to acquire the knowledge (Benbasat *et al.*, 1987). It helps to comprehend the role of the surrounding settings on the problem (Eisenhardt,

1989). The case study can be explanatory, descriptive or exploratory depending on the research purpose (Yin, 2009). In the case study approach, the researcher should explain the reason for chosen the case study approach, present the case, analyze the similarities and the differences across the multiple cases or unit of analysis (Creswell, 2012). The case approach is best fit when there are cases identified and there is a need for in-depth understanding of the case settings (Creswell, 2012). Furthermore, It is preferred when questions of “How” and “Why” been asked and the researcher has little control over the events (Yin, 2009). Specially in situations where an in-depth of the real setting of a phenomenon is required such as individual behaviors, interrelationships and organizational processes (Yin, 2009). Also, in scenarios where there is no clear distinct between the phenomenon and its context (Yin, 2009). The researcher has the option to design single case study or multiple case studies. According to (Yin, 2009), there are four types of case study designs:

- i) Type 1: Single case holistic
- ii) Type 2: Single case embedded
- iii) Type 3: Multiple case holistic
- iv) Type 4: Multiple case embedded

Single case study design is recommended in certain conditions in which the case is representing a critical test of theory or unique situation (Yin, 2009). Benbasat *et al.* (1987) recommended the use of single case study for exploration purpose and validation of the instrument. When the analysis is targeting a program or an orientation within the organization, then it is called a holistic design (Yin, 2009). However, if the case study analysis is aimed more than one unit of analysis like multiple projects, then it is called an embedded design (Yin, 2009). The advantages of using multiple case study is the replication of case design using multiple case study and the prediction of certain results (Yin, 2009). Such replication will need to be based on a rich theoretical framework to predict the theoretical replication (Yin, 2009). This is aligned with the understanding from Benbasat *et al.* (1987) who explained that the use of multiple cases enriches the obtained descriptions that can used as theoretical basis.

### 3.3.2 Research Strategy

The case study as a research strategy is widely used in qualitative research in the area of information systems (Darke, Shanks, & Broadbent, 1998). The case study research is preferred when there is little understanding about the how and why processes or phenomenon occur and the experiences of individual and the context are playing significant role (Darke *et al.*, 1998). Yin (2009, p. 29) pointed out “*case studies have been done about decisions, programs, the implementation process, and organizational change*”. The case study could be a single case or multiple cases (Miles *et al.*, 2014). Single case can be informative if selected as unique or revelatory. However, it is recommended to include multiple cases to get deeper understanding of process and outcomes from more cases (Miles *et al.*, 2014). The selection of case is depending on the suitability of the case to answer the research questions and potential access to case data (interview people, documentations, archival, etc.) (Yin, 2009).

The research question posed by the study is; how could the enterprise architects align the development process of EA with the stakeholders’ goals in the public sector of Oman? The researcher decided to use a case study approach as a main strategy to tackle the research questions. As discussed earlier, the advantage of using case study approach is enabling the researcher to investigate the phenomenon within its context (Gummesson, 2000). In summary, the following reasons were the drivers for using this strategy:

- i) The interactions between the enterprise architects and the stakeholders to develop EA are occurred with no control from the researcher and it is essential to explain the development process. Moreover, it is important for the study to understand the factors influencing the alignment between the enterprise architects and the stakeholders holistically. Thus, the case study approach is the best choice to address such aspects. This is aligned with the understanding obtained from Benbasat *et al.* (1987), Yin (2009) and Creswell (2012).

- ii) The nature of the research is both exploratory by exploring the development process of EA and explanatory by explaining the factors influencing the alignment between enterprise architects and the stakeholder. Also, the need to explain the influence of each factor and provide recommendation to address them.
- iii) The use of initial alignment model that evolved along the research stages
- iv) The main research question is a “How” question. As explained by Yin (2009), it is recommended to employ case study approach when such question is raised.

This is aligned with EA literature trend in which case study approach is the most utilized approach.

### 3.3.3 Qualitative Data Collection Instruments

Yin (2009) suggested three principles in the data collection stage, which are the use of multiple evidence sources, creating database of case study reports and maintain chain of evidences. Maintaining chain of evidence starts by formulating case study questions, then linking the questions to the case study protocol topics, then cite the relevant evidence sources in the case study database, and finally build the case study report (Yin, 2009). One of the advantages of using the case study approach is the availability of different data collection methods (Benbasat *et al.*, 1987; Eisenhardt, 1989). Baxter & Jack (2008) explained the possibility of using six data evidences types documentation, archival records, interviews, direct observation, participant observation and physical artifacts. Since the researcher is the main instrument in qualitative data collection, the risk of bias is high and Lapan *et al.* (2011) recommended the use of conceptual model and writing diaries to minimize the personal influence. Below sections elaborate the data sources methods common in case study approach.



### **3.3.3.1 Documentation Review**

The documentation is one of the common types of case study evidence where the documents are available in the internet (Yin, 2009). Examples of documentary info are organization internal reports, minutes of meetings, progress reports, letters, email, public documents etc. (Flick, 2013). The main use of documentation in case study is for the triangulation purpose (Yin, 2009). It is also used to verify info related to the organization names and titles of individuals and can be used by the researcher for inferences.

### **3.3.3.2 Archival Analysis**

Unlike the documentation, the archival records are quantitative in nature and include census, clients service records, budget records, and previous survey data about employees or participants (Yin, 2009). The archival records are produced for different purpose and available to the public (Lapan *et al.*, 2011). The usefulness of archival records varies from one case to another depending on the nature of the study and the need for quantitative analysis.

### **3.3.3.3 Interviews**

Interviews are considered the essential and main source of case study info that follow none rigid guidelines (Creswell, 2012). The investigator should use friendly and none threaten questions in the open-ended questions (Yin, 2009). There are three types of interviews an in-depth interview, a focused interview and a formal survey (Yin, 2009). The investigator in the in-depth interview takes the opinions of respondents and asks them for their insights in some circumstances in extended and lengthy sessions (Yin, 2009). The in-depth interview may last between 1 to 2 hours and more than one session with the same interviewee (Lapan *et al.*, 2011). Hence, the role of respondent in this type of interview is more informants. In the focused

interviews, the interview sessions are short (might be limited to 1 hour) and guided by the questions prepared in the case study protocol which should not be a leading questions (Yin, 2009). It is also known as semi-structured interviews and targets larger sample 12 to 15 interviews (Lapan *et al.*, 2011). The formal survey is a structured interview consists from questions that are part of a survey to produce quantitative data (Yin, 2009). The survey follows the normal sampling and regular survey instrument procedures.

Creswell (2012) discussed the steps required to conduct the interview. First, the researcher should verify the questions that need to be answered in the interview session. Then, the interviewees expected to answer the questions are determined. Then, the researcher decides on the optimal interview type and the medium of conducting the interview (phone, face to face, etc.). After that, the use of recording procedures and design interview protocol are recommended. Then, the researcher should test the protocol through pilot. Finally, the researcher selects the participants and the sites and obtains the necessary consent from them.

#### **3.3.3.4 Observations**

The observations add extra dimensions for the study that are not captured during the interviews Auerbach & Silverstein (2003). Yin (2009) discussed three types of observations, which are direct observations, participants' observation and physical artifacts. Direct observations normally focus on the environmental conditions surrounding the phenomenon and range from formal procedures for data collection via case study protocol to informal where the investigator observes things like building condition, furniture and the workspace during a meeting or visit (Yin, 2009). Participant observation is a type of observation in which the investigator is playing active role in the events Auerbach & Silverstein (2003). It is mostly common in the studies of anthropology or social life of groups (Yin, 2009). Physical Artifacts is a type of evidence source in which the data collected based on a physical artifact (like technological device or instrument) (Yin, 2009). Compared to the rest of

evidence sources discussed above, the physical artifact is the less relevance to most of the case study (Yin, 2009).

Similar to the interviews, Creswell (2012) explained the steps required to conduct observation. First, the researcher should select the site and the role of observation. Then, the researcher designs the observation protocol and let someone to introduce you. Finally, the researcher withdraws from the site and writes down full notes.

### **3.3.4 Qualitative Data Analysis**

The categorization and the use of patterns are the core features of qualitative data analysis. The analysis of qualitative data is the main element towards building the theory (Eisenhardt, 1989). Creswell (2012) elaborated the overall process for qualitative data analysis that begins with preparing the data, then organizing them into themes through a process of coding and finally reporting them in figures and discussion. There is no single approach to analyze the qualitative data and the scholars sometimes use different naming for the same analysis technique. This section is focusing on analysis techniques namely comparison (constant and theoretical), cross-case analysis and classification based on source.

The use of comparison is one of the major qualitative analysis feature (Corbin & Strauss, 2008). Corbin and Strauss (2008) classified two types of comparisons; constant comparison and theoretical comparison. As they explained, the constant comparison is to compare the collected events by looking for similarities and differences in which the similar events are grouped under one category. This is aligned with the Straussian approach that consists of three stages namely open coding, axial coding and selective coding (Creswell, 2012). In the open coding, the researcher studies the collected data to come up with categories and use comparative approach to saturate the possible categories that include subcategories called “properties” (Creswell, 2012). The researcher examines the categories and identifies the core category that will be the main focus of the study. The second step is the

axial coding that aims to explain the core category by relating it with the other categories. The third step is the selective coding in which the concluded findings from axial coding are organized into theoretical model.

In the theoretical comparison, the initial classification of collected data is based on literature, theory or researcher's experience (Corbin & Strauss, 2008). Then, the researcher searches for similarities/differences and maps them to each category and makes comparison between the categories. This technique is suggested by Yin (2009) and called it the logic models that considers sequential stages of matching the empirical events with the theoretical predicted events. Similarly, Eisenhardt (1989) suggested categories in the analysis based on literature or researcher understanding.

The cross-case comparison is common when two case studies or more are considered. The cross-case synthesis is specific for the multiple case study in which each individual case study is analyzed using word tables and later these tables compare the overall pattern in all tables to draw conclusion (Yin, 2009). In line with Yin, Eisenhardt (1989) proposed selecting pair of cases and examines the similarities and differences between them, which result in categories, and new concepts.

The classification based on source is suggested by Eisenhardt (1989). It is to classify the data based on the source and after that search for similar patterns from different data sources. This tactic is helpful to minimize the researcher's bias because it relies on more than one data source.

### **3.4 Case Study Design**

Case study design refers to the plan of all steps required to initiate research questions till the conclusions that answer these initiated questions (Yin, 2009). The highly inductive or loosely design is recommended for the experienced researchers who have enough time and resources (Miles *et al.*, 2014). However, if the researcher

is a beginner in the field of qualitative research, tighter design is recommended to provide focus on the procedures and how to deal with data overload (Miles *et al.*, 2014). So the choice between the loosely design or tighter design depends on how much known about the phenomenon, time availability, the experience of the researcher, instruments and the analysis (Miles *et al.*, 2014).

Researchers developed initial conceptual framework to provide some focus on the research problem and provides some guidance in later research stages. The conceptual framework explains the initial perception of the researcher on the most important constructs of phenomenon (Miles *et al.*, 2014). Normally, the researcher uses his personal experience and theory to develop the initial conceptual framework (Miles *et al.*, 2014). The qualitative researcher keeps refining and reconfiguring the framework as the data are collected and analyzed (Miles *et al.*, 2014). While planning for case study design, the researcher is forced to think about preliminary theory that addresses the researcher topic (Yin, 2009). The main goal of preliminary theory is to develop theoretical framework that guides the researcher in overall case design whether it is exploratory, explanatory or descriptive (Yin, 2009). Miles *et al.* (2014) recommend to develop the conceptual framework in graphical form and after laying out your thoughts, compare it to the literature findings. In the context of this research, the author is guided by research questions and MPT to develop the research initial theoretical model. The initial theoretical model was concluded and discussed in details in Section 2.7. The researcher used the theoretical model in developing the initial coding cycle themes as part of data analysis. However, the researcher used open-ended questions during interview sessions and performed the data collection inductively. In other words, the researcher was opening the door for any emerge concept from the data collection and analysis.

### **3.4.1 Case Study Questions**

The first step in case study design is to define the initial research questions and specify potential priori constructs to shape initial theory design based on literature (Eisenhardt, 1989). The development of research questions may start prior

or follow the development of the conceptual framework and refine throughout the research (Miles *et al.*, 2014). Designing and scoping case study research require a comprehensive literature review to position the research questions in the appropriate context (Darke *et al.*, 1998). It is crucial to note that these initial questions and constructs are tentative and no guarantee for keeping them while progressing through different research stages (Eisenhardt, 1989). The researcher should be open for any new arisen concepts or constructs during data collection and data analysis (Eisenhardt, 1989).

Based on the research problem, the initial research questions were formulated prior the preliminary study as follow:

*How could the enterprise architects engage effectively with the stakeholders in EA development?*

To answer this main question, four sub-questions created as follow:

*Question 1: What is the process of the EA development?*

*Question 2: What are the factors influencing the engagement between the enterprise architects and the stakeholders in EA development?*

*Question 3: What are the roles of stakeholders in the engagement activities during EA development?*

*Question 4: What framework can be used to support the enterprise architects in the engagement with the stakeholders in EA development?*

After conducting the preliminary study (discussed in Chapter 4), it was concluded that the term alignment compared to engagement is more relevant. As highlighted before, the objective is to achieve an agreement between the enterprise architects and the stakeholders on the developed architectures. This finding is supported by Gartner's study on top EA pitfalls in which the engagement is explained based on the extent of alignment between the goals of IT and business stakeholders. Furthermore, the researcher examined the definitions of engagement and alignment in literature. Miliszewska and Horwood (2004) explained that engagement grounded on the idea of collaboration between teams to successfully executing tasks. Luftman *et al.* (1999, p. 3) defined Business IT Alignment as “*applying IT in an appropriate and timely way, in harmony with business strategies, goals and needs*”. By considering these two definitions and the research problem, the

term alignment was much closer to the research context compared to engagement even from literature perspective. Hence, the term engagement was replaced by alignment. Additionally, though the enterprise architects considered as stakeholders by the Freeman's definition of stakeholder but for the sake of clarity and addressing research problem, they had been separated into enterprise architects who were leading and looking after the architecture plan and stakeholders who were concerned in their requirements and challenges. This is also aligned with EA literature in which there is a distinction between the enterprise architects and the stakeholders. As a result, the questions had been rewritten accordingly as highlighted in section 1.3.

### **3.4.2 Case Selection**

The selection of case study is important specifically in defining the generalization boundaries of findings (Eisenhardt, 1989). Issues of case site accessibility and willingness of informants to participate are among the common issues of case study research (Darke *et al.*, 1998). Hence, the criteria of case selection should address these issues upfront by considering them as part of case selection criterion.

The case study research can be a single case or multiple cases. Both single and multiple cases can be used for exploratory purpose (Darke *et al.*, 1998). In explanatory, the single case study can be used as basis for further investigation by applying them in more cases (Darke *et al.*, 1998). The single case study is recommended when the case is unique or a revelatory case and there is a need for detailed description about the case (Yin, 2009). On the other hand, multiple cases main advantage is allowing the researcher to test the replication of findings by conducting cross analysis between cases (Miles *et al.*, 2014). There is no ideal number of cases and normally it is decided based on research questions (Darke *et al.*, 1998).

The sampling within any research is highly related to the study problem and its contribution to address it (Lapan *et al.*, 2011). There are two concerns when doing

qualitative sampling which are the relevancy of the sample to the situation and the generalizability of the sample (Lapan *et al.*, 2011). Despite the availability of several qualitative sampling techniques purposive, midpoints, theoretical sampling (Eisenhardt, 1989; Lapan *et al.*, 2011; Orlikowski, 1993), the selected sampling technique of the participants depends on the used qualitative approach (Creswell, 2012). The purposive sampling is common in case studies and participants selection (Creswell, 2012). There are no rigid criteria for the selection of the case study. The selection is normally based on accessibility, geographical closeness and the willingness of the organization to participate in the research (Yin, 2009). In general, the selection of cases is based on the access to the potential respondents and the possibility of theoretical replications (Yin, 2009). On the other hand, Eisenhardt (1989) highlighted the need to give an attention to the market in which the cases operate to enable the researcher to control the environmental differences.

For the sake of this research, Government Architecture Framework (GAF) is selected as a single case study purposefully for the reasons explained in Section 4.4. The real case study name and the participants' names are hidden for anonymity and confidentiality reasons. Among the rationales of conducting single case study is that it represents a typical project for the public sector and also its relevancy to the research problem (Yin, 2009). The case study main actors are interacting within the same environment (public sector). So the findings of the study are generalizable within the government sector in Oman.

### **3.4.3 Interview Participants**

In the case study approach, it is very important to define the case to distinguish between the main data of the case and the context data which is external to the case (Yin, 2009). The researcher can use the research questions, literature and previous studies as a guide to define the case (Yin, 2009).

This research followed single case study in which GAF represents the case study. The site of interview was dependent on the location of the government entity



in which the interviewee belongs to. The research questions provided initial insights on participants sampling in specific context to tackle research problem (Miles *et al.*, 2014). The identification of case study sample is a complex task. Hence, it is advisable that the researcher collects initial data about the case to get some understanding on the case and the central actors who contribute to answer the research questions (Miles *et al.*, 2014). Unlike quantitative samples, the qualitative study samples include small number of people operating or interacting under specific context and the purposive sampling is the common sampling technique in qualitative study (Miles *et al.*, 2014). However, random sampling is rarely used in qualitative study because the researcher purposively selects specific setting to investigate the phenomenon (Miles *et al.*, 2014). In qualitative studies that used grounded theory as mode tend to follow theoretical sampling that is deduced based on specific constructs (Miles *et al.*, 2014).

Based on the research problem that focuses on the alignment between the enterprise architects and the stakeholders and after conducting the preliminary study, the central actors are identified. As a result, the GAF case main actors are the enterprise architects and the stakeholders who participated in GAF development. The researcher purposefully was targeting to interview those enterprise architects and the stakeholders to capture their views. In addition, the researcher was seeking to understand the context of the GAF by understanding the development process of GAF and the roles of the stakeholders and the enterprise architects.

#### **3.4.4 Crafting Instruments and Protocol**

It is critical for the researcher to follow a systematic approach in the data collection of the case study. Besides that, the researcher should have common investigation skills, which are asking good questions, interpretation of answers, good listener, flexible, firm in grasping the issues of study and unbiased (Yin, 2009). The planning for data collection is crucial to ensure efficient time use and relevancy of collected data to the research topic (Benbasat *et al.*, 1987). To prepare for a specific case, the researcher needs to get approval of the plan (case study protocol), gain

consent from participants, ensure the privacy and confidentiality, and protect them from any harm (Yin, 2009).

According to Yin (2009), the investigator should act as a senior investigator and to do so, the investigator should have case study training that includes:

- Discuss the purpose of the study, its main questions and the criteria for case selection
- Review of the case study protocol components (theoretical framework, importance of topic and the link between the evidence source in relation to each question)
- Review of the methodology like field procedures, follow-up activities, evidence types and project timeline

The training uncovers the potential problems in the case study preparation and the capability of the researcher and ensure the alignment among the research team members (Yin, 2009).

The case study protocol is the instrument directed to a specific case to guide the researcher and contains the procedures and rules (Yin, 2009). It helps to improve the reliability of the case study research (Yin, 2009). The drafted case study protocol should be submitted to Institution Review Board for review and approval (Yin, 2009). In general the case study protocol consists of overview of the case study, field procedures, case study questions and case study report guide (Yin, 2009). The overview of the case study normally elaborates the objective of the research and the tackled issue. This is in line with Darke *et al.* (1998) who suggested preparation of letter that includes research purpose, nature of data to be collected and the expected outcome. The field procedures focus on access to case site, sources of data and matters to ensure no harm to the case participants. The case study questions refer to the questions that are asked by researcher and the sources to answer them. The questions should target to serve the unit of analysis of the case study and the questions attention on the organization not individuals (Yin, 2009). Finally, the case study report outlines the main sections for the expected case study report and the extent of documentation (Yin, 2009).

The researchers in case study research employs multiple data sources which support the triangulation of findings (Eisenhardt, 1989). Case study protocol contains the procedures and the instruments that are utilized to guide the researcher (Yin, 2009). Hence, the use of case study protocol is vital to increase the case study reliability and act as a guide especially for novice researchers. Before developing the case study protocol, the researcher should state clearly the objectives of the research and the benefits for the participated organizations (Darke *et al.*, 1998). The research questions, conceptual framework and sampling give the researcher a direction on what data instruments choices to be used (Miles *et al.*, 2014).

Darke *et al.* (1998) highlighted important points for the researcher who is going through the data collection process in case study research:

- Agree on the confidentiality matters and restrictions in publications
- The researcher should get sufficient information about case site
- Information like participants names and positions should be known before contacting them for interviews
- The case study data should be documented and organized as they are collected
- Building a case database that contains all data collected enable other researchers to review them, hence improving the reliability of the case. It is recommended to use qualitative computer software to assess building the case database.
- Interviews are the primary method for data collection in interpretive studies. Hence, the researcher should use open-ended questions to capture the views and experiences of the participants.

As a supporting instrument for the interview, Yin (2009) suggested to employ analytic memoing which is a brief report on the researcher reflection on the interview session that normally highlight any apparent new concept, main themes and future direction of study. It is similar to the suggestion highlighted by Miles *et al.* (2014) who recommended the use of contact summary that contains a set of questions to provide striking points about the interviewee in terms of themes, issues and situation. The use of contact summary or analytic memoing supports the researcher to plan for

next interviews and also act as initial source for data analysis. The common sources of evidence discussed for case study research are documentation, archival records, interviews, direct observations, participant-observation, and physical artifacts (Yin, 2009).

Based on the above discussion and also following the interpretive case study protocol guidelines used by Miskon (2013), the study protocol consisted of:

- Consent form: it is a form that includes a brief description on the research purpose, expected outcome and confidentiality/privacy matters. At the end of the form, the interviewee should sign to consent for the interview session.
- Pre-interview checklist: it includes info related to the case study site and informant like case study website, role of informant and access to the site.
- Pre-analysis data collection plan: it is a form in which the researcher plans the types of evidences to be captured in each visit to the case site.
- Interview questions: the open-ended questions which are to be asked during the interview session. The researcher uses them as a guide during the interview but may ask other questions depending on the interviewee's answers. All of these questions are designed to answer the main research questions.
- Interviewee details: it includes details specific to interviewee like name, position and contact details.
- Call for participation: it is a letter prepared to the case site representative seeking their support to participate in the research.
- Field notes templates:
  - i) Contact Summary Form: set of questions to help developing a summarized reflection about the interview session.
  - ii) Observation Checklist: a table in which the researcher can record any observation during the visits to case site for interview sessions.
  - iii) Document Summary Form: it is a summary on the collected documents from the site and their purpose.

More details about the protocol can be found in Appendix A. This protocol was validated as part of the preliminary study discussed in Chapter 4. Several changes had been made especially in the interview questions in order to make them clearer and suitable to the case study context, refer to Appendix B for the modified interview questions.

### 3.4.5 Analyzing Data Procedures and Guidelines

A key feature in case study research is the overlap between data collection and data analysis by utilizing the field's notes and commentary (Eisenhardt, 1989). Several advantages can be gained from this overlap such as flexibility in data collection, chance to adjust protocol questions or adding additional source of data and comprehending initial understanding of theory (Eisenhardt, 1989). Eisenhardt (1989) discussed the importance of data analysis as part of theory building from case study and described two types; within case analysis and cross-case analysis.

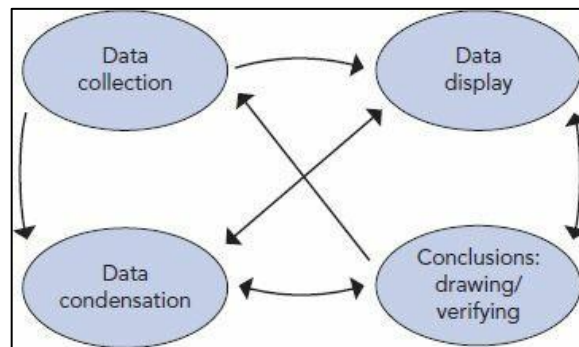
One of the difficulties in case study research analysis is the amount and variety of collected data. The two well-known ways of qualitative data analysis are inductive approach (commonly used in grounded theory) and deductive approach (Darke *et al.*, 1998). The inductive approach involves coding sentences from collected data into categories or concepts (Darke *et al.*, 1998). Each category captures relevant or similar sentences to the category definition. Finally the categories are analyzed for relationship to build theory (Darke *et al.*, 1998). The deductive approach comprises pre-existing list of codes based on conceptual framework, theory or research questions (Miles & Huberman, 1994). It is absolutely valid to follow top down approach in qualitative analysis by starting from conceptual framework or theory (Miles & Huberman, 1994). However, the researcher should be open while collecting and analyzing data for any new ideas and discarding any concept if seen inapplicable (Miles & Huberman, 1994).

When discussing qualitative data analysis, codes, coding and themes are key terms in which the analysis is based on. Codes are "*labels that assign symbolic*

meaning to the descriptive or inferential information compiled during the study” (Miles *et al.*, 2014, p. 79). The higher level of categorizations makes themes which are subcategorized into patterns (Miles *et al.*, 2014).

### 3.4.5.1 Research Analysis Procedures

The researcher is following the qualitative analysis guidelines recommended by Miles *et al.* (2014). There are three main activities in qualitative data analysis 1) data condensation, 2) data display 3) conclusion drawing and verification (Miles *et al.*, 2014) as depicted in Figure 3.1.



**Figure 3.1:** Data analysis interactive model (Miles *et al.*, 2014, p. 33)

Data condensation is the ongoing activities or decisions related to simplification, abstraction, organization and classification of collected data from the field (interview transcripts, documents, field notes, etc.) (Miles *et al.*, 2014). Hence, data coding and generation of categories are among the main activities of this phase. Data display is the process of summarizing the compressed data using a display form such as tables, graphs or networks (Miles *et al.*, 2014). Conclusion drawing and verification is the process of drawing conclusions from the analyzed data and activities required to validate/test these conclusions (Miles *et al.*, 2014).

It can be noticed from the data analysis interactive model is the iterative process between data collection and the three streams of data analysis (Miles & Huberman, 1994). The data collection and analysis should happen concurrently to

enable the research to refine the instruments or identify strategies to tackle the arisen concepts (Miles & Huberman, 1994). As preparation for the data analysis, all collected data should be converted into a digital form of documents (Miles & Huberman, 1994). For example, recorded audio interviews are transcribed and hand written field notes need to be typed electronically.

#### **3.4.5.2 Data Condensation**

Qualitative researchers face the challenge of condensing the overloaded data and build meaningful codes out of them (Miles & Huberman, 1994). Codes are used primary to categorize related or similar data chunks into categories or themes that are in a later stage further analyzed (Miles & Huberman, 1994). In other words, coding main mission is to condense the data through a careful reading of collected data (Miles & Huberman, 1994). There are methods of creating codes, deductive coding and inductive coding. Deductive coding is developing list of codes prior data collection based on conceptual framework, theory and research problem or research questions. Inductive coding is the generation of codes from the collected data also known as in vivo coding. There are two coding cycle; first cycle coding and second cycle coding (Miles & Huberman, 1994). The first cycle coding focus on building the initial codes that summarize the data (Miles & Huberman, 1994). The second cycle coding also known as pattern coding is the process of subcategorizing the codes from the first cycle into smaller themes or constructs (Miles & Huberman, 1994).

The initial codes whether created deductively or inductively evolve along the process of analysis (Miles & Huberman, 1994). Some codes might be relabeled, deleted and some new codes might emerge (Miles & Huberman, 1994). The researcher might use descriptive coding or in vivo coding to do the pattern coding (Miles & Huberman, 1994). Descriptive coding is to assign a label (word or short sentence) that summarize phrase (Miles & Huberman, 1994). Then the analyst extracts all phrases with similar meaning as the chosen label word (Miles & Huberman, 1994). In vivo coding uses word or short sentence from the collected data itself to be as a label specially the repeated ones (Miles & Huberman, 1994). So

in vivo, the codes are generated from data themselves (Miles & Huberman, 1994). This is normally common in inductive analysis approach. There are around 25 coding methods and the researcher has the choice to select and mix between them (Miles & Huberman, 1994).

### **3.4.5.3 Data Display**

After creating the pattern coding or second cycle coding, the next step is creating displays, which are visual format of data (matrix or network) (Miles & Huberman, 1994). In other words, it is the process of converting the condensed coded data into matrices and networks (Miles & Huberman, 1994). The matrix consists of intersection between rows and columns (Miles & Huberman, 1994). Hence, it is a tabular format data to ease data viewing and detailed analysis. The network is a set of nodes connected through links and it is helpful to display a sequence of actions, events and processes (Miles & Huberman, 1994). The creation of these displays supports the researcher to draw and verify the conclusions (Miles & Huberman, 1994). The displays are driven by research questions and appeared concepts related to research interest (Miles & Huberman, 1994). The data entries of matrices and networks could be direct quotes from field data, summarized phrases and researcher explanation (Miles & Huberman, 1994).

### **3.4.5.4 Conclusion Drawing and Verification**

The codes should be part of a meaningful structure. Another important aspect is pre-specifying operational definition for each code whether specified deductively or inductively (Miles & Huberman, 1994). This is to ensure consistency during coding process (Miles & Huberman, 1994). Another benefit of code definition is when same data are coded by two coders, improves the coding reliability (Miles & Huberman, 1994).



The concluded concepts or constructs from the analysis step need to be compared with the case evidence (Eisenhardt, 1989). The goal is to refine and define the construct as initial step then building measures for each particular construct (Eisenhardt, 1989). The measures in qualitative study includes descriptions for each construct and verification process to confirm or disconfirm the construct's evidence (Eisenhardt, 1989). The most important aspect here is that the researcher explains thoroughly and publishes the procedures and evidences of findings (Eisenhardt, 1989). The comparison of findings with a broad range of literature is essential to underlie reasons for a difference in findings and maybe identify situation in which the difference occurs (Eisenhardt, 1989). Similarly, discussing the similarity between findings with supported evidences from literature improves the validity and creates potential to generalize the findings in similar contexts (Eisenhardt, 1989).

The most important aspect in reaching closure step is the theoretical saturation that is the point in which no new concepts emerge and the learning from collected data becomes minimal (Eisenhardt, 1989). The process of iterating between data and theory normally stops when the theoretical saturation is reached. One of the critical point that needs to be considered by the researcher in case study reports is to identify the audience of the case study findings (Yin, 2009). In addition, the reporting is correspond to the research broader context and the approach used quantitative, qualitative or mixed methods (Yin, 2009).

### **3.4.6 Qualitative Analysis Tool**

The use of computer applications is important in qualitative study and all field notes and audio recording require to be transformed into digital form for further analysis (Miles & Huberman, 1994). The benefits of using computer tools for analysis are:

- Helpful to automate the steps of analysis like creation of categories, their definitions, coding rules and handling the text.
- Working as a center for all documentation and analysis to make it easier for auditing and tracing.

- Providing some quantitative features like counting frequency of words and comparing categories

There are multiple qualitative programs available in the market. There is no preference on one software over the other but the researcher should select the software that enables writing notes, act as storage, coding, data retrieval and content analysis (Miles & Huberman, 1994).

The computer-assisted analysis tools in qualitative research are not doing the analysis but support the researcher to automate the process of analysis which is the responsibility of the researcher (Creswell, 2013). Despite the availability of software packages that serve as an assistant tool, the researcher needs to follow certain strategies during the analysis phase (Yin, 2009). Creswell (2012) explained that the computer software supports the qualitative researcher to examine large amount of data, visualize the relationships and organize the data. In context of this research, NVivo from QSR International was used as research data analysis software. NVivo was utilized by the researcher to analyze the literature to identify the potential alignment factors. Furthermore, it was used in the analysis of findings from preliminary and main case study phases.

### **3.4.7 Study's Trustworthiness**

The quality of the research design is a concern for any academic research. In the context of the case study research, there are some tactics that could be utilized to improve the reliability and the validity, which are construct validity, internal validity, external validity and reliability (Yin, 2009). The construct validity refers to the appropriateness of the operational measures for the study constructs (Yin, 2009). Improving the construct validity can be obtained by using multiple source of evidences, maintain chain of evidence and review the draft of the case study report by the key informants (Yin, 2009). Benbasat *et al.* (1987) elaborated that the use of multiple data sources helps to triangulate and support research conclusions. The internal validity is specific to the exploratory studies where the study is targeting to

prove a relationship (Yin, 2009). The external validity refers to the possibility of generalizing the case study findings beyond the case study context specially in cases of using theory (Yin, 2009). Reliability is aiming to minimize the bias and reduce errors and if the same procedures used again will end up with same case study findings (Yin, 2009). This is can be achieved by documenting all procedures as part of case study protocol and relying on reviewers (Yin, 2009).

The data collection and data analysis in case study research are subject to researcher bias and preferences (Darke *et al.*, 1998). The most widely used trustworthiness criteria in qualitative study is the one explained by Guba that consists of four constructs; creditability, transferability, dependability and confirmability (Shenton, 2004). They are also known as internal validity, external validity, reliability and construct validity (Yin, 2009). One of the tactic is to use more than one data source and during the analysis to compare the patterns obtained from the sources (Eisenhardt, 1989). If patterns are supported by different sources, the findings will be strongly grounded (Eisenhardt, 1989). In case of findings conflict, it is a trigger for the researcher to conduct deeper investigation to find out the cause of the findings conflict (Eisenhardt, 1989).

Credibility (or Internal validity) refers to the extent of the findings reflecting the actual realities (Shenton, 2004). Transferability (or external validity) in qualitative study is the confidence of the reader to transfer the findings of the case to another situation in which similar phenomenon is studied (Shenton, 2004). Ultimately the findings from the qualitative study should be understood within the context of the participated organization(s) but it is providing great value for similar projects conducted in different context (Shenton, 2004). Dependability (or reliability) is when another researcher uses same tools and procedures followed in the same context again, similar results will be obtained (Shenton, 2004). Confirmability (or construct validity) is to ensure that the findings are results of informants' experiences and ideas rather than researcher's preferences. In other words, determining how to accept the level of data and arisen constructs (Shenton, 2004). Shenton (2004) discussed in details the four Guba's trustworthiness constructs and suggested steps to

fulfill each construct as shown in Table 3.1. The researcher employed these steps to address the four constructs of Guba's trustworthiness.

**Table 3.1:** Steps to achieve four Guba's trustworthiness constructs (extracted from Shenton, 2004)

Guba's Construct	Steps
Internal Validity	<ul style="list-style-type: none"> <li>*The employment of well established research methods in data collection and analysis</li> <li>*Getting familiar of participants culture or organization culture prior data collection through preliminary study.</li> <li>*Random sampling of participants to neglect the researcher bias in selection.</li> <li>*Triangulation: the use of different data collection methods with the use of wide range and diverse participants.</li> <li>*Explain and give the right for the participants to refuse to participate and also to withdraw from interview session at any time.</li> <li>*The use of rephrased question to uncover deliberate lies.</li> <li>*Refine the constructs or the initial categories and revisit them along with data analysis</li> <li>*Frequent discussion with the supervisor(s) to discuss ideas, actions and approach to minimize own bias and preference</li> <li>*Peer review or feedback should be welcome through the duration of the project to challenge researcher assumptions.</li> <li>*The use of researcher reflective commentary about data collection session.</li> <li>*The investigator's background, qualification and experience for the phenomenon under investigation.</li> <li>*Ask informant to read and confirm the interview transcript. Second check is to verify with the respondents the emerging theory and concepts.</li> <li>*Detailed description of phenomenon under investigation to understand its context</li> <li>*Examination of previous research findings</li> </ul>
External Validity	<ul style="list-style-type: none"> <li>*Number of participated organization and their location</li> <li>* Any restrictions from informants who provided the data</li> <li>*Number of participants involved in the study</li> <li>*The used data collection methods</li> <li>*The length and number of data collection sessions</li> <li>*The period of time the data are collected</li> </ul>
Reliability	<ul style="list-style-type: none"> <li>*Describe in details the research design and implementation</li> <li>*Operational details of data gathering</li> <li>*Reflective appraisal of inquiry process</li> </ul>
Construct Validity	<ul style="list-style-type: none"> <li>*The employment of triangulation here is helpful to reduce investigator bias. The use of trail audit diagram to trace research step-by-step procedures that that architects to formation of recommendations.</li> <li>*Triangulation to reduce effect of investigator bias</li> <li>*Admission of researcher's beliefs and assumptions</li> <li>*Recognition of shortcomings in study's methods and their potential effects</li> <li>*In-depth methodological description to allow integrity of research results to be scrutinized</li> <li>*Use of diagrams to demonstrate "audit trail"</li> </ul>

Ethical matters should be a concern that needs to be considered by all researchers. Ruane (2005) identified ethical considerations when conducting a research as follow:

- No harm strategy
- Obtain consent and give freedom for yes or no
- Grantee the privacy and confidentiality of participants
- Avoid conflict of interest
- Always report the truth
- Consult institutional review board

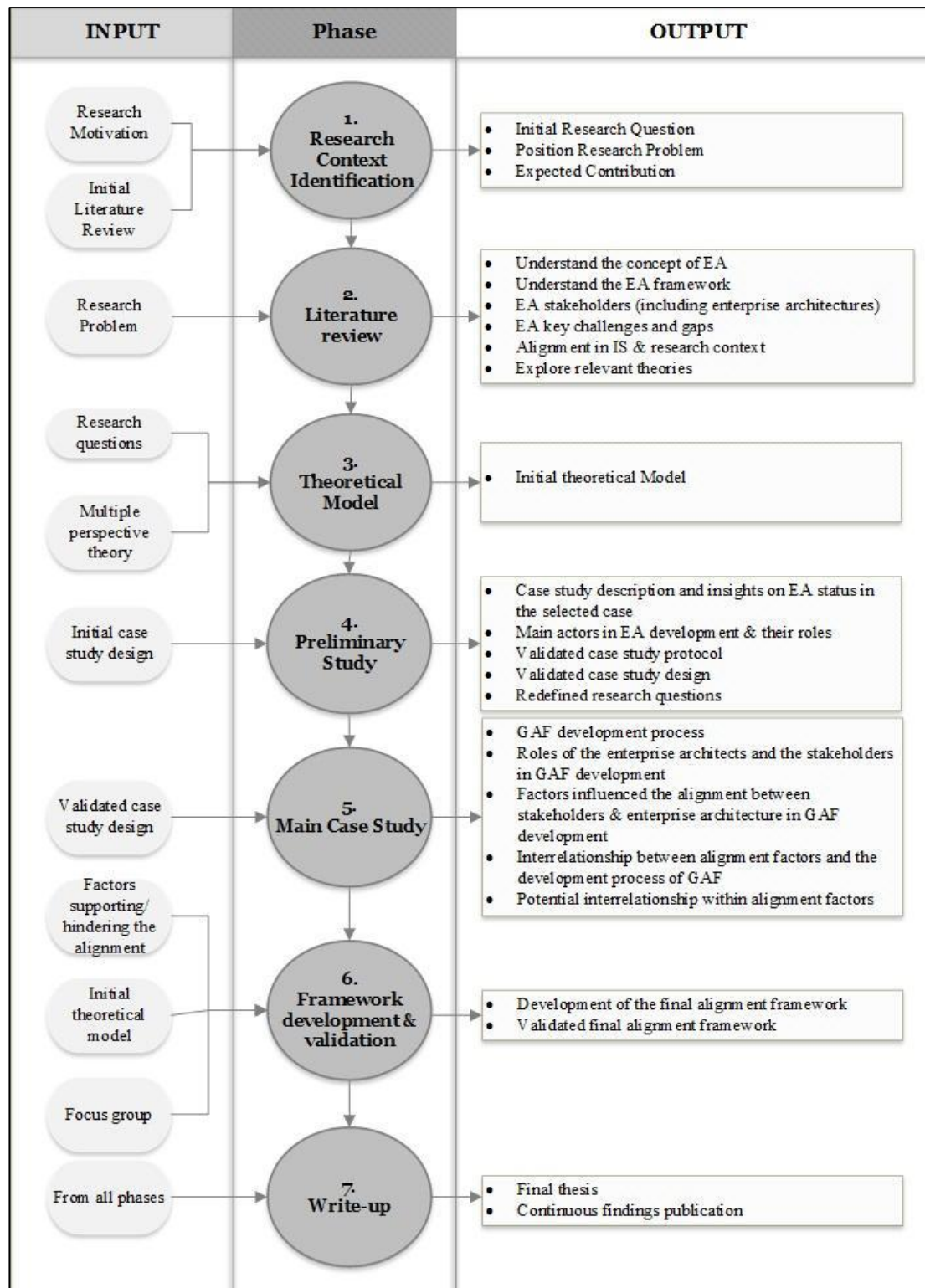
Similarly, Lapan *et al.* (2011) and Benbasat *et al.* (1987) stressed that the researcher should provide an assurance of no harm for the participated organization. Creswell (2012) discussed the anticipated ethical issues and the tips on how to address them through the different research stages as follow:

- Gain approval from the participated organization and consent from participants before conducting the study.
- Explain the purpose of the study, respect others and do not force them to sign consent forms
- Avoid disturbing on the site, respect the participants and be honest with them
- Be neutral with all participants and respect their privacy
- Use clear language in reporting the findings, do not plagiarize and do not disclose information that harms the participants
- Share the findings with others through publication and comply with ethical standards

The researcher followed the tips provided by Creswell (2012) to eliminate any ethical risk during the research. Specifically, the researcher followed no harm strategy, gained approval through signing consent forms, gave overview of study purpose, minimized the disruption in the participated organizations sites, reported the findings clearly and ensured frequent publication of findings.

### **3.5 Research Design**

The research design is the plan of conducting the study and so far there is no agreed research design for qualitative research (Creswell, 2012). Creswell (2012) discussed steps of research design process that begins with broad assumption that leads to a topic and confirming the existence of the problem that is close to human. Next, define research questions and refine them through the research process and then collect the data through the known qualitative instruments. After that, analyze and validate the findings. In the context of this research, it consists of seven main phases; namely research context identification, literature review, initial theoretical model, preliminary study, main case study, framework development and validation and write-up. The research operational framework phases, their input and output are illustrated in Figure 3.2. Though these phases are shown sequentially but mostly run in parallel and iterated.



**Figure 3.2: Research operational framework**

### **Phase 1 (Research context identification)**

The purpose of phase 1 was to identify the scope and the context of the research. The main motivation of the study was the high failure percentage of EA adoption. Through mining into the details of academic literature and practitioners'

reports, the researcher decided to tackle the issue of alignment between the enterprise architects and stakeholders in EA development because it was confirmed by literature that it is playing a significant role in the failure of EA. The main input activities of this phase were research motivation and initial literature review. The main outputs of this phase were initial research questions, research problem and expected research contribution.

### **Phase 2 (Literature review)**

Driven by the research problem, the researcher at this phase developed a holistic understanding about EA then diving deeply to the main pillars of the study EA development, stakeholders (including enterprise architects), alignment, EA challenges and relevant theories suitable for the research context. The output of phase 1 got verified and expanded at this phase.

### **Phase 3 (Theoretical model)**

The purpose of this phase was to develop an initial model that provides initial guidance for the researcher as suggested by Miles *et al.* (2014). The researcher utilized MPT and research questions to develop the initial theoretical model as detailed in Section 2.7. The theoretical model provided three dimensions that characterized the alignment factors in the development process of EA under technical, organizational and personal domains. Additionally, the researcher conducted SLR to explore the claimed potential alignment factors from literature perspective.

### **Phase 4 (Preliminary study)**

The main inputs of this phase were the initial theoretical model and initial case study design. The case study design was crucial because it provided the guiding tools for the researcher to improve the reliability. Hence, the initial case study design components (initial case study protocol, etc.) needed to be validated and tuned to suit the context of the case study, refer to Appendix A for case study protocol. Also, this phase was critical to identify the main actors (enterprise architects and stakeholders) and their roles to address RQ2. This phase was completed and provided valuable findings for the research by getting insights on the suitability of the case to answer



the research questions, identification of the main actors in EA development, refining research questions (refer to revised interviews questions in Appendix B) and overall case study design to make it case oriented.

#### **Phase 5 (Main case study)**

This primary phase targeted to understand the EA development process in the selected case and identify the factors supporting or hindering the alignment between enterprise architects and stakeholders in EA development. In this phase semi-structured interviews (with both enterprise architects and stakeholders) and documentation review were used as the main methods for data collection. Interviews transcription, coding and analysis activities took place at this phase. Relevant documentations were collected and 15 interviews were conducted and transcribed. Interviews transcriptions along with documentations were uploaded to Nvivo11 to start the actual analysis. Utilizing the initial theoretical model and research questions, the researcher created initial coding schema. Despite the use of the theoretical model and research questions to develop the initial coding themes, the researcher was analyzing the data openly for any new emerge concept during the coding stage. So the researcher was following a mix of deductive and inductive coding approach.

#### **Phase 6 (Framework development and validation)**

This phase had two objectives; one to develop the final framework and second to validate the final framework. The factors obtained from phase 5 along with MPT shaped the final alignment framework. The researcher provided detailed description of each factor along with their influence and also gave recommendations on how to address each factor based on the case study context. The trustworthiness activities started since preliminary study phase following the guidelines of Shenton, (2004). Additionally, to ensure rigorous validation of the final framework, the researcher organized and conducted a focus group (refer to Appendix C) from the case study enterprise architects to validate the framework. This is in line with the research purpose to develop alignment framework that guides the enterprise architects in developing future EA.

**Phase 7 (Final Write-up)**

This phase aimed to document and to report the final findings of all phases in the final thesis. The process of write-up was started in parallel with rest of phases' activities. The main output of this phase was the final thesis document and the publications of research findings at different stages.

**3.6 Summary**

The chapter gave an overview of the overall research paradigms and introduced interpretivism as a guiding paradigm of the research. In addition, it detailed types of qualitative research approaches and discussed why case study approach is selected as a research strategy to tackle the research questions. It also introduced the qualitative data collection instruments and analysis techniques. It discussed in details the case study design which was used by the researcher as a guide to execute the main case study phase. It highlighted the designed research questions, case selection and case actors. In addition, it explained the case study protocol and the analysis procedures. Finally, it detailed the steps that guide the researcher to address the trustworthiness of study as discussed by Shenton (2004). Finally, it depicted the research operational framework and explains the activities of its seven phases.

## **CHAPTER 4**

### **PRELIMINARY STUDY**

#### **4.1 Overview**

The preliminary phase aimed to build an initial understanding of the case as part of the preparation for the main data collection stage. Specifically, it had the following objectives:

- 1) Validate the initial case study protocol specifically the suitability of the interview questions.
- 2) Get an initial understanding about the case study, e.g. case study description, status of EA development and main actors of the case.
- 3) Capture initial data tackling RQ1 and RQ2.

This chapter consists of case selection, case description, initial case study design, preliminary findings and conclusion. The case selection describes the approach followed by the researcher to select the case study. Case study description provides a description of the research main case. Initial case design explains the preliminary study instruments and data analysis techniques. Preliminary findings provide details on the initial case findings. Finally, the chapter is concluded by a summary of the key findings of preliminary study.

## 4.2 Case Selection

The researcher faced the challenge to identify all Omani organizations that adopt EA concept due to the absence of central repository. Hence, the researcher used snowball sampling strategy to identify the organizations as follow:

- i) The researcher started from his employer (PDO) that adopted pilot project of EA in which the EA project manager who directed the researcher to another organization (IT regulatory body of government).
- ii) Researcher approached the government IT regulatory body that confirmed the development of EA. The researcher asked if they are aware of other organizations that adopt EA. They directed him to a leading telecom company in Oman called OmanTel.
- iii) The researcher approached OmanTel that confirmed the adoption of SOA concept but not EA. The researcher asked them if they are aware of any other organizations that adopt EA but the answer was no.
- iv) The researcher contacted EA consultant who was familiar of Omani market to check if he knows any organizations that adopt EA. He confirmed the adoption of EA in PDO, IT regulatory body and maybe OmanTel which were already approached by the researcher.
- v) Finally, the researcher stopped as the list reached the saturation level in which no new organizations appeared.

PDO and IT regulatory body agreed to participate in the research. However, there is a difference between the two organizations. PDO is a company operating in the private sector and both the enterprise architects and the stakeholders exist within the same organization. In IT regulatory body scenario, it is a government agency acting as the CIO of the Omani government and looking after all IT aspects in the governmental organizations. In government case, the enterprise architects were a team from IT regulatory body and the stakeholders were members nominated from the government ministries.

These findings were discussed with the research team and the examiners during defense assessment. The steer was the difficulty of considering multiple cases

as the two cases operating in different sector with different EA setup and context. Hence, the choice was to consider the development of EA in the government which falls under the project called government architecture framework (GAF) and the findings can be generalized in the governmental sector of Oman.

### 4.3 Case Description

Oman is located in southwest of Asia. According to the National Centre of Statistics and Information (NCSI) statistics as of July 2016, the population of Oman is 4,413,309 (NCSI, 2016a, p. 3). Oil and Gas is responsible of 78.7% of governmental revenue budget of 2015 (NCSI, 2016b). Hence the economy of Oman is highly dependent on oil and gas industry. ICT in Oman gained significant attention from his Majesty Sultan Qaboos specially in the last 10 years demonstrated by setting up IT regulatory body in 2006 as an outcome of Royal decree 52/2006 (ITA, 2016). In 2010, His Majesty Sultan Qaboos Award for Excellence of proficiency in eGovernment services was announced to motivate governmental organizations to digitize and improve their services and processes. His Majesty stated in the speech to Oman Council:

*“Giving attention to human resources, including the provision of the various tools required to enhance their performance, incentives to develop their capabilities, diversifying their creative talents and to improving their scientific and practical qualifications, is the basis of real development and the cornerstone in its structure which is based on solid foundations. His Majesty also directed the Government to simplify processes, adopt technology in its daily operation, and focus on electronic delivery of its services” (ITA, 2008).*

IT regulatory body is the responsible body for the delivery of IT projects to the Omani society and oversee all projects contributing to the Digital Oman Strategy (ITA, 2016). The digital Oman strategy is directed through his Majesty vision of transforming Oman into a knowledge based economy (ITA, 2008). IT regulatory body is playing the role of CIO in the government of Oman. The vision of IT regulatory body is

*“to transform the Sultanate of Oman into a sustainable Knowledge Society by leveraging Information and Communication Technologies to enhance government services, enrich businesses and empower individuals” (ITA, 2016).*

As part of improving IT capabilities and integration across governmental agencies, they developed government EA framework. Based on TOGAF and Singaporean EA framework, IT regulatory body sponsored and initiated the development of GAF in March 2009. The development of GAF v1 was completed in March 2010 (ITA, 2010). The desired business outcomes of GAF (ITA, 2010) were:

- Ease access and faster services for the citizens and business
- More efficient and effective Oman Government
- Optimize recourses and investments

#### **4.4 Initial Case Design**

GAF is the architecture framework developed for all Oman government agencies and centrally managed by IT regulatory body. GAF project was selected as main research case study for the following reasons:

- 1) Oman Government via IT regulatory body already initiated and developed EA framework
- 2) Uniqueness of the case as it covers unified sector the governmental sector in Oman
- 3) IT regulatory body enterprise architects along with the participated stakeholders from government entities showed interest and agreed to participate in the study
- 4) Geographical nearness of participants to candidate's living area
- 5) The suitability of the case to address the research questions (RQ1 to RQ4)

The focus of the study is to develop a framework that supports the alignment between the enterprise architects and the stakeholders in EA development process to ensure a mutual understanding and agreement. Furthermore, GAF layers are similar as TOGAF consists of four main domains; business, applications, data and

technology that are called reference architectures in the case study context. The development of each reference architecture achieved through working groups of enterprise architects and stakeholders. Each reference architecture was developed through a working group that is led by one enterprise architect (from IT regulatory body) and stakeholders representing different ministries. For the sake of preliminary study, two interviews were planned; one with BRA architect and another one with stakeholder from one of the ministries.

#### **4.4.1 Initial Case Study Protocol**

Appendix A includes the proposed case study protocol that went through the process of validation as part of preliminary study before used as data collection instrument in the main case study phase. The use of structured protocol to collect case study data improves the reliability of the data. Furthermore, it guides the researcher to plan in advance on how to tackle each research question. Based on the recommendation of Yin (2013) & Miskon (2013), the initial case protocol designed and consists of eight parts described as follow:

- a) Consent form: to obtain written consent from the participant for the interview session.
- b) Pre-interview checklist: background of the interviewee, organization chart, organization website and participant role in GAF.
- c) Interview questions: interview questions, which are designed based on research questions.
- d) Interviewee details: to capture contact details of interviewee
- e) Call for participation: to provide brief overview on the research purpose and request approval for participation
- f) Contact summary: to provide reflection on main struck issues in the contact, summary of key findings and key points that need focus in the next contact.
- g) Observation checklist: researcher observation during interview session whenever applicable.
- h) Document summary form: name of document and summary about it.

Refer to appendix A for more details about initial case study protocol. It was designed to consider and provide initial findings on RQ1 and RQ2.

#### **4.4.2 Preliminary Study Data Analysis Overview**

There were different sources of data that were captured during the preliminary study. These sources were:

- Documentations: GAF project documents which were provided by some of the participants involved in the interview sessions.
- Official website: general information related to organization example organization structure, services, mission and vision.
- Interviews transcripts: transcriptions of interviews audio recordings into written document.

The researcher followed a priori inductive approach suggested by Miles and Huberman (1994). This approach is taking the advantage of deductive approach analysis by starting the analysis with general account themes which are based on conceptual framework and research questions. However, the researcher has to be open for any arisen themes or concepts from the collected data as well as modify and update the initial themes along the analysis. This analysis approach found to be ideal due to:

- 1) Take advantage of theoretical conceptual model to ensure data condensation.
- 2) Take advantage of inductive approach to keep the researcher open for any new concepts emerging from the collected data and reduce researcher's bias.

#### **4.5 Preliminary Case Study Findings**

Two interviews were conducted as part of the preliminary study; one with the architect of business working group (ITA2) and one stakeholder from one of the government entities; refer to Table 5.1 for interviews profile summary. The



interviews were audio recorded and transcribed manually into written documents. In addition, GAF related documents were collected from the enterprise architect. Furthermore, IT regulatory body website was explored for related information.

Initial themes or categories were suggested prior data analysis. The first level consisted of stakeholder perspective and enterprise architect perspective which aimed to capture the views of both parties. Under each perspective, there were four main categories described as follow:

- 1) GAF: to capture any information related about GAF case context for example GAF development, case settings and status.
- 2) Alignment: to alignment aspects that influenced the development of reference architectures, and alignment recommendations from both enterprise architects and stakeholders.
- 3) Enterprise architect roles: to address enterprise architects roles in general and specific in the working group.
- 4) Stakeholder roles: to include working group members' roles, identification, challenges of identification and management.

However, the findings from the interview with the stakeholder were excluded because his involvement was limited to the deployment and implementation phase which is outside the scope of this research.

#### **4.5.1 Insights on GAF Development and Status**

As discussed in Section 4.2, GAF was initiated and led by IT regulatory body. The purpose of GAF as mentioned in one of the GAF project documentations:

*“The purpose of the framework is to lay down the building blocks, principles and standards that guide the design, construction, deployment and management of distributed Information Systems across the various Government Agencies” (Introduction to GAF).*

Unlike TOGAF that provides guidance on how to develop EA within organization, GAF aimed to build a common reference governmental framework for

all Omani governmental agencies to enable the integration between them. Furthermore, it should be used in the future as a base for developing specific agency architecture. BRA architect says:

*“We have developed this Omani government architecture framework as a reference architecture as next step every organization, every government entity needs to develop their agency specific enterprise architecture following the guidelines available in the GAF. Now if they are following GAF to develop their enterprise architecture, we have introduced certain elements in GAF which will ensure that they will be in the same or they will be in the same boundaries which will basically help agencies to integrate at a later stage” (ITA2).*

Based on the initial interview findings, the development of GAF consisted of two main phases; forming working group and development of reference architectures (business, information, application and technology). The formation of architecture working groups was initiated by the four enterprise architects from IT regulatory entity through a set of activities that are discussed in details in the next section. Each working group was responsible of developing the related reference architecture as illustrated in Figure 4.1. Below are quoted statements from business architect who explained that the focus was on governmental lines of business instead of specific agencies processes and rest of reference architectures followed these lines of business:

*“In business architecture framework basically we have identified government line of businesses not agencies as whole. So government is delivering these lines of businesses as whole and then we identified which ministries are responsible by their mandates to deliver particular line of business. We defined solution reference architecture like if any organization is basically developing solution or application to deliver services, there should be certain principles need to be followed when they are developing any solution. Technology reference architecture basically it is dealing with the infrastructure. It defines what should not be adopted for different reasons. Information reference architecture, we have defined and identified certain data hubs. There is need for some common information references that need to be created” (ITA2).*

Section 2.4.4 discussed the well-known EA frameworks used for EA development which are TOGAF, Zachman and FEAF. However, the GAF development process is not falling under any specific known framework. The architecting team developed a customized framework tailored to Oman government needs because the available industry frameworks provide guidance to develop EA for

a specific organization but not for a wide government EA. Furthermore, the development process of GAF utilized the understanding from TOGAF ADM cycle specifically business architecture phase, IS architecture phase and technology architecture phase. Similar to TOGAF, GAF has four main products BRA, IRA, ARA and TRA.

#### 4.5.2 Insights on GAF Main Actors and their Roles

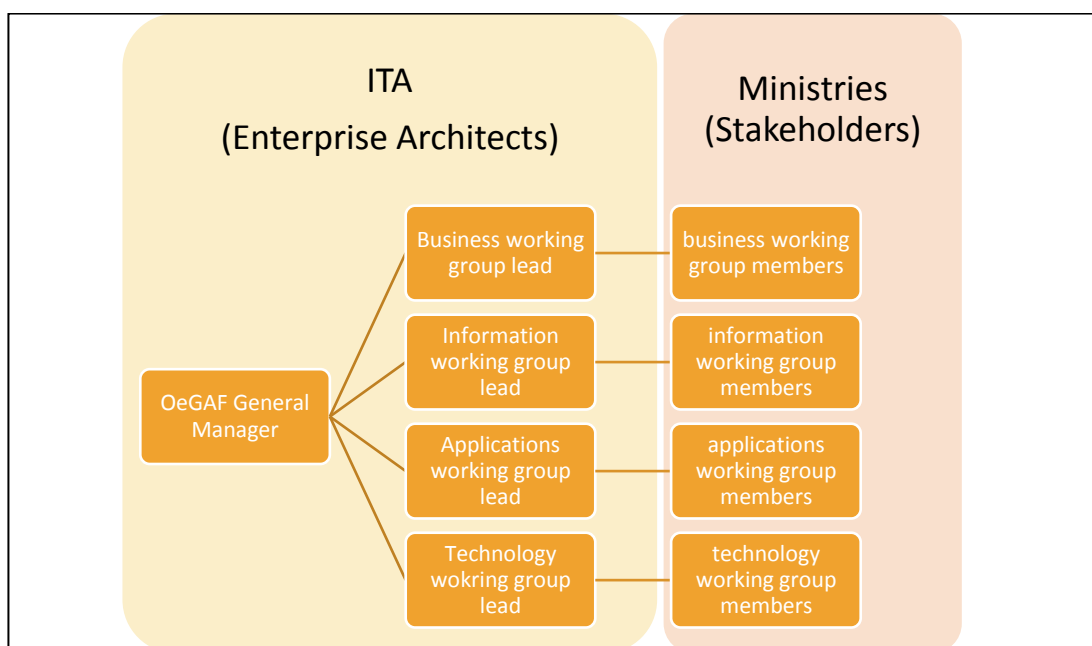
As highlighted, GAF consisted of four reference architectures (business, information, application and technology). The working group was formulated to develop each reference architecture. For each working group, there was an enterprise architect leading the architecture activities. Rest of the group members (representing the stakeholders) were identified by sending participation letter by IT regulatory body to all governmental agencies to nominate representatives for the four working groups. So the working group stakeholders were the main stakeholders who worked with the working group architect to develop GAF. In addition, these group stakeholders later after the development are the potential beneficiaries of the developed GAF to comply with it in their related agency services. Business reference architecture architect says:

*“We sent invitation or nomination form to each and every organization. We ask them to nominate themselves at the first stage. That is the first thing because we cannot go only with selected organizations, we need to provide equal opportunity for each organization” (ITA2).*

The nominated working group stakeholders from the ministries had certain tasks based on their group and similarly the working group architect had specific tasks. Table 4.1 provides a summary of stakeholders and working group architect tasks in the development of reference architectures as quoted from the interview with business working group architect.

**Table 4.1:** Enterprise architect and stakeholder tasks in GAF development as obtained from preliminary study (ITA2)

Stakeholders Tasks	Enterprise architect Tasks
<p>*“Share their knowledge, share their requirements and transform them into reference architecture”.</p> <p>*“Drafts reviewed by the working group and then we receive comments from those working groups for those drafts”</p> <p>*“get their feedback like ok this is what the shape of the document would be”</p>	<p>*“to build awareness through workshops to create kind of initial understanding with all stakeholders”</p> <p>*“compile the information and then we share the draft with the working group”</p> <p>*“Based on that information gathering, we develop certain drafts, initially we share the outline of the draft with the working groups”</p> <p>*“conduct a workshop again so we can communicate and provide a briefing on that draft to make it, facilitate them to understand the draft”</p> <p>*“incorporate those comments or concerns in to the draft and if there are not relevant to the scope, we just communicate back to the individuals”</p>



**Figure 4.1:** Overview of GAF main actors

Figure 4.1 gives an overview of the GAF main groups and key actors in the development process. The overall project manager was from IT regulatory body and all the working group architects (known also as working group leads) were reporting to him. Since GAF has four main products Business Reference Architecture (BRA), Information Reference Architecture (IRA), Applications Reference Architecture (ARA) and Technology Reference Architecture (TRA), there were four working group architects who managing and leading the development of each group. The

working group architect for each specific group was working closely with the working group stakeholders nominated by the government agencies to develop the reference architecture. Hence, in the main case study design, the target was to interview all working group architects and a sample of group stakeholders from the four working groups.

It was highlighted in literature review that there is no pre-defined group of stakeholders in EA and the stakeholders are identified based on the case context. Considering this fact, the researcher focus was to identify the key actors who played a role in the development process of GAF. The key actors were the architects team represented by the GAF project manager and the working group architects and the stakeholders represented by the working group stakeholders from different governmental agencies. The roles of working group architects and the working group stakeholders in GAF were in line with the research's definitions of enterprise architects and the stakeholders. The working group architects were compiling architecture information, sharing and leading the development process of each working group. The working group stakeholders were providing the as-is situation at their organizations, their concerns and feedback on the developed architecture documents.

#### **4.5.3 Initial Alignment Factors**

Since this study aimed to develop alignment framework that supports the enterprise architect to align the development process of EA with the stakeholders' goals, the researcher was giving a special attention to explore the factors that influence the alignment between the working group architects and working group stakeholders in the development of the four reference architectures. That was achieved by using semi-structured interviews with both (the business working group architect and the stakeholder). However, as highlighted previously during the interview with the stakeholder, it was found that the interviewee was not part of the development team (working group stakeholder) and his main focus on the adoption and compliance with GAF. So, the findings from the interview were eliminated. The

analysis was restricted to the outcome from the interview with BRA working group architect.

Table 4.2 shows the obtained initial factors with the supporting sample evidence from BRA working group architect interview. These initial factors were refined in the main case study phase discussed in Chapter 5.

**Table 4.2:** Initial alignment factors obtained from preliminary study

<b>Alignment Factor</b>	<b>BRA Working Group Architect</b>
Governance: the distribution of decision authority to manage the activities of EA	“if the governance structure is not available, if the processes are not defined in proper manner within an organization, the enterprise architecture itself cannot go very far and the organization will not see any benefit out of the enterprise architecture because you see the enterprise architecture on itself will be dealing with something which is beyond its control” (ITA2)
Architecture Knowledge: the architectural knowledge, experience and skills of the enterprise architects	“The most important part is the facilitation from the architect so if the team lead is not capable enough to run this kind of project, it will be very difficult to handle all of these stakeholders because everyone is coming from a different background” (ITA2)
Stakeholders identification: the identification of the qualified stakeholders who are knowledgeable of business processes and demands	“we do not have the complete picture of who is setting where in the organization and who is capable to deliver this kind of services” (ITA2)
Awareness: The stakeholders knowledge of EA practices	“Build awareness through workshops to create kind of initial understanding with all stakeholders and for the next steps in developing the reference architectures” (ITA2) “conduct the awareness session, give them the understanding to come to the same page to avoid the situation when everyone talking in different languages at the later stage of the project ” (ITA2)
Participation: The involvement of key stakeholders in EA activities	“To participate in the development of enterprise architecture references or the architecture itself” (ITA2)
Value of EA: the organizational expected benefits from the development of EA	“The most important aspect is that they do not get the understanding like what benefits they will get out of this. So this is the most important thing because if the stakeholder is not understand why they are participating ” (ITA2)

## 4.6 Summary

The preliminary study was conducted as preparation for the main case study data collection and analysis phase. It helped to validate the case study protocol and also gather the initial understanding for the case study (GAF), which assisted to adjust the interview questions. Hence, the interview questions were rewritten to make them clearer and relevant to the case context (refer to appendix B for the updated interview questions). This chapter also explained the preliminary case design, case description, and data analysis approach. Furthermore, the preliminary findings provided an overview on the main actors of the case and their roles. Also, it outlined the initial insights on the GAF development process and identified six initial factors that influenced the development of reference architectures between the working group architects and the working group stakeholders which were refined and further explored in the case study main phase in Chapter 5.

The preliminary study showed the required improvement for the data collection instruments and the focus areas that the researcher should focus on to answer the research questions in main case study phase. In summary, the main case study phase focused on confirming the stakeholders and enterprise architects roles and responsibilities. It confirmed and expanded the understanding of GAF development process. Additionally, it investigated the factors influencing the alignment between stakeholders and enterprise architects perspectives during the development process of GAF. Also, it investigated how these factors can be addressed based on the views of the stakeholders and the enterprise architects.

## **CHAPTER 5**

### **CASE STUDY FINDINGS**

#### **5.1 Overview**

This chapter is intending mainly to answer RQ1, RQ2 and first part of RQ3. Also, it expands and confirms the findings from preliminary study. Particularly, it explains the analysis of the collected case data. Then it discusses the findings related to GAF development process, roles of architects and stakeholders in the development process and the identified alignment factors. These factors are categorized into technical alignment factors, organizational alignment factors and personal alignment factors. The definition and characteristics of each factor are discussed along with the recommendations to address its negative influence. Finally, it concludes the chapter with the chapter key findings.

#### **5.2 Analysis of Collected Case Data**

There were 15 interviews conducted with the stakeholders and the architects who participated in the development of GAF. The interviews were restricted to those who were actively involved in the development process and willingly accepted to participate in the interview sessions to ensure gathering rich data about the development of GAF. All the interviewed individuals were the subject matter experts at their organizations. To guarantee the anonymity and confidentiality of



interviewees' identity, the names of the interviewees kept anonymous as depicted in Table 5.1.

During the interview session, the researcher was taking notes for any new arisen insights during the sessions. In the interview session number 14, there were no new insights noted. For a confirmation purpose, the researcher conducted interview session number 15 in which again there were no new insights noted. This is in line with the findings of Guest, Bunce, and Johnson (2006) who concluded empirically that the data saturation (92%) can be achieved in the first 12 interviews. The average duration of interviews was 1 hour. The interviewees represented the four working groups (BRA, IRA, ARA and TRA) in addition to the project manager and security architect who played a role in setting the security standards in TRA and ARA. These interviews were transcribed into written scripts and exported to NVivo for analysis. In addition to the interviews, set of GAF documents were collected and exported to NVivo as illustrated in Appendix D. These documents were mainly utilized to triangulate the findings in the development process of GAF and enterprise architects and stakeholders roles which were obtained from interviews sessions wherever applicable.

**Table 5.1:** List of interviewee's summary, their role and organization

<b>Interview Code</b>	<b>Role</b>	<b>Organization</b>
ITA1	Project Manager	ITA
ITA2	BRA Group architect	ITA
MoM1	BRA Group stakeholder	Ministry of Manpower
MoE1	BRA Group stakeholder	Ministry of Education
ITA3	ARA Group architect	ITA
MoJ1	ARA Group stakeholder	Ministry of Justice
MoJ2	ARA Group stakeholder	Ministry of Justice
ITA4	IRA Group architect	ITA
MoC1	IRA Group stakeholder	Ministry of Commerce
ITA5	IRA Group stakeholder	ITA
ITA6	TRA Group architect	ITA
MoF1	TRA Group stakeholder	Ministry of Finance
MoCA1	TRA Group stakeholder	Ministry of Civil Services
MoE2	TRA Group stakeholder	Ministry of Education
ITA7	Security architect	ITA

The findings discussed in this chapter are supported by sample of quotations from the respondents who participated in the interviews and GAF project documents. As pointed out in Chapter 3, the researcher is following Miles *et al.* (2014) data analysis model. The researcher followed a deductive approach to suggest the initial coding themes which are development process, enterprise architects roles and stakeholders roles, alignment, organizational, personal and technical. These initial themes illustrated were driven by the research questions and the initial theoretical model. The second cycle of coding followed an inductive approach by analyzing the initial themes or nodes and based on similarities created child nodes under each parent node.

To improve the inter-coding reliability, all created nodes along with their definitions and codes were verified by another coder following the recommendation of Bandara, Miskon, & Fieft (2011). The differences were discussed and changes mutually agreed for each node.

### 5.3 GAF Development Process

This section is addressing RQ1 (*What is the development process of EA in the public sector?*) by building the understanding on the development process used to develop GAF. Since the research aimed to investigate the alignment between the stakeholders and enterprise architects in EA development, it was crucial to understand the development process that took place to develop GAF. The main source of the GAF development process was the interviews conducted with the enterprise architects (project manager, business architect, information architect, applications architect and technical architect). The main direct question asked about the development process was:

- What is the process of developing (business or information or applications or technical) reference architectures?

In addition, there were some indirect questions in which the interviewees provided some info about the development process. Examples of these questions were:

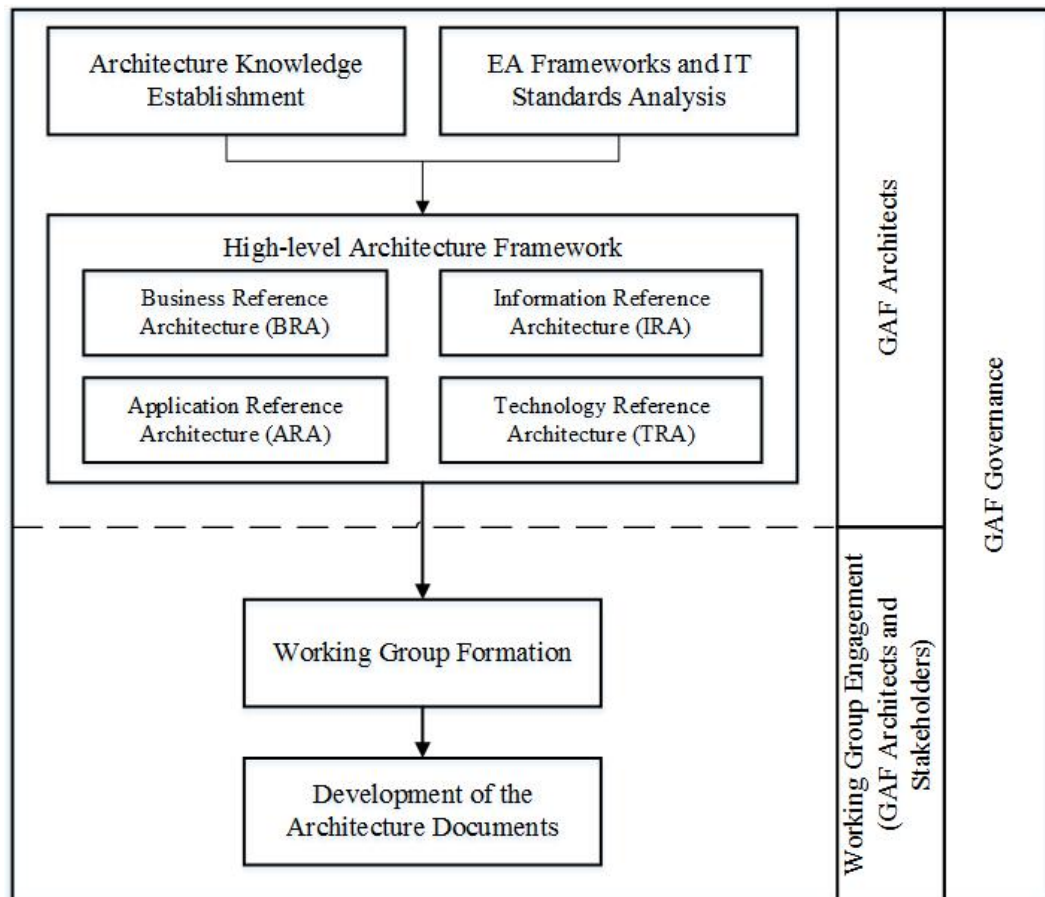
- Could you provide an overview of GAF purpose and its current status in

general and (business or information or applications or technical) reference architecture in specific?

- What was your role in (business or information or applications or technical) reference architecture development?
- Who were the main stakeholders during the GAF development phase?
- How did you identify the nominees/stakeholders of (business or information or applications or technical) working group?
- What were the challenges facing the identification/nomination of (business or information or applications or technical) working group stakeholders?
- What were the roles of (business or information or applications or technical) working group stakeholders in the development of GAF?

Though the development process was not documented but there were several project documents produced during the development phase which were used by the researcher to validate and expand the knowledge on the input captured from the interviewees. Thus, the relevant text from interviews transcripts and projects documents were captured under development process node. The content under development process node were analyzed inductively based on similarities to identify the main steps of the development process as displayed in Figure 5.1.

The GAF development started by setting up GAF governance and followed by two steps that run in parallel which were architecture knowledge establishment and EA frameworks & IT standards analysis. The next step was to propose a high-level architecture framework. Then, the formation of the working group step took place. The last step was the development of architecture documents through continuous working group engagements. The details of each step are discussed in the next sections.



**Figure 5.1:** Government architecture framework development process

### 5.3.1 GAF Governance

It refers to establishing the project governance structure to govern all the development process stages. It consisted of the project steering committee that provided steer to the project team in arising obstacles and endorsed the key architecture deliverables. So the four working groups reported the key findings or obstacles to the project steering committee. The members of the steering committee were the executives from the government regulatory body that oversees the development of EA across the government entities. The applications architect was explaining the reason on why the members of the steering committee were restricted to the executives of IT regulatory body by saying:

*“If we had steering committee members from different ministries, it depends on their level of competence about enterprise architecture at that point of time so to sell the idea at the senior management of ministries and get their commitment will take a lot of time. Also, the*

*steering committee should provide steer on the arising issues, so the members of the committee should have clear understanding about IT because if not, they may give improper steer and slow the project instead” (ITA3).*

One of the key steers provided by the steering committee during the initial development stage was to ask the project team to identify an experienced partner who went through the experience of developing EA for a government to provide consultancy services whenever needed during the different development stages.

### **5.3.2 Architecture Knowledge Establishment**

At this step, the focus was to equip the enterprise architects with the needed knowledge to start the development process. This was achieved through conducting EA trainings for the enterprise architects and made them TOGAF certified. To address the lack of EA development experience in the government sector within EA consultancy companies, the steering committee asked the project team to identify a partner who developed something similar for a government. The project team identified a partner who was a counterpart of the IT regulatory body in Oman and went through similar initiative in one of the Eastern Asian country (actual name of the country is not mentioned for anonymity purpose). The security architect says:

*“The management said, go find someone who can help you because we were small team of 4 people and none of us had a formal experience of EA development in government..... Though we were trained but we were not really skilled. So the first thing that we did is to find a partner. So we tried in the private sector, we got I think 4 offers to develop EA but none of them were really interesting but then we were lucky that it happened the (one of Asian countries) government representatives were here in Oman at that time. They came in and they just completed their first round of EA” (ITA7).*

Hence, this partner provided the consultancy support to develop the initial high-level government architecture framework and in later stage reviewing the development process outcomes with the enterprise architects.

### 5.3.3 EA Frameworks and IT Standards Analysis

Unlike TOGAF which is normally used to develop EA for a particular organization, the intention of GAF project was to develop a framework for the whole government. The business architect explained this fact by saying:

*“There is a framework available like TOGAF but we cannot say TOGAF is available and every organization should follow TOGAF to develop their enterprise architecture. There are a lot of components that need to be tailored up to certain level for the whole of government perspective” (ITA2).*

Thus, it was important to study and analyze the current known EA frameworks along with the international IT standards. Additionally, the enterprise architects explored the EA initiatives implemented in other countries to capture the learning and to find out if something can be adopted in the context of Oman. A mix of different EA frameworks, IT standards and practices were used to develop the initial high-level government architecture framework with the support from the consultancy partner. The project manager says:

*“It is kind of localization of the international standards. If you go deep in our government architecture framework, you will find components tailored from TOGAF, COBIT, and ITIL” (ITA1)*

### 5.3.4 High-level Architecture Framework

The objective of this step was to build the initial foundation of the framework by defining the general design principles, the main expected deliverables and stakeholders' nomination process. The security architect says:

*“we put very high level GAF framework in which we defined the principles and what will be the development process in place and what kind of working group stakeholders to involve from the ministries and what will be the deliverables of each reference architecture” (ITA1).*

The general design principles provided the overall architecture development boundaries that need to be adhered by the four architecture groups while developing BRA, IRA, ARA and TRA. These development guiding principles listed below as documented in Introduction to GAF document:

1. *Use appropriate IT to meet government business needs, policies and directions.*
2. *Comply with international and national regulatory and legal requirements in the development of government IT solutions.*
3. *Strive to share and reuse government IT resources such as data and IT infrastructure.*
4. *Promote agility to accommodate quick change and permit fast deployment of government IT systems and solutions.*
5. *Ensure security in the development and management of government IT systems and solutions.*
6. *Develop and manage IT architectural standards and best practices to be complied by government agencies, with room for creativity and innovation to meet unique requirements.*
7. *Adopt and adapt international standards and best practices, and maintain platform independence” (Introduction to GAF Booklet)*

The architecture deliverables defined the main products of the architecture framework and their high-level description e.g. BRA, IRA, ARA and TRA. At this step, the architects built the high-level picture of main components in each reference architecture. The components of BRA are BRA principles, its scope and its relationship with other reference architectures. The IRA, ARA and TRA components are almost the same and consist of scope, its relationship to other reference architectures, standards classifications, design principles, technology watch, architecture design considerations, technical and general standards.

Another outcome from this step was establishing the stakeholders' nomination process that describes the nomination process which was followed to nominate representative from different ministries for the four reference architectures. The information architect says:

*“It was very structured process, what we did was we sent a nomination letter officially from the CEO to the undersecretaries of all the ministries. So in that nomination letter, we wrote an introduction and what kind of involvement required. We explained for example for information reference architecture what are the skills required in order for the ministry whom to nominate for information reference architecture” (ITA4).*

### **5.3.5 Working Group Formation**

It refers to the execution of the nomination process to identify representatives (stakeholders) from governmental entities for the four architecture working groups and the awareness sessions on the GAF project. Specifically, it covered all

nomination activities that include sending nomination letters, reminders and follow-up to get the nominees. The solution architect says:

*“We started by sending letter to government agencies saying that this project is going to start and we would like to get people. Also we tried to explain what kind of skills that we are requiring for each working group..... indirectly as well we ask the people that we are working with them through other projects that we are about to start new project and it will be good if you can participate with us” (ITA3).*

After receiving the list of nominees, the enterprise architects conducted awareness sessions for the nominees on EA concept and benefits and explained the project objectives. The project manager says:

*“We got nominations. So when we have them, we conducted a major awareness session to all of them. We gave them awareness about the requirements and the expectations from them” (ITA1).*

The process of nomination and working group formation are discussed in details in Section 5.4.1.

### **5.3.6 Development of Architecture Documents**

This is the actual development step which was running through continuous working group engagements between the stakeholders and the working group architects. These engagement sessions aimed to understand the as-is or current entities services, applications and technology infrastructure and challenges facing them. Additionally, questionnaires were used to gather data about the entities. One of the stakeholders says:

*“As initial start, they had to understand the current infrastructure or systems and also the situation at the ministries. This work could not happen without involvement from the ministries. This project was aiming to set high-level roadmap for the ministries to follow. So this developed framework should be aligned with the ministries needs because enterprise architects alone did not have the full picture of the ministries core services and the details of their infrastructure” (MoM1).*

Furthermore, the engagement sessions used by the enterprise architects to provide updates on the project progress and also reviewing the developed architecture documents. The security architect says:

*“With the sustained communication and continuous updates. Also, every two-months, we had joint meetings so that way people knew that this is*



*not a dead project. Also, sending regular communication via emails”*  
(ITA7).

As highlighted earlier, the development activities of GAF were carried out to support the final goal of delivering government services as integrated enterprise. These architecture development activities focused on drafting the four reference architectures (BRA, IRA, ARA and TRA) using the collected data to customize and expand the initial architecture framework discussed in Section 5.3.4. In addition, these drafted architectures were discussed and reviewed for validation purpose.

BRA describes the government lines of business (services) and the responsible government agency which delivers or supports that particular service. The identified services under BRA were centric around citizens, residents and commercial establishment. BRA enables the government to prioritize which services to streamline and the involved government agencies. BRA describes

*“The different lines of business and the associated government functions of the Oman Government that cut across the boundaries of different agencies”* (BRA booklet).

IRA describes the data definitions used across the government agencies in which the focus was on person data, commercial establishment data and land data because these were the most required data to deliver government services. It also leverages the technical standards needed in ARA and TRA to smoothen the integration and exchange of data across government agencies. IRA lists

*“The data definitions and data elements of common and shared data that are used across the Oman Government. As part of the initial baseline scope, IRM describes the data pertaining to ‘Person’, ‘Establishment’ and ‘Land’ data hubs which are commonly used by various agencies’ applications. It also defines technical standards, design and security considerations and best practices related to the management of data”*  
(IRA booklet).

ARA consists of applications design and development technology and government applications portfolio. The applications design and development technology describes the standards approach in the design and development of applications that needs to be followed across government agencies to eliminate any

future obstacle of integrating these applications. The government applications portfolio details the current used applications and their interfaces in each government entity. It also identified the opportunities of applications reuse and integration among government entities. It defines as well the security considerations at applications level. ARA describes:

*“the common applications and application components that can be shared across the Oman Government. It includes the technical standards and security considerations pertaining to the design and implementation of solutions and applications”* (ARA booklet).

TRA defines the infrastructure design, technologies, security and implementation standards that enable the integration at systems level among the government entities. TRA defines:

*“The infrastructure technologies and their respective technical standards to enable better system integration and interoperability across the Oman Government. It also defines the security considerations and standards related to the infrastructure technologies”* (TRA booklet).

One of the important elements in the four architectures documents is the reference architecture principles. These specific architecture principles developed as design boundaries in each reference architecture. So all the standards detailed under the four architectures should comply with each reference architecture principles. The purpose of these design principles was to ensure the alignment between the four architectures and the overall government architecture goal of integrating the government entities to provide citizen services efficiently. The BRA principles as documented in BRA document are:

*“Principle 1: Integrated View of Government Functions Independent of Agency Boundaries. The lines of business and the associated government functions are defined based on a whole-of-government approach that categorizes related government functions together, regardless of the agencies that perform such functions.*

*Principle 2: Focus on Alignment of Agencies Activities as Logical Business Functions different agencies’ activities are grouped together through a business focus approach to provide a holistic view of the government functions”* (BRA Booklet).

Similarly, the IRA principles as documented in IRA document are:

*“Principle 1: Share and re-use government data where possible to increase data consistency and remove redundancies*

*Principle 2: Access to single source of government data as much as possible*

*Principle 3: Ensure confidentiality and privacy in the development and the management of government data*

*Principle 4: Adopt open and vendor-neutral standards & best practices with wide industry acceptance” (IRA booklet).*

The ARA principles as documented in ARA document are:

*“Principle 1: Use current appropriate IT solutions to meet the government business needs and operational requirements*

*Principle 2: Optimize and share government IT solutions for cost effectiveness*

*Principle 3: Design for serviceability, reliability, availability and scalability*

*Principle 4: Promote agility and quality in the government IT solutions*

*Principle 5: Ensure security in the development, implementation and management of government IT solutions*

*Principle 6: Use IT solutions that support open, vendor-neutral standards and best practices with wide industry acceptance” (ARM booklet).*

The TRA principles as documented in TRA document are:

*“Principle 1: optimize and share government infrastructure for cost effectiveness, operational efficiency and interoperability*

*Principle 2: Design highly available, scalable and adaptive government infrastructure*

*Principle 3: Promote agility and quality of government IT infrastructure*

*Principle 4: Ensure security in development, implementation and management of government infrastructure*

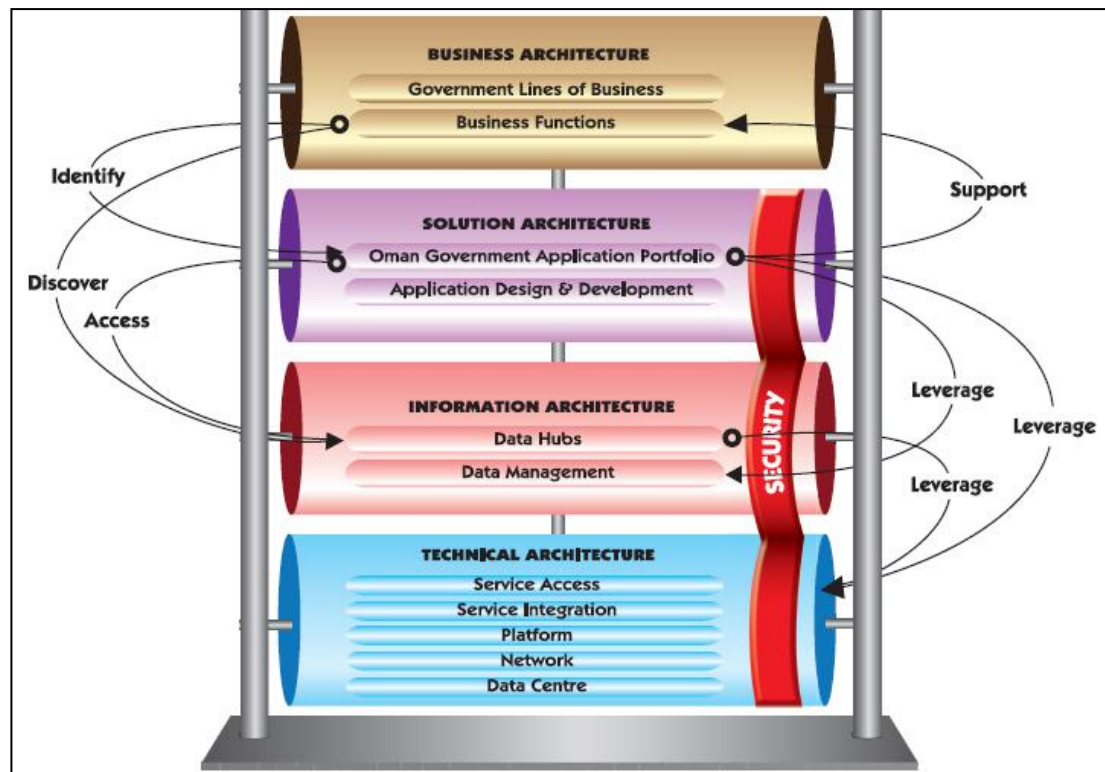
*Principle 5: Use open and vendor-neutral standards and best practices with wide industry acceptance” (TRA booklet).*

### **5.3.7 Summary of GAF Development Process**

The GAF development aimed to enable seamless integrated government services which are provided by multiple government entities. Unlike ADM cycle process of TOGAF, GAF development followed different process due to the uniqueness of government context and government goal of seamless integration among its entities. Based on the analysis of the conducted semi-structured interviews, the GAF development process consisted of five steps; namely, architecture knowledge establishment, EA frameworks & IT standards analysis, high-level architecture framework, working group formation and development of architecture documents. These development steps were supported by GAF governance. The overall development process of GAF depicted in Figure 5.1. The GAF governance

was the project steering committee that steered the development process and endorsed the final architecture documents. The architecture knowledge establishment was the step concerned on building the architecture knowledge and skills among the architects' team members through formal trainings and establishing contract with EA consultancy partner to support the architects during the development process. The EA frameworks & IT standards analysis was the step in which the architects studied the industrial EA frameworks, IT standards and EA development in other governments to propose high-level architecture framework suitable to the public sector of Oman. The high-level architecture framework step drafted the common GAF design principles, nomination process of stakeholders (representatives) from government entities and expected deliverables of the four architectures (BRA, IRA, ARA and TRA). The working group formation step was the execution of the nomination process drafted in the previous step to identify the ministries participants in the GAF four architecture development. The development of architecture document was the final step in which the architecture document of each reference architecture was drafted. This was achieved through several engagement sessions which were carried out by the architects with the nominated stakeholders to develop the four architectures.

The four architectures (BRA, IRA, ARA and TRA) were not developed in silos but interrelate with each other as shown in Figure 5.2. BRA identifies the required government entities to deliver a service in which the business process is optimized and consolidated. Accordingly, the applications under ARA are suggested to be designed to support the consolidated process. Thus, ARA leverages the TRA technical standards to accommodate applications of ARA. Similarly, the shared services under BRA require particular flow of data that need to be exchanged. Hence, the IRA details these data types' definitions and standards to ensure data integrity and compatibility. IRA provides these data types to applications and set the technical standards to host these data in TRA. Once the government entities involved in delivering the shared government services follow and comply with the developed GAF standards in IRA, ARA and TRA, the seamless integration will be enabled.



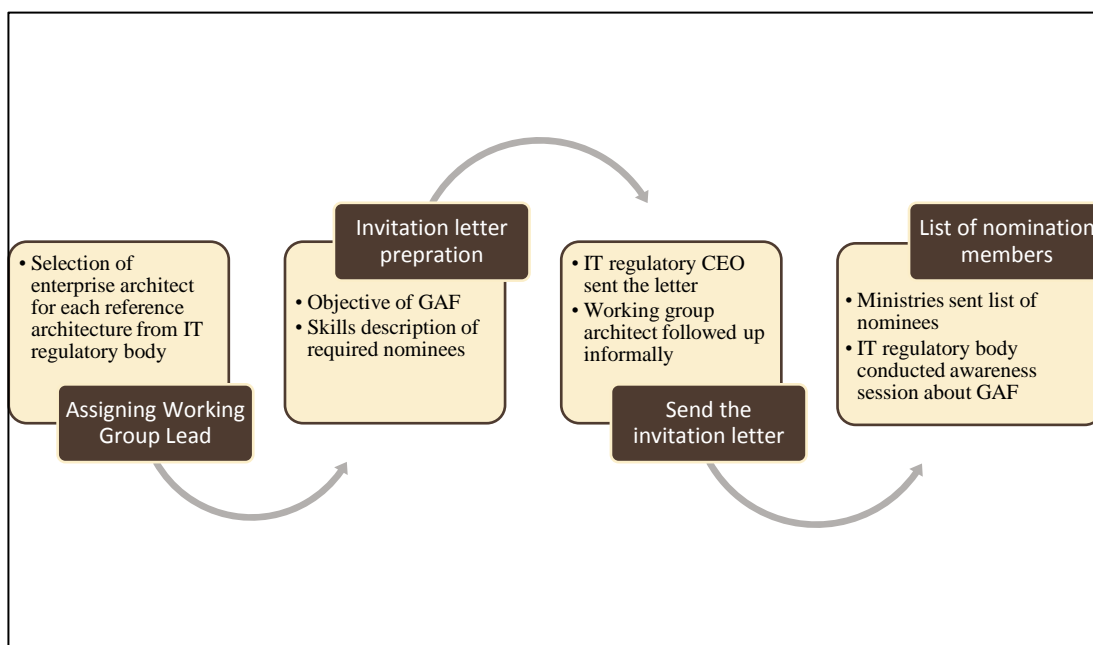
**Figure 5.2:** Four reference architectures of GAF and their interrelationship (extracted from introduction to GAF booklet)

#### 5.4 Enterprise Architects and Stakeholders Roles

This section is addressing RQ2 (*What are the roles of stakeholders and enterprise architects in development process of EA in the public sector?*). It verifies and expands the initial findings from the preliminary study on the roles of the working group stakeholders and the working group architects. The researcher utilized GAF documentation review and interviews to analyze the findings related to working group formation process and exploring the roles of working group stakeholders and architects. As discussed in the previous section, working group formation was one of the main steps of GAF development that included nominating the working group stakeholders who represented the ministries and working group architects from IT regulatory body. Hence, this section is detailing the nomination process followed during the development process and the roles of both working group stakeholders and working group architects.

### 5.4.1 Stakeholders Nomination Process

The nomination process of working group stakeholders from different government ministries and assigning working group architects for the four working groups BRA, IRA, ARA and TRA is illustrated in Figure 5.3. It summarized the steps followed to constitute the four working groups of the four reference architectures that form the GAF.



**Figure 5.3:** Followed steps to form the working groups

The constitution of working group started by assigning working group architects who were specialized in that particular field. So the consultant who specialized in infrastructure was selected to be TRA working group architect. The consultant specialized in applications was selected to be ARA working group architect. The consultant specialized in data management and databases was selected to be IRA working group architect and the consultant with the experience of cross government lines of business was selected to be BRA working group architect. The GAF project manager says:

*“In governance and advisory division, everyone is specialized in something and support project or initiative as secondary role for example consultant named X is specialized in infrastructure and maybe support other areas like application but we selected him to*

*architect technical working group due to his main specialization” (ITA1).*

Then, the assigned working group architects prepared an invitation or a nomination letter in which they provided a background about the project, its objective and the required skills of the nominee for each of the four working groups. One of the stakeholders who was a member of IRA says:

*“Now each of these reference architectures has a team architect and supporting working group members. These members are the one who look deeply at the data of the reference architecture and come up with kind of list of attributes available in the nominated working group stakeholders across the government since the environment that we are developing in the enterprise architecture here in Oman, we need to identify key members from the government entities and key members from semi government organizations so we can have a good representation of entities who can educate us and provide us their current scenario and status as well as the limitations and what they are looking for as part of this enterprise architecture. So eventually this architecture later has to support their needs” (ITA5).*

The information architect also says:

*“So in that nomination letter (I can share a copy of the letter), we wrote an introduction and what kind of involvement required. We explained for example for IRA what are the skills required in order for the ministry whom to nominate for the IRA. So we kind of gave a guideline saying for a working group stakeholder for IRA, we need these capabilities. So that is how formally we identified the right set of people with the right skills to be part of the working group” (ITA4).*

After that, the nomination letter was sent by IT regulatory body CEO to government entities. The information architect says:

*“It was very structured process, what we did was we sent a nomination letter officially from the CEO of IT regulatory body to the undersecretaries of all the ministries” (ITA4).*

In addition, the enterprise architects of the four working groups who were also involved in other projects with government entities briefed them on the GAF project to encourage government staff to participate. The application architect says:

*“Indirectly as well we ask the people that we are working with them through other projects that we are about to start new project and it will be good if you can participate with us” (ITA3).*

Finally, the ministries sent the nominated names to IT regulatory body. GAF working group architects conducted an awareness session to all nominated stakeholders on the project’s objective and the expectations from the nominated stakeholders. The project manager of GAF says:

*“We got nominations. So when we have them, we conducted a major awareness session to all of them. We gave them awareness about the requirements, about the current status of Governance framework, GAF status, the expectations from working group stakeholders, and so on” (ITA1).*

## 5.4.2 Roles Overview

In the preliminary study, the roles of both the working group architects and the working group stakeholders were discussed briefly. The working group architect played six main roles in the GAF development process namely EA knowledge acquirer, EA development investigator, GAF skeleton developer, working group former, data analyzer and architecture document developer. The working group stakeholders had three roles which were participators, entity as-is explainer and architecture document reviewer. Hence, this section is investigating these roles in addition of tasks carried out under them as obtained from the interviews with the working group architects and stakeholders.

### 5.4.2.1 Working Group Architects Roles

To understand the roles of the working groups’ architects in the development process, there was a direct question asked during the interview with the working group architect, *what was your role in the development process of GAF?*. Similarly, the working group stakeholders were asked on the role of the working group architects based on their involvement during the development process. The roles of the architects were the same in the four working group architectures. However, the scope of each reference architecture was different from each other. For example, the business architect focus while collecting the data to build the BRA was more on defining the shared services and government entities delivering these services. On the other hand, the information architect did the same task of data collection but the focus was on defining the data types needed to run the services. Thus, the roles and tasks were the same but their scope differed based on the reference architecture



required to be developed. The roles of the working group architects along with the carried out tasks under each role is illustrated in Table 5.2 that shows as well the number of interviews sources and the number of references (coded passages) per role.

**Table 5.2:** Working group architects roles in GAF development

Role	Source	Reference	Tasks
EA knowledge acquirer	3	5	-Obtain self EA trainings and partner
EA development investigator	4	11	-Explore governments who developed their own EA -Study EA frameworks and best practices
GAF skeleton developer	8	27	-Define the scope of the reference architectures -Develop the nomination process -Define high-level GAF principles
Working group former	9	38	-Execute the nomination process -Create the working groups -Conduct awareness sessions for working group stakeholders on EA concept, its benefits and GAF objective
Data analyzer	5	10	-Invite and engage group stakeholders for regular engagement sessions (meetings, workshops, etc.) -Collect the data through the working group stakeholders
Architecture documents developer	9	20	-Invite and engage group stakeholders for regular engagement sessions (meetings, workshops, etc.) -Develop the architecture documents based on the data collected from the working group stakeholders

**EA knowledge acquirer** as role focused on getting self EA training and certifications. Also, it explored the possibility of partnering with EA consultancy organization. Security architect says:

*“Though we were trained but not really skilled. So the first thing that we did is to find a partner” (ITA7).*

**EA development investigator** covered the tasks of exploring the governments who already developed their own EA and also the study of EA industrial frameworks and IT best practices. Information architect says:

*“We were trying to get best practices concepts like defining data hubs. So there were a lot of readings, analysis of the best practices in the world” (ITA4).*

**GAF skeleton developer** defined the stakeholders’ nomination process, general GAF design principles (discussed in Section 5.4.3) and GAF layers which are BRA, IRA, ARA and TRA along with their scope. Security architect says:

*“we put very high level OeGAF framework in which we defined the principles and what will be the development process in place and what kind of working group members to involve from the ministries and what will be the deliverables of each reference model” (ITA7).*

**Working group former** as role focused on executing the nomination process of stakeholders from ministries, form the working group after receiving the nominations and conduct awareness session on EA concept, its benefits and GAF objective. Business architect says:

*“We sent invitation or nomination form to each organization. We ask them to nominate individuals at the first stage” (ITA2).*

**Data analyzer** role covered the engagements with the stakeholders and collect the required data. IRA working group member says:

*“Contributing as a working member to provide the standards and database related things for IRM” (ITA5).*

**Architecture documents developer** role included engaging with the stakeholders for the sake of developing and reviewing the architecture documents. The GAF project manager says:

*“The architect has to develop the architecture draft and taking input from the working group members” (ITA1).*

#### 5.4.2.2 Working Group Stakeholders Roles

Similarly to the working group architect, there was a direct question during the interview with the stakeholders to ask them about their role in the development. In addition, the working group architects as well were asked about the role of the stakeholders. The findings from the main case study interviews confirmed that the working group stakeholders played three roles shown in Table 5.3.

**Table 5.3:** Working group stakeholders roles in GAF development

Role	Source	Reference	Tasks
Entity as-is explainer	12	25	-Explain the standards, practices, services, data types, applications and technology infrastructure used in the government entity -Describe the challenges facing their organization
architecture documents reviewer	9	13	-Discuss and negotiate the requirements of other working group stakeholders related to reference architecture standards -Review and give opinion on the output documents produced as part of the discussions and workshops
Participator	3	3	-Participate and attend engagement sessions

The role of **entity as-is explainer** focused on presenting the entity as-is situation in terms of processes, services, infrastructure, solutions, utilized standards and related challenges during engagement sessions or by filling the questionnaires prepared by the architects. In relation to this role, the project manager says:

*“The work required from the working group stakeholders was to explain the challenges that they were facing in the ministries in their day-to-day work. If someone is working in a datacenter, he will be interested to know the standards to operate the datacenter and the process..... for example if there is a draft provided, the working group stakeholder should provide input on that draft whether the stakeholder agree or not agree or maybe there is a need for enhancement for the standards” (ITA1).*

**Architecture documents reviewer** role included reviewing the documents developed by the working group architects that target to develop the four reference architectures for wide government and providing feedback upon the review. On the review development documents role, information architect says:

*“To review all the documents or all output that we wanted them to review and give their opinion if yes that can be included in the government architecture” (ITA4).*

**Participator** role covered attending and participating in engagement sessions (meetings, workshops, etc.). TRM working group member says:

*“The group architect was gathering people, communicate and listen to them. He was recording the technical experience of each ministry based on members input” (MoCA1).*

Similar to the working group architects roles, the stakeholders played the same roles in the development across the four architectures. However, the nature of the roles and tasks were tailored based on the developed reference architecture. For example, the participated stakeholders in BRA working group explained and provided the current services delivered by their entity. Likewise, the participated stakeholders in TRA working group discussed their current technical infrastructure at their entity.

## **5.5 Development Process and Roles Interrelationship**

In order to build an in-depth knowledge on the case settings and the overall development of GAF, it is important to map the roles of the architects and the stakeholders with the GAF development process. The researcher utilized matrix coding functionality in NVivo 11 in which the development process steps listed in column and the enterprise architects and stakeholders roles listed in row guided by Miskon, Bandara, & Fielt (2017). The matrix coding search for intersection passage exists in both the row and column to highlight a potential relationship.

The outcome showed the first three development steps were mainly carried out by the architects. This result was expected as the steps of EA knowledge establishment, EA frameworks and IT standards analysis and High-level architecture framework were the preparation steps prior involving the stakeholders. In particular, EA knowledge acquirer and EA development investigator architects' roles were performed in architecture knowledge establishment step and EA frameworks and IT standards analysis. GAF skeleton developer was the played architect role in high-level architecture framework step. On the other hand, working group formation and architecture documents development were involved both the architects and the stakeholders. In the working group formation, the architects performed the role of working group former and the stakeholders played the role of participator as the main activity for them was to attend the awareness sessions. Architecture documents development is the most development steps in which several roles were performed by the architects and the stakeholders. At this step, the architects' roles were data

analyzer and architecture document developer whereas the stakeholders played the role of entity as-is explainer, participator and architecture documents reviewer. Table 5.4 summarizes the roles of the architects and the stakeholders in each development step and the tasks carried out under each role.

**Table 5.4:** GAF development process and roles interrelationship.

GAF Development Process	Architects		Stakeholders	
	Roles	Tasks	Roles	Tasks
Architecture knowledge establishment	-EA knowledge acquirer -EA development investigator	-Obtain self EA trainings and partner -Explore governments who developed their own EA -Study EA frameworks and best practices	None	None
EA frameworks and standards analysis IT	-EA knowledge acquirer -EA development investigator	-Obtain self EA trainings and partner -Explore governments who developed their own EA -Study EA frameworks and best practices	None	None
High-level architecture framework	-GAF skeleton developer	-Define the scope of the reference architectures -Develop the nomination process -Define high-level GAF principles	None	None
Working group formation	-Working group former	-Execute the nomination process -Create the working groups -Conduct awareness sessions for working group stakeholders	-Participator	-Participate and attend engagement sessions
Development of architecture documents	-Data analyzer -Architecture documents developer	-Invite and engage group stakeholders for regular engagement sessions -Collect the data through the working group stakeholders -Develop the architecture documents based on the data collected from the working	-Participator -Entity as-is explainer -Architecture documents reviewer	-Participate and attend engagement sessions -Explain standards, practices, services, data types, applications and technology used in the entity -Describe entity challenges -Discuss and negotiate the requirements of stakeholders

		group stakeholders		-Review and give opinion on the architecture documents
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## 5.6 Alignment Factors

This section is aiming to address the first part of RQ3 (*What are the factors influencing the alignment between the enterprise architects and the stakeholders in the development process of EA in the public sector?*) that targets to identify the factors influencing the alignment between working group stakeholders and working group architects during the development of GAF. As highlighted in Chapter 4, the main purpose of introducing GAF was to enable the integration between government entities which is expected to result in simplifying and automating the services provided to citizens. At the beginning of the interview, the researcher explained the study's definition of alignment as discussed in Section 2.4.2 to ensure a mutual understanding with the interviewees. There were some key interview questions (refer to the Appendix B for all interview questions) to capture the factors influencing the alignment during the development process which were asked the working group architects:

- How do you align the development of (business or data or application or technical) reference architecture with the organizations needs or concerns provided by the working group stakeholders?
- What are the factors that support the alignment between (business or data or application or technical) working group stakeholders' perspective and working group architect perspective?
- What are the factors that hinder the alignment between (business or data or application or technical) working group stakeholders' perspective and working group architect perspective?
- What do you recommend to improve the alignment between (business or data or application or technical) working group stakeholders' perspective and working group architect perspective?

Almost similar questions were asked as well the working group stakeholders but in the context that suited their roles in the development of GAF:

- How do you align your organizations needs with the standards provided by IT regulatory body enterprise architect as part of (business or data or application or technical) reference architecture development?
- What are the factors that support the alignment between (business or data or application or technical) working group stakeholders and enterprise architect?
- What are the factors that hinder the alignment between (business or data or application or technical) working group stakeholders and enterprise architect?
- What do you recommend to improve the alignment between (business or data or application or technical) working group stakeholders and enterprise architect?

For the first cycle of coding, the coding rule was to code any text that showed direct or indirect impact on the alignment between the working group stakeholders and architects utilizing the study's definition of alignment. In addition, the researcher mapped the coded text (alignment factors) into the three dimensions using the three lenses (technical, organizational and personal) of MPT, hence the coding rule used for each dimension was:

1. **Organizational:** The organizational perspective covers the aspects related to the organization. It represents the influencing environmental factors where the working group architects and stakeholders were interacting.
2. **Personal:** The personal or individual perspective includes all individual related aspects. In the context of the study, it comprised individual associated aspects with working group stakeholders and architects.
3. **Technical:** The technical perspective includes the technical characteristics of the system. In the context of EA, it represents all technical aspects related to the architecture and the development activities executed by the enterprise architects and the stakeholders.

The second coding cycle was done inductively by analyzing the coded text under each dimension using descriptive coding approach into themes that represents the alignment factors under each dimension. Under technical dimension, there are three factors namely standardization, development scope and principles. In the

organizational dimension, there are three factors which are culture, top management support and governance. In the personal dimension, there are six factors which are communication, commitment, change management capability, awareness, value of EA and experience.

### **5.6.1 Technical Alignment Factors**

As discussed earlier, the technical perspective represents the technical characteristics of the system. In this research context, these characteristics are related to GAF development methodology that influenced by the technical alignment factors between the working group stakeholders and architects. Standardization, development scope and principles were the identified technical alignment factors. Table 5.5 shows the distribution of interview sources for the three technical factors. For example, standardization factor was mentioned by 10 participants, seven of them were working group stakeholders (7S) and three were the working group architects (3A). Additionally, it shows the number of times the interviewees provided statements supporting the concluded factor. For example, if one interviewee explains two evidences for the same factor, then the source of interview is one but the number of references is two. The description of each factor along with the views of both the working group architects and stakeholders are discussed in details in the next sections.



**Table 5.5:** Technical factors based on the perspective of working group architects and stakeholders

Factor	Sources		References	Sample Evidence
Standardization	10	7S	18	<i>"The standards were clear to the IT regulatory body people but for us we were not used to the international standards and the development of our network for example were based on individual effort"</i>
		3A	12	<i>"Individually we collect these data attributes. Later on, what we did as enterprise architects, we collected and formulated comprehensive list of this data related to person hub, land hub, or related to business hub. So when we did this, we invited all entities and conducted workshop to present the holistic consolidated data and then we told them for person data, these are the related data and explained the source of these data from each entity. Then they were able to see the big picture and identified how data were collected and also the duplicate of data that were collected by different entities with different attribute code. Then they realized the need to standardize and eliminate data limitations and gaps."</i>
Development scope	8	4S	7	<i>"In our ministry, we had several buildings across the country and they were not following any standards. If we follow the same standards specified for large building or head office to the small building, it would be too costly. I was telling them if we could produce architecture specifications for the small buildings but they did not address it."</i>
		4A	12	<i>"We talked about the as-is scenario and we told please note that this architecture is for the whole of government and not developing architecture specific for your ministry. Second thing, we asked them to remove the hat of your own ministry or systems and think for the whole of government"</i>
Principles	4	2S	7	<i>"So the discussions in the to-be were focused on the how we can implement the standards because all the involved ministries provide services so these organizations should be integrated and data should not be stored in different organization but to be accessed from the organization database owning that data"</i>
		2A	4	<i>"Principles normally our first layer of defense and whatever the stakeholders are saying should be complying with the principles"</i>

### 5.6.1.1 Standardization

It refers to the level of standardization at different government entities in infrastructure, applications and data and its impact on working group stakeholders' to agree with the GAF standards. Some ministries in terms of IT infrastructure and implementation of standards were far ahead from others which created challenges to agree on the reference architecture because the transition effort required was much higher compared to the ministries with higher technology standards maturity. Some working group stakeholders mentioned since their infrastructure was at the initial stage of development, the new standards should not be applied to them and resisted on agreeing on tight GAF standards. To tackle this challenge, the working group architects introduced mandatory and optional standards based on the extent of standards utilization at entities by using maturity checklist. So for those entities which were at the initial stage most of the standards are optional and will be given a period of time to enhance their infrastructure to comply with the mandatory standards.

From working group architect perspective, it was challenging to manage working group stakeholders with different level of experience and expectations. Information architect says:

*“We wanted to have many standards as mandatory because we felt to define things very tight but ministries were not ready and said if you make mandatory our systems from day one will not be compliant so we need more time and you cannot make the standards mandatory from day one” (ITA4).*

Despite several ministries were at the initial stage of using IT systems and standards which created some resistance to agree on standards but at the same time it was easier for the working group architects to sell the concept of GAF and show the expected benefits to the working group stakeholders. Such benefits are difficult to sell or justify if most of ministries are advanced in complying with the international standards. These facts (poor data quality, the lack of integration between entities and redundant data) were supported by statistics helped to sell the concept and value of EA. The working group stakeholders explained that these facts enabled them to agree on the development standards. One of the stakeholders from IRA working group

says:

*“The most facilitating factor was when everyone showed their organization data so we can understand the current facts about the data in different ministries that enable us later to agree on the standards. Previously, we did not know what kind of data exist in other ministries but when we started the discussions as part of IRA working group based on the provided data from each ministry, the discussion was based on facts on the ground. That enabled us to agree on final solutions to overcome the current challenges and ease our work.” (MoC1).*

#### **5.6.1.2 Development Scope**

It refers to the influence of project scope and deliverables on the expectations of both working group stakeholders and architects, which created some challenges during the development of GAF. The working group architects explained that the developed framework was for the whole government and not specific for a particular government entity. The requirements or concerns raised by the working group stakeholders were addressed only if applicable and beneficial for the wide government. However, there was a push from the working group stakeholders to consider developing standards to address the needs of the small scale ministries which were not entertained by the working group architects. One of the issues highlighted by one of the working group architect; despite the target was to develop standards for wide government but there were no terms of reference. Such terms can be shared with the working group stakeholders to have a better understanding of their responsibilities, objectives and deliverables in GAF project. The working group architects were targeting to develop tight standards in each reference architecture but the working group stakeholders were looking for flexible standards that address immature entities. This issue was resolved by introducing mandatory and optional standards based on the entity readiness.

So the scope was based on the concept of developing standards to enable the integration between government entities. Business architect says:

*“A criterion was the scope as we were developing the reference architecture for the whole of government. We were not developing something for the agency specific. If you are crossing the line and going*

*too specific this may not be common for or applicable for the whole of government that is our boundary. So if you are going beyond that certain point like you are going very specific in a particular aspect which may be relevant to the organization only not the whole of government that was our criteria” (ITA2).*

To manage the expectations of the working group stakeholders, the recommendation was to draft and agree on terms of reference prior the actual development of reference architecture. Security architect suggested:

*“I think we gave a very good understanding for each working group stakeholders on that. However, we supposed to draft very detailed terms of reference as I said in terms of timeline, deliverables, etc.” (ITA7).*

### **5.6.1.3 Principles**

It refers to the design boundaries that both working group stakeholders and architects should comply with during the development of reference architectures. There were two types of design principles used during the development; namely GAF general principles and reference architecture specific principles (refer to section 5.3 for more details on the principles list). The GAF principles had been set by the working group architects prior the start of reference architecture development process to ensure that GAF development outcomes of the reference architectures comply and contribute towards the common goal of seamless integration between government entities. The GAF general principles were used to maintain the relationship of working group architects with the working group stakeholders e.g. all reference architectures should be vendor product neutral. Hence, the working group architects were not entertaining any requirements if not complying with the GAF general principles. Technology architect says:

*“Principles normally our first layer of defense and whatever the stakeholders are saying should be complying with the principles” (ITA6).*

The specific principles of each reference architecture were developed in cooperation with the working group stakeholders and used to control the scope of the reference architecture. As a recommendation to efficiently utilize the employment of design principles in the development process, it was recommended to get the

working group stakeholders involvement in the design of the GAF general principles.

One of the IRA stakeholders says:

*“once the design principles are freeze then you are sure that you have enough buy-in from the working group stakeholders and the scope of the design principles are very well understood” (ITA5).*

#### 5.6.1.4 Summary of Technical Factors

Table 5.6 provides a summary of each technical factor influence and the recommendation to address based on the findings from the interviews sessions. The influence of factors and their validation are further discussed in Chapter 6. The (–) sign means the factor had negative influence on the alignment during the development process of GAF. However, the (+) sign represents the positive influence on the alignment.

**Table 5.6:** Technical alignment factors influence and recommendation

Factor	Nature of Influence	Recommendation
Standardization	a) stakeholders from low standards adoption organizations resisted the new architecture standards as they see them as threat (-) b) Enterprise architects found it easier to sell the concept of EA and promoting its benefits for low standards adoption entities (+)	a) classify architecture standards to be optional and mandatory depending on entity technical maturity a) consider the size of governmental entities as the small ministries can not comply with same standards as the large ministries
Development scope	a) Since the scope was to develop an architecture for the whole government, it was used to accept needs or concerns related to the overall government (+) b) small scale ministries resisted to apply same standards for small and large ministries (-)	b) draft detailed terms of reference prior the development of the reference architectures and get it agreed with the group stakeholders b) develop two categories of standards; one for large ministries and another standards for small scale
Principles	a) used by the working group architects to assess the ideas and requirements of the working group stakeholders (+)	-Involve the working group stakeholders in the development of the general GAF principles instead of get them agreed among working group architects only

### 5.6.2 Organizational Alignment Factors

According to MPT, the organizational and personal lenses represent the social part of the studied system or phenomenon. The organizational perspective addresses the contextual characteristics of the organization. There are three identified factors that influencing the alignment between the working group stakeholders and the working group architects which are top management support, governance and culture. Table 5.7 illustrates these factors based on the interviews with the stakeholders and the enterprise architect architects along with the sample evidence. The (S) refers to number of the interviews sources of the stakeholders and the (A) refers the number of interview sources of the architects.

**Table 5.7:** Organizational factors based on the perspective of working group architects and stakeholders

Factor	Sources		References	Sample Evidence
Governance	7	3S	7	<i>“Though IT regulatory body is overlook after the standards and policies for the government but there are some of ministries that might not even involve IT regulatory body in adopting any technology or application. But the situation will be different if IT regulatory body has forcing power over the ministries. So all initiatives suggested by IT regulatory body will move very slow. The ministries look at IT regulatory body recommendations as optional and it is up to them to adhere or not even if the recommendation of IT regulatory body is the best for them”</i>
		4A	8	<i>“it was primarily when we face challenges like this we escalate it to the steering committee because the working group level was the operational team level”</i>
Culture	6	2S	3	<i>“The other thing that hinders our work was some stakeholders who thought that their data are confidential and were not willing to share them.”</i>
		4A	12	<i>“The world says that government should be opening as much as possible. The data should be made open as much as possible but ministries are going against this”</i>
Top Management Support	6	4S	8	<i>“There was also support from the top management of the ministry to contribute in such national project in order to get the learning to enhance our services”</i>

				<i>“our management has always those worries and fears on new standards or initiatives and this exists till today”</i>
		2A	2	<i>“the buy in from the business side is the second challenge as well because if you have developed a reference architecture, you need to adopt it to tailor it for the organization, you need a commitment from the business side”</i>

### 5.6.2.1 Top Management Support

It refers to the buy-in and the commitment of the top management in different governmental entities to support the working group stakeholders and empower them during the development of GAF. Some of the working group stakeholders faced challenges during the development discussions with the working group architects because their management did not allow them to share the data. They were against the idea of integration and data exchange because of their fears on data confidentiality. On the other hand, there were other stakeholders who got continuous support from their management during the development and even empowered them to take the decisions related to GAF development. One of the stakeholders from IRA working group says:

*“Some entities have the infrastructure ability to exchange the data but because of top management disagreement, they will not do it. The top management thinks that their data are confidential and should not be shared but the technical people have different view and think it can be shared” (MoC1).*

From working group architects perspective, they faced initially the challenge to get the buy-in from IT regulatory body management. Later when their management saw the potential of benefits behind it, they got a wonderful support through all development stages. In addition, whenever the working group stakeholders faced challenges due to the lack of support from their management, the working group architects escalated the issues to the project steering committee to get their support.

The recommendation was to avoid forcing ministries which are not showing willingness to participate in the development. One of the stakeholders from the BRA working group says:

*“Study the willingness of organizations to participate in the development of reference architectures because some ministries were not really welcoming the idea of GAF” (MoM1).*

#### **5.6.2.2 Governance**

It discusses the distribution of decision authority given to IT regulatory body as it is considered like the CIO for governmental entities. Also, it refers to the role of the GAF steering committee on resolving the issues arising from working group stakeholders. One of the hindering aspects is that some of the working group stakeholders consider IT regulatory body (the sponsor of GAF project) as organization with no power to force IT standards on governmental entities. Hence, the ministries were not given sufficient attention to IT regulatory body's initiatives like GAF. One of the stakeholders from IRA working group says:

*“IT regulatory body did not have that authority or power to force ministries and this problem is existing till today” (MoC1).*

The working group architects confronted by difficulties to agree on some standards as the working group stakeholders were looking for governmental regulations or policies to support these standards. The working group architects utilized the project steering committee to escalate the issues that cannot be agreed with the working group stakeholders in order to progress things forward. The information architect says:

*“It was primarily when we face challenges like this we escalate it to the steering committee because the working group level was the operational team level” (ITA4).*

#### **5.6.2.3 Culture**

It refers to the organization norms and beliefs which are accumulated internally or been influenced by the surrounding community. The working group



stakeholders pointed out that some of the discussed international standards during GAF development were against the traditions or the laws of the country which were dropped as agreed with the group architect. Furthermore, there were some ministries which did not have the willingness to share the data might be related to the conservative culture of these entities. One of the stakeholders from IRA working group says:

*“The working group architect normally comes and says this is the best practice that we need to adopt but as members we were only selecting things that are applicable to the country because sometimes there are things that are against the traditions and norms for example data activities related to alcohol factory production. This type of activity is not common for GCC countries. So we reached an agreement based on negotiation with the working group architect.” (MoC1).*

The working groups faced the bureaucratic environment in the government entities that did not recognize email as a formal channel of communication which result in delay in the nomination process. Furthermore, Arabic is the official and main language in the government sector and it was as well the participated working group stakeholders first language but the working group architects of the four reference architectures were not speaking Arabic which caused some communication challenges as discussed under communication factor. Furthermore, several organizations did not have the openness culture of sharing the organizational info.

#### **5.6.2.4 Summary of Organizational Factors**

Table 5.8 summarizes the organizational factors in terms of influence nature and the recommendation to address each factor as obtained from the interviews. The (–) sign means the factor had negative influence on the alignment during the development process of GAF. However, the (+) sign represents the positive influence on the alignment. The influence and the recommendations are discussed further in Chapter 6.

**Table 5.8:** Organizational alignment factors influence and recommendation

<b>Factor</b>	<b>Nature of Influence</b>	<b>Recommendation</b>
Top management support	a) Resist sharing organization data due to confidentiality concerns related to architecture integration standards (-) b) top management who buy-in the concept of EA, empowered their working group stakeholders to take the decisions (+)	a) avoid including governmental agencies that do not show willingness to participate
Governance	a) working group stakeholders did not appreciate the governance role played by IT regulatory body (-)	a) escalate issues in which the working group stakeholders were not cooperative to the project steering committee
Culture	a) difficulty in utilizing services like email as a communication channel and instead sending formal letter (-) b) the bureaucracy in governmental process caused delayed in getting the nominations and also to book the working group stakeholders for meetings (-) -The understanding of the main country's religion and traditions simplified agreeing on architecture standards (+)	a) The utilization of communication channels that suits the stakeholders (calls, sms, etc.) b) advance planning as governmental process is time consuming and the need for a relationship to informally follow-up

### 5.6.3 Personal Alignment Factors

In the previous section, the discussion was on the organizational factors influencing the alignment between the working group stakeholders and architects. This section focuses on the individual characteristics represented by the working group stakeholders or working group architects during the development of GAF. These individual alignment factors are communication, commitment, change management capability, awareness, experience and value of EA. In Table 5.9, the (S) refers to number of stakeholders in the interviews that support the factor and the (A) refers the number of the architects' evidences.

**Table 5.9:** Personal alignment factors

Factor	Sources		References	Sample Evidence
Commitment	5	2S	2	<i>"Yes there was formal communication that they want to nominate people but they was nothing regarding assuring the commitment of stakeholders to participate. It was open to me if I want to attend or not. So this is my opinion"</i>
		3A	8	<i>"Most of those working group stakeholders had a full time job in their ministries so they were busy in their day-to-day tasks, in their day-to-day initiatives and things like that, so this was kind of additional responsibility for them. So many times their commitment was a concern"</i>
Awareness	7	3S	9	<i>"We did not have the knowledge about the enterprise architecture and best international practices. Even we were thinking that such knowledge is a waste of money and time"</i>
		4A	10	<i>"The lack of knowledge of what is enterprise architecture, what enterprise architecture will do for me, for the government and for the ministry? The concept of governance in the country is still not yet mature"</i>
Communication	7	3S	13	<i>"The IT regulatory body team was speaking English and the government organizations are comfortable with Arabic to provide accurate information. They know English but not all of them can speak English fluently"</i>
		4A	10	<i>"There was disparity of IT competence within the working group stakeholders. So you cannot treat them all with the same level and required different approaches. So that is why rather having joint meetings, the effort was refocused to have individual meetings and once in two months we had joint meeting. The joint meetings were more on updating the progress and not much for a debate"</i>
Value of EA	8	4S	7	<i>"maybe not obstacle but some stakeholders did not see benefits from the project"</i>
		4A	9	<i>"Initially the commitment of the stakeholders was challenge because they cannot see tangible benefits for them or their organizations. So people did not see individual benefits"</i>
Experience	8	7S	15	<i>"They did not have the experience and their ministries at initial stage or even did not start. So you need members who can give you their experience and what was happening at their ministries. On the other hand, if you bring members with no experience"</i>

				<i>of IT at their organizations, they will just provide theoretical information. At the end, the experience is a corner stone</i>
		1A	6	<i>“one of the challenges was to balance between the different skills and competence level of stakeholders from different ministries but we did not have choice except managing it”</i>
Change management capability	11	7S	11	<i>“The working group architect was listening to our opinion and was open for discussion. I mean was not kind of a person who forcing his idea. Sometimes we tried to enforce our view but the working group architect used the logic to convince us”</i>
		4A	6	<i>“Generally we tried to draft something from the first round and see if there are disagreements from stakeholders. Sometimes we conducted something like SWOT analysis. So we discussed the findings openly with the group and then we came to a decision”</i>

#### 5.6.3.1 Commitment

It refers to the participation of the working group stakeholders in the development of the reference architectures and their commitment in the assigned tasks. The availability of the working group stakeholders was a concern for the working group architects. They explained that the working group stakeholders were busy at their day to day job in their respective organizations. Additionally, some of the stakeholders did not see tangible benefits for them or their organizations which resulted in low participation. The information architect says:

*“Most of those working group stakeholders had a full time job in their ministries so they were busy in their day-to-day tasks, in their day-to-day initiatives and things like that, so this was kind of additional responsibility for them. So many times their commitment was a concern. If you want to call for a working group meeting, you need to give very advance notice” (ITA4).*

The working group stakeholders as well shared similar concern as they had responsibilities and tasks at their organizations and also there was nothing official to ensure their full time participation in the project. One of the working group architects confirmed that there was no formal letter detailed the working group stakeholders' responsibilities, frequency of engagements with timeline to ensure their commitment. Thus, to ensure the commitment of stakeholders, one of the stakeholders from TRA

working group highlighted the need for a formal letter asking for a full commitment to participate in the development:

*“Yes there was formal communication that they want to nominate people but they was nothing regarding assuring the commitment of stakeholders to participate” (MoCA1).*

### 5.6.3.2 Awareness

It covers the working group stakeholders’ knowledge about EA concept and its benefits. The initial understanding about EA as a concept for the working group stakeholders is very important to ease the process of developing the reference architectures and ensure its alignment with the working group stakeholders’ needs and concerns. The concept of EA was totally new for the working group stakeholders and one of them mentioned that they were worried from this new unknown concept and another member initially thought that such concept and standards are a waste of money. One of the stakeholders from TRA working group says:

*“They were telling us about the standards but it was not clear to us how it will impact our day-to-day work in the initial days. It was something totally new not only for us but for everyone. It is like we were worried about something, which is unknown” (MoF1).*

The working group architects faced difficulty in the beginning as the concept of EA was new and some stakeholders mentioned that this concept is for the enterprise not the government. The working group architects conducted several workshops or awareness sessions to increase the awareness on EA and its benefits. Furthermore, the working group architects were trying to bring the stakeholders to the same level of EA understanding and to demonstrate the value of standards. Business architect says:

*“our approach was, first provide orientation to them to take them on the same page or the same level of understanding, so we conducted different workshops for them because there are a lot of people who are coming from different backgrounds so to take them to the same understanding level, we conducted the workshops for the awareness session with the individuals working group then we share our scope and the vision of GAF” (ITA2).*

### 5.6.3.3 Value of EA

It refers to the understanding of EA value and benefits both for the organization and the individual and how it is impacting the agreement with working group architects. The working group stakeholders discussed that the competence and experience of the working group architect helped to build a confidence on the value of GAF. Others explained that some of the organizations were still at the early stages of utilizing IT, so it was challenging for them to comprehend the benefits of EA. In addition, some members did not see direct individual benefits like incentives. One of the stakeholders from BRA says:

*“The IT regulatory body reported that they achieved the KPI and reported it to their management and maybe got incentives for that. But these people of government who spent time and effort what sort of incentives had given to them” (MoE1).*

The working group architects highlighted the importance of convincing the working group stakeholders of the GAF value otherwise it would impact their interest in the different stages of the development. They explained that the working group stakeholders were looking to understand how these architecture benefits contribute to their daily tasks which was difficult to demonstrate at the initial stage of the development but later after data gathering, it was easier to justify. Information architect says:

*“They were not able to relate or understand the value of having standards or architecture or the need for alignment for the whole of government” (ITA4).*

The working group architects managed to demonstrate the value of GAF by showing facts about the redundancy and quality of data. Also, the amount of effort required to maintain the data so later they realized the value of having centralized the data with data owner organization and they just access it whenever needed. Furthermore, the working group architects got support from the project steering committee members who were ambassadors to promote the value of GAF in the governmental entities. Also, considering that GAF was targeting to integrate the government entities which was a pre-requisite step towards other government initiatives like government data center. Security architect says:

*“The deliverables from the project is not something tangible like servers but set of documents so people can easily mistake us and lose*

*commitment but the sustained commitment from management helped us a lot and also they were our ambassadors with other ministries in case of issues with ministries or working group stakeholders to engage with their counter parts in the ministries to overcome these issues.” (ITA7).*

#### **5.6.3.4 Change Management Capability**

It refers to the leadership skills, project management and architecture knowledge of working group architects to facilitate the discussions of reference architectures development with the working group stakeholders. The architecture knowledge was a key for the success of the development process so the working group architects established a partnership with another governmental entity (who went through similar initiative) to bridge any architecture gap. The working group stakeholders were coming from different background, different level of skills and experience, so the working group architects were trying to strike a balance to manage them using a mix of engagement approaches. For example, they were conducting joint meetings which were aiming to provide progress on the project and review the draft of documents and individual meetings to seek a feedback on particular development aspect. They were transparent and discuss openly to come up with final decisions.

The working group stakeholders emphasized on the demonstrated skills of the working group architects in terms of openly taking their input, listening to their opinions and skills in managing brain storming sessions. One of the stakeholders from BRA working group says:

*“The working group architect was listening to our opinion and was open for discussion. I mean was not kind of a person who forcing his idea. Sometimes we tried to enforce our view but the working group architect used the logic to convince us” (MoM1).*

Also, one of the stakeholders from IRA working group says:

*“When you look for working group architect, the focus should be on the change management and leadership skills.... it is important to go and visit countries that implemented that particular project to understand the challenges that they faced” (MoC1).*

### 5.6.3.5 Communication

It refers to the influence of communication channel, language, and engagement type on the alignment between the working group architect and stakeholders. The working group stakeholders explained that the number of sessions to communicate the progress of the project was insufficient which make them lose the track of the project. In addition, the working group architects were using email as channel of communication but several stakeholders were not comfortable to use email service. Since Arabic was the main language in the public sector and native language, it was challenging for the working group stakeholders to understand and express their views in English which was the main language for the communication and the development process. Additionally, the working group stakeholders were translating organizations documents and findings from Arabic to English which consumed a plenty of time. One of the stakeholders from BRA working group says:

*“The way of communication was via email and for me as person because of my experience I can deal with that. But it was challenge for other organizations to get used to the level of communication via email and address their concerns. So the channel or the tool of communication and the frequency was not enough or appropriate”* (MoE1).

The working group architects faced several challenges started by working group stakeholders' nomination in which a formal letter was sent to several government entities but unfortunately in some occasions got lost. So, informal follow-up was required by the working group architects with the IT managers in different ministries via emails or visits to ensure that they received the letter. Since Arabic was the main language in the government sector, all formal communication was in Arabic which resulted in difficulties of translating terminologies like enterprise architecture to Arabic. Also, the media of communication like emails were not officially used so the working group architects were trying to communicate with stakeholders using calls, SMS, etc. to plan for the meetings and workshops in advance. Also, they stressed on the need of the pre-existing relationship with different entities prior the start of the project to speed up and ease any request sent to them.



There were several recommendations suggested during the interviews which were assigning single person to look after all communication with the ministries, assigning translator to work with the working group architects, translate all the requirements in Arabic prior the start of the actual development and establish frequent face to face discussions with the working group stakeholders. The working group stakeholders as well recommended awareness sessions for all ministries prior the start of the nomination process. One of the stakeholders from BRA working group says:

*“There are two options; first to develop everything in Arabic because it is the first language used in the ministries and later translates to English. The second option is to assign translator working closely with the working group architect and translate to the members. I do not think it is possible to bring experts speaking Arabic because the Arabic world still not advanced in the area of IT at that time.” (MoM1).*

#### **5.6.3.6 Experience**

It refers to the technical experience and the competence of the working group stakeholders in the domain of the four reference architectures BRA, IRA, ARA and TRA. It can be noticed that the experience was of a concern for the working group stakeholders and highlighted by seven interviewees. It was mentioned by only one working group architect and that is due to the fact that they were looking for a wider participation regardless of the experience and competence of the participants. Security architect says:

*“We did not have a strong process for the development itself in terms of criteria; for example what would be the competence level of working group stakeholders? How do we select them? Or what is the selection criterion? We got nominations and these nominations were accepted or kept aside based on our subjective decisions. So we did not have a documented criterion” (ITA7).*

The new established ministries had young staff with limited years of experience and the long established ministries had staff with good experience and competence. So the challenge that faced the working group architects was how to manage the mix of working group stakeholders' different level of experience and competence. Security architect says:

*“Young ministries they had youngsters and large ministries had people with good experience. So one of the challenges was to balance between the different skills and competence level of stakeholders from different ministries but we did not have choice except managing it” (ITA7).*

From the working group stakeholders’ view, the experience of stakeholders resulted in several challenges. First, some of the nominees did not have the right background or competence level to discuss the development of a particular reference architecture that resulted in a delay in data collection and review process because these nominees needed time to go back every time to discuss and understand the matters from their colleagues at the ministry. Another challenge was some of the stakeholders did not have the mix of technical skills and as well the appreciation of the business perspective. Additionally, some of the stakeholders were lacking professional certificates and the experience of the staff was dependent on the involvement with the local vendors to implement the IT solutions, hence it was related to the extent of IT solutions usage in the government entities.

To tackle the challenge of working group stakeholders’ experience, there were a set of recommendations obtained from interviewees. One is to improve the nomination process of working group stakeholders by formulating a criterion, the nominating entity should adhere to this criterion and the final assessment need to be done by the working group architects in form of interviews. In addition, the working group architects can include the working group stakeholder subordinates as part of the development specially the data gathering to speed up the process and address the issue of experience. One of the stakeholders from BRA working group says:

*“There were cases in which the ministry nominated member who was not specialized in the area. So I recommend for such nomination, there should be pre-requisites that required nominating the members. One of the pre-requisite will be for sure that the nominated member should have relevant experience to the scope of the project. So the member becomes contributor rather than obstacle.” (MoM1).*

### 5.6.3.7 Summary of Personal Factors

Table 5.10 summarizes the personal factors in terms of influence nature and the recommendation to address each factor as obtained from the interviews. The (–) sign means the factor had negative influence on the alignment during the development process of GAF. However, the (+) sign represents the positive influence on the alignment.

**Table 5.10:** Personal alignment factors influence and recommendation

<b>Factor</b>	<b>Nature of Influence</b>	<b>Recommendation</b>
Commitment	a) working group stakeholders skipped some engagement sessions with working group architects because they were busy with tasks at their organizations (–) b) The decline of interest with the working group stakeholders to actively participate as they do not realize benefits (–)	a) & b) IT regulatory body should send a formal letter to the ministries asking to nominate members as a full time for the development of GAF project
Awareness	a) resisting and not supporting the development process (–)	a) conduct awareness sessions to explain the concept of EA and its value for all ministries prior the nomination and development processes
Value of EA	a) Inability to see the individual benefits for working group stakeholder's day to day tasks at the initial stage of the development (–) -The experience and competence of the working group architects built confidence on the potential benefits (+)	a) explain the intent of the overall development and promote the concept in the government sector a) allocate incentives for the involved stakeholders
Change management capability	a) The working group stakeholders expressed their ideas and concerns freely because the working group architects were open to any comments (+) b) Efficient management of brainstorming sessions by providing justifications to reject or accept (+)	-visit other governments and meet the enterprise architects to obtain the lessons learnt
Communication	a) difficulty to communicate efficiently with working group stakeholders as the email was not formal channel of communication in the government (–) b) stakeholders faced difficulty to express their views in English and also to translate the requests in	a) frequent use of face to face discussions b) to provide list of requirements prior the start of the project and translate them in Arabic b) assign translator to work with the working group

	Arabic (-) c) confusion due to absence of single person of communication between IT regulatory body and ministries (-) -pre-existing relationship with entities supported speeding up some requests required from entities (+)	architects c) assign single person from IT regulatory body responsible for all communication with the ministries to answer any concern or clarification raised from working group stakeholders
Experience	a) delay in entity data gathering (-) b) delay in decision making due to the lack of knowledge related to the reference architecture domain (-) c) difficulty in managing group stakeholders with different level experience and competence (-) d) Providing theoretical info without practical basis that results in difficulty to digest the value of GAF standards (-)	a) & b) involve group stakeholders subordinates if needed c) set criterion for nomination and interviews to assess the nominees before accepting them d) conduct awareness sessions for the government agencies about EA concept prior the nomination process

## 5.7 Summary

This chapter discussed the used analysis approach to analyze the interviews and documentations which was a mix of deductive and inductive approach. The deductive method used to propose the initial themes and the inductive approach followed to categorize and create child nodes for each theme. The GAF development process consisted of architecture knowledge establishment, EA frameworks and IT standards analysis, high-level architecture framework, working group formation, development of architecture documents and all governed by GAF governance. The process of stakeholders' nomination was described. The roles of the enterprise architects and the stakeholders were explained along with the tasks under each role. There were twelve alignment factors were obtained from the interviews and categorized based MPT into technical domain that includes standardization, development scope and principles, organizational domain that includes governance, culture and top management support and personal domain that comprises communication, awareness, value of EA, change management capability, experience and commitment.

## CHAPTER 6

### FRAMEWORK DEVELOPMENT AND VALIDATION

#### 6.1 Overview

Chapter 5 detailed the case study findings in terms of development process of GAF, the roles of the enterprise architects and stakeholders and the alignment factors. The purpose of this chapter is to address the second part of RQ 3 (*How these factors are interrelated with the development process and the roles of stakeholders and enterprise architects?*) and RQ 4 (*What framework can be used to support the alignment between enterprise architects and the stakeholders in the development process of EA in the public sector?*). Thus, the focus was on developing the alignment framework which was achieved through building the interrelationship between the GAF process, roles of the actors and the alignment factors. Additionally, the chapter is discussing the potential alignment factors interrelationships. It discusses all trustworthiness steps which were considered prior the data collection till the validation of the final framework. Specifically, it gives details on how the four Guba's trustworthiness constructs; internal validity, external validity, reliability and construct validity applied in the research. In addition, it discusses the ethical considerations taken by the researcher following Creswell (2012) recommendations. Finally it concludes the chapter with the key findings.

## 6.2 Interrelationship between Development Process & Alignment Factors

One of the crucial steps towards developing the final alignment framework was to investigate the interrelationship between the GAF development process, the roles of enterprise architects and the stakeholders and the alignment factors. It enabled to obtain a better understanding on the influence of the alignment factors on the development process steps and the roles of the enterprise architects and the stakeholders. Section 5.5 discussed the interrelationship between the development process and the performed roles in each development step. This section creates an in-depth understanding of the interrelationship between the GAF development process and the obtained alignment factors.

The investigation of the interrelationship between the alignment factors with the particular development step is providing an initial groundwork towards understanding the influence of the alignment factor on the development step which will open the door to validate them in future different contexts. The interrelationship between the development process and the alignment factors was obtained through the matrix coding query in NVivo 11 by listing the development process steps in column and the alignment factors in row. It used Boolean AND to search for passage that intersects between the row and column.

The matrix results showed that the first two development steps were not influenced by any alignment factors which can be rooted to the nature of the activities carried out at these two steps which were focusing on raising the EA knowledge of architects and investigating the development of EA in other countries. Despite high-level architecture framework step did not involve any stakeholders roles but it pointed out interrelationship with alignment factors namely principles, experience and development scope. It is because the recommendations of these three factors highlighted the need to involve the stakeholders in the high-level architecture framework step as depicted in Table 7.2. Thus, these three factors considered at this development step. The working group formation demonstrated a relationship with awareness, communication, culture, commitment and value of EA. Due to the lack of awareness about EA concept with some of the stakeholders made them did not see a

tangible value of the project that resulted in low participation in working group formation step. The bureaucracy in governmental processes delayed the nomination process of stakeholders and also restricted the architects from using communication channels like email which was not recognized as official channel of communication between government entities. The architecture documents development step was influenced by most of the alignment factors specifically communication, principles, standardization, culture, change management capability, governance, development scope, top management support, value of EA, commitment and experience. These factors influenced the architecture development step because it was the main step in which the architecture reference documents were drafted and reviewed. The influence characteristics of each factor are discussed in details in Section 6.5.2.

The overall interrelationship between the GAF development process, roles of actors and alignment factors is depicted in Table 6.1. It shows the roles performed by the architects and the stakeholders at each development step. Additionally, it clarifies the alignment factors that influenced the played roles at each development step.

**Table 6.1:** GAF development process, roles and alignment factors interrelationship.

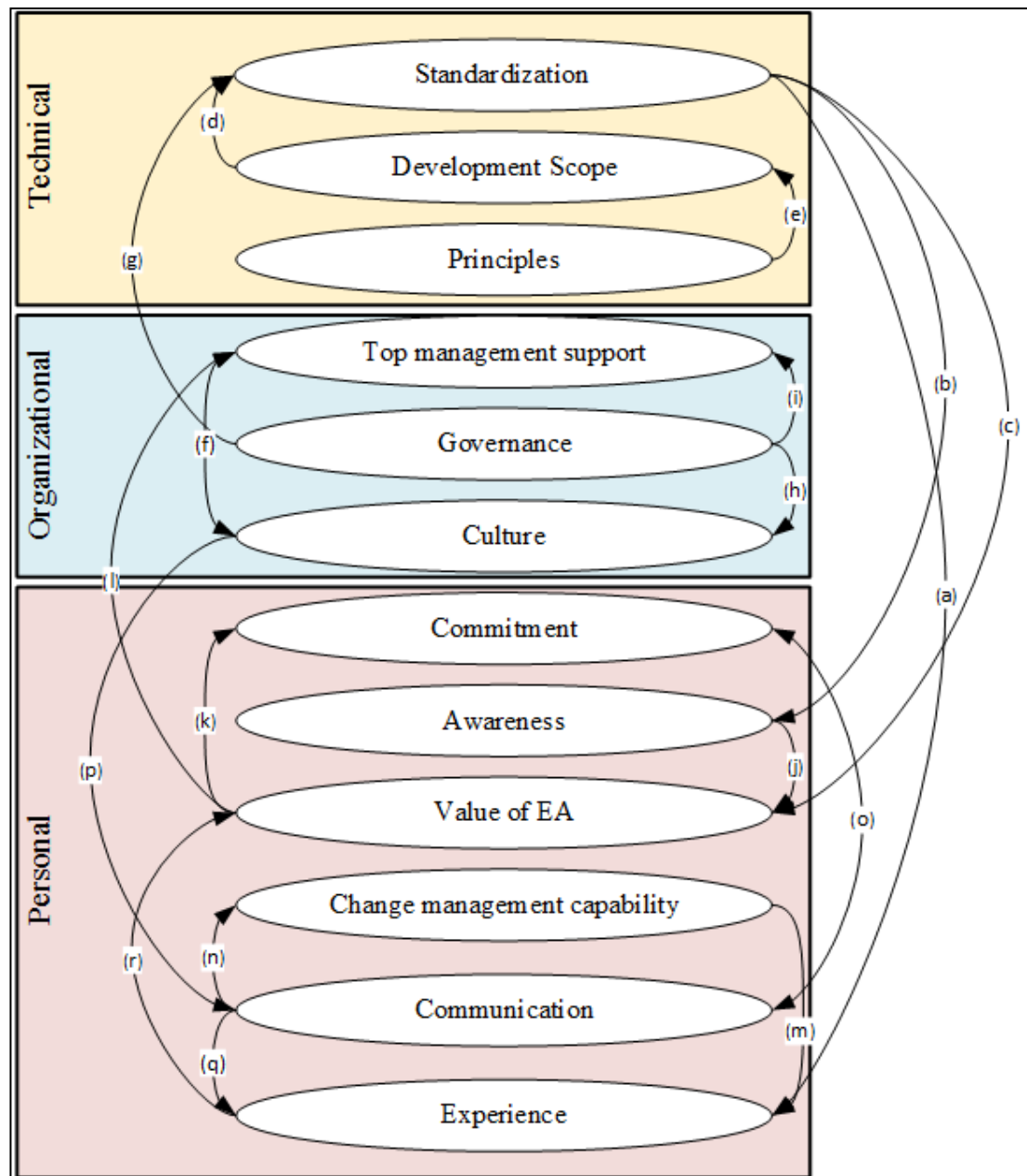
GAF Development Process	Roles		Alignment Factors
	Architects	Stakeholders	
Architecture knowledge establishment	-EA knowledge acquirer -EA development investigator	None	None
EA frameworks and IT standards analysis	-EA knowledge acquirer -EA development investigator	None	None
High-level architecture framework	-GAF skeleton developer	None	-Principles -Experience -Development scope
Working group formation	-Working group former	-Participator	-Awareness -Communication -Culture -Commitment -Value of EA
Development of architecture documents	-Data analyzer -Architecture documents developer	-Participator -Entity as-is explainer -Architecture documents reviewer	-Communication -Principles -Standardization -Culture -Change management capability -Governance -Development scope

			-Top management support -Value of EA -Commitment -Experience
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### 6.3 Potential Interrelationship between Alignment Factors

As obtained from the case study analysis, there were 12 alignment factors that influenced the development of the government architecture framework. Using matrix coding query in NVivo 11 and guided by Miskon, Bandara, & Fielt (2017), the researcher investigated the potential interrelationship between factors to build a holistic understanding about them. The matrix coding utilized by listing the 12 alignment factors nodes both in rows and columns, then searched the passages that existed in two or more factors. The existence of shared passage provided a signal for potential interrelationship between the factors. Hence, the researcher analyzed the passage to find out if there is a potential association between the factors whether it was a negative or a positive association. Furthermore, the association was studied whether the influence in one direction or mutual reinforcing. Figure 6.1 summarizes the overall interrelationships between alignment factors. The details of the factors interrelationships discussed in the next sections.





**Figure 6.1:** Alignment factors overall interrelationship

### 6.3.1 Culture Interrelationship

The culture as alignment factor had a potential influence with governance (see path (h)), top management (see path (f)) and communication (see path (p)) factors. In some governmental entities, the culture of sharing the data did not exist which created a challenge to gather the data about the as-is view of the ministries. It was fueled as well by the top management fear about the organization data who

instructed the participated stakeholders to avoid sharing any data related to the organization. One of the participated stakeholders says:

*“The other thing that hinders our work was some stakeholders who thought that their data are confidential and were not willing to share them. During the discussions with them, they mentioned that the top management in their organization did not allow them to share the data”* (MoC1).

Thus, we can notice that there was a mutual negative reinforcement between culture and top management factors. Due to this reinforcement, the enterprise architects tried to explain that these info are needed to understand the governmental organizations as-is state to build suitable standards but it did not work and they had no choice except to escalate the matter to the project steering committee. Hence, the governance as factor played a positive role to reduce the negative influence of the culture and top management factors. One of the enterprise architects says:

*“We explained to them and tried to convince them to get the basic information....we had to escalate it to the project steering committee to seek their support”* (ITA7)

The bureaucracy and the formality culture existed in the government played a negative impact on the communication. For example, email as a channel of communication was not recognized and all communication with governmental entities had to go through formal letters. In addition, the communication should be in the country native language “Arabic” which was another challenge as the enterprise architects were not speaking Arabic. One of the enterprise architects mentions:

*“The bureaucracy was involved, people expecting formal letter but not email because email is not considered formal”* (ITA7).

### **6.3.2 Governance Interrelationship**

As explained in section 6.3.1 that governance played a positive influence on both culture (see path (h)) and top management (see path (i)) to reduce the negative influence of not sharing the organization data. Additionally, the governance played a negative influence on the standardization (see path (g)) factor. Since there was a low maturity in governmental entities to follow and comply with standards, the project was supposed to be driven by law or policy to empower the project team rather than

just a discipline. One of the enterprise architects says:

*“Ministries were not used to work on proper architecture and their style was to rely on outsourcing and vendors...many thought that the project supposed to be driven by law or mandate rather than a discipline” (ITA4).*

### **6.3.3 Top Management Support Interrelationship**

As discussed in section 6.3.1, the top management played a negative factor on culture (see path (f)) and was influenced positively by the governance (see path (i)) factor. Furthermore, the top management specially in the IT regulatory body when they understood the value and the potential contribution of developing the architecture framework on other government IT projects, they provided a great support till the end of the development. Thus, the value of EA as factor played a positive influence on the top management support (see path (l)). One of the enterprise architects says:

*“The interesting thing the moment we managed to sell the concept of EA, we got wonderful management commitment from the beginning till the end of the development” (ITA7).*

### **6.3.4 Awareness Interrelationship**

The awareness had a potential association with value of EA (see path (j)) factor and standardization (see path (b)) factor. The awareness played a positive influence on the value of EA. The stakeholders in the beginning were not able to see the link between the value of EA for them in their day to day work but after conducting awareness sessions for them on the EA concept and its benefits that enabled them to see the link.

The awareness and value of EA as factors were influenced positively by the standardization factor. There was a lack of standards in several governmental entities which made it easier for the enterprise architects to explain the concept of EA and its benefits. One of the information architecture stakeholders says:

*“There were no standards at that point of time that the government entities could use to develop their applications or systems to align them towards a common goal. That helped us a lot when we conducted the awareness about the vision of the EA” (ITA5).*

### **6.3.5 Change Management Capability Interrelationship**

The change management capability factor had a positive association with communication (see path (n)) and experience (see path (m)) factors. There was a variation in the skills and experience of the participated stakeholders. Hence the enterprise architects used different communication strategies of using joint meeting for project updates and individual meetings for data gathering. So, the change management capability factor had a positive influence on experience and it was influenced positively by communication. One of the enterprise architects explains:

*“There was disparity of IT competence within the stakeholders, so we cannot treat them all with the same and required different approaches....the effort was refocused to have individual meetings and once in two months we had joint meeting...in some occasions, we were meeting the stakeholders at their organizations and involve their colleagues who made up for the lack of skills to manage the data gathering” (ITA7).*

### **6.3.6 Commitment Interrelationship**

The commitment factor had association with communication (see path (o)) and value of EA (see path (k)) factors. The stakeholders explained that their involvement was voluntarily as there was no formal communication during the nomination process to ensure their commitment. On the other hand, the enterprise architects spent a lot of communication effort to ensure their attendance for meetings and workshops. Hence, the commitment and communication had a mutual negative reinforcement. One of the stakeholders says:

*“There was communication to nominate people but there was nothing regarding assuring the commitment of the participated stakeholders” (MoCA1).*

The commitment especially in the initial project stage was influenced negatively because the stakeholders cannot see tangible benefits. Thus, the value of EA as factor influenced the commitment negatively. One of the enterprise architects says:

*“Initially the commitment of the stakeholders was challenge because they cannot see tangible benefits for them or their organizations” (ITA7).*

### **6.3.7 Communication Interrelationship**

The communication factor had a potential association with culture (discussed in Section 6.3.1), change management capability (discussed in section 6.3.5), commitment (discussed in Section 6.3.6) and experience (see path (q)). As highlighted in Section 6.3.5, the communication had a positive influence on the experience through the utilization of different communication strategies to manage the different level of skills and competence among the stakeholders.

### **6.3.8 Experience Interrelationship**

The experience factor had potential associations with change management capability (discussed in Section 6.3.5), communication (discussed in Section 6.3.7), value of EA (see path (r)) and standardization (see path (a)). The experience had a positive association on value of EA as the experience and the competence of the enterprise architects gave the stakeholders the confidence on the potential benefits of the development for their organizations. One of the stakeholders says:

*“The competence and experience of the working group architect gave us the confidence and trust that this reference will add value for our organization” (MoM1).*

Some of the organizations that lack standards or low in utilizing the IT resulted in limited experience and competence. Hence, the standardization factor had a negative association on the experience factor. One of the stakeholders says:

*“Some of the ministries were still at the initial stage of using the electronic or digital services so the nominated stakeholders in terms of work experience limited to supporting desktops” (MoCA1).*

### 6.3.9 Value of EA Interrelationship

The value of EA had associations with top management support (discussed in Section 6.3.3), awareness (discussed in Section 6.3.4), commitment (discussed in Section 6.3.6), experience (discussed in Section 6.3.8) and standardization (see path (c)). The value of EA was influenced positively by the standardization factor as in many organizations there were no standards followed in designing their systems which made it easier to demonstrate the potential benefits. One of the stakeholders says:

*“There were no standards at that point of time that the government entities could use to develop their applications or systems to align them towards common goal” (ITA5)*

### 6.3.10 Principles Interrelationship

The design principles had a potential positive influence on the development scope (see path (e)) factor. The principles provided the design boundaries to ensure that the development was not crossing them and stayed within the agreed scope. One of the stakeholders says:

*“I suggest for the enterprise architects and the stakeholders to spend enough time to come up with specific scope boundary for each reference architecture” (ITA5).*

### 6.3.11 Development scope Interrelationship

The development scope had associations with principles (discussed in Section 6.3.10) and standardization (see path (d)). The lack of standardization in some entities played a negative influence on the development scope as they requested to exempt the small and new entities from the standards. Thus, the standardization factor played a negative influence on the development scope. One of the enterprise architects says:

*“So there were small ministries that have different opinion and explaining that it is not possible to apply same scale for large and small organizations” (ITA7).*

### **6.3.12 Standardization Interrelationship**

The standardization factor had interrelationships with governance (discussed in section 6.3.2), awareness (discussed in section 6.3.4), experience (discussed in section 6.3.8), value of EA (discussed in section 6.3.9) and development scope (6.3.11).

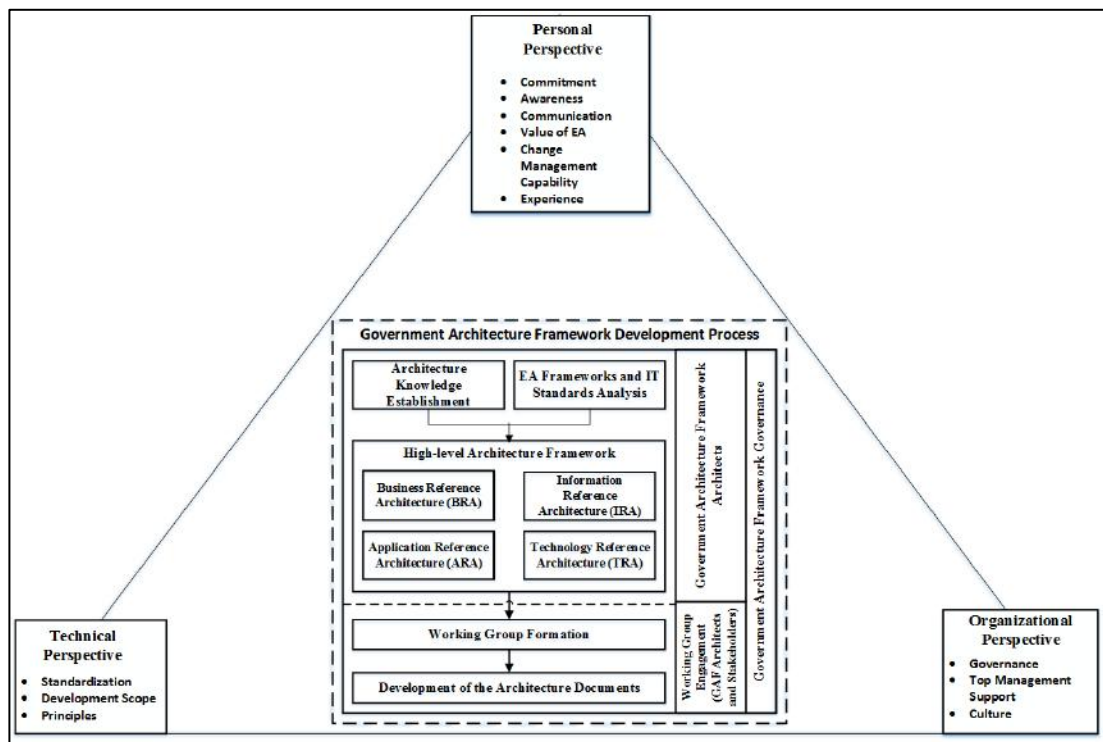
## **6.4 Development of the Alignment Framework**

The research utilized the initial theoretical model shown in Figure 2.8 to provide the initial guidance in data collection and analysis. Based on the findings on the GAF development process (refer to Section 5.3), roles of the architects and the stakeholders (refer to Section 5.4), alignment factors (refer to Section 5.6) and the interrelationship between GAF development process and alignment factors (refer to Section 6.2), the final alignment framework is developed as illustrated in Figure 6.2.

The framework consists of the GAF development process which is shown in the center of the framework. It represents the GAF development steps architecture knowledge establishment, EA frameworks and IT standard analysis, high-level architecture framework, working group formation and development of the architecture documents. All of these steps were govern through GAF governance (project steering committee).

The framework highlights the distribution of the architects and the stakeholders' roles over the development process. It shows that the first three development steps were performed by the architects. The fourth and fifth development steps were performed by both the architects and the stakeholders.

The framework details the alignment factors under the three perspectives; personal, technical and organizational. The personal perspective covers commitment, awareness, communication, value of EA, change management capability and experience factors. The technical perspective includes standardization, development scope and principles factors. The organizational perspective comprises governance, top management support and the culture. The interrelationship between the alignment factors is discussed in Section 6.3. The validation of the alignment factors characteristics on the GAF development process is detailed in the next section.



**Figure 6.2:** Final Alignment framework in GAF development process

## 6.5 Validation of the Alignment Framework

As part of ensuring rigorous internal validity and construct validity, the researcher organized a focus group session with case study architects to validate the final results and generalize the findings in the selected case study context. The focus group is an interactive method that allows the participants to discuss and elaborate to obtain a deeper understanding and improve the trustworthiness of findings (Nili,



Tate, & Johnstone, 2017). Rosemann and Vessey (2008) suggested to validate the resulted theoretical model constructs from the traditional case study research using applicability checks. They explained the applicability checks method which consists of seven steps:

1. **Planning the applicability checks:** to clearly specify the research questions and the applicability checks objectives
2. **Selecting focus group session facilitator:** to select a person with in depth knowledge on the research being investigated
3. **Familiarity of participants with the examined subject:** to inform participants with the research objective and implication and their evaluation role.
4. **Design the instrument for conducting the session:** the design of well-established criteria, format and agenda.
5. **Environment appropriateness to conduct the session:** to conduct the session in environment that supports the interactions with the participants
6. **Conduct the session:** to present the agenda, ground rules and conduct it in professional manner
7. **Analyze the data:** procedures for data analysis

For each step, there are principles and criteria that need to be followed by the moderator as a guideline (Rosemann & Vessey, 2008, p. 13). The researcher utilized this guideline to develop the focus group protocol explained in Appendix C. The protocol were shared and validated by two experts to conclude the final focus group protocol. The focus group session's objectives were as follow:

1. Validate the concluded GAF alignment factors definitions, their characteristics and the recommendations.
2. Refine the research alignment framework based on the focus group feedback

### 6.5.1 Prior the Focus Group Session

The main users of the developed alignment framework are the EA practitioners who are represented by the enterprise architects in GAF case study. The alignment factors findings from the case study phase were sent in advance via email

to the GAF enterprise architects. The time and date of the focus group were agreed with the GAF architects. The profile of the participated enterprise architects described in Table 6.2.

**Table 6.2:** Focus group participants' profile

<b>Area of Specialty</b>	<b>Years of Experience</b>
Infrastructure and Security Architecture	30 years
Information Architecture	19 years
Business Architecture	21 years

### **6.5.2 Focus Group Session Outcome**

The researcher asked the participants to sign the consent form (see Appendix C) and took their permission to use audio recorder in the session. The participants were briefed on the case study findings, the purpose of the session and the agenda. The focus group lasted for two hours in which all the factors listed in the three forms were discussed in the next sections. The session was aiming to validate the obtained alignment factors and their definitions by the case architects. Furthermore, the session validated the influence of each factor and the suggested recommendations that targeted to eliminate or reduce the negative influence of the factor. The alignment factors validation forms consist of two parts. The first part was to validate the alignment factors and their definitions. The participants were given the choice to accept the findings, refine them by proposing adjustments or reject the finding with comments. The second part was to validate the influence of the factors and the recommendation(s) to address the negative influence.

#### **6.5.2.1 Technical Alignment Factors Validation**

The validation of the technical alignment factors consists of two forms (see Appendix C); one form is to validate the technical alignment factor and its definition

shown in Table 6.3 and another form to validate the influence of each factor and to validate the recommendation for each factor as depicted in Table 6.4. The three technical factors standardization, development scope and principles were validated and agreed by the participants with minor revision of the standardization's definition and development scope's definition.

**Table 6.3:** Technical alignment factors validation

Factor	Definition	Accepted	Revised	Rejected	Participants Concluded Remark
Standardization	The level of standardization at different government entities in infrastructure, applications and data		√		Remove the word "level" as it is adding confusion and replace it with word "Lack"
Development scope	It refers to the influence of project scope and deliverables on the expectations of both working group stakeholders and architects, which created some challenges during the development of GAF		√		Remove unnecessary sentence from definition "which created some challenges during the development of GAF"
Principles	It refers to the design boundaries that both working group stakeholders and architects should comply with during the development of reference architectures	√			No change

The second validation form covered the influence of the technical factors and the recommendation to address each factor as shown in Table 6.4 along with the participated practitioners' feedback.

For standardization factor, there were two kind of influence realized. One negative influence which was the technical staff at the low standards governmental entities resisted the proposed architecture standards as they see them as threat. To reduce the resistance against the architecture standards, the participated practitioners

suggested classifying the standards to be optional (no urgency to adopt them) and mandatory (must adopt as soon as possible) depending on the technical maturity of governmental entities. The second was a positive influence which was the enterprise architects found it easier to sell the concept of EA and promoting its benefits with senior managers in low standards adoption entities. Furthermore, the participated practitioners were asked if there is a further suggestion for the standardization factor that needs to be considered by the enterprise architects. They suggested that to consider the investment (budget, effort & technical complexity) required in entity to comply with the proposed architecture standards.

Under principles factor, there was one positive influence. The working group architects used the design principles to assess the ideas and requirements of the working group stakeholders to ensure that these requirements were aligned with the goal of the seamless integration between government entities. The participants also suggested involving the working group stakeholders in the development of the general GAF principles depending on the architecture knowledge of the stakeholders.

The influence nature of development scope was a positive and a negative influence. The positive influence was in a sense that the scope of GAF was to develop architecture for the whole government which was used by the working group architects to accept stakeholders' needs or concerns which were applicable to the overall government and filtered out any specific entity requirement. The negative influence was the challenge for working group architect to maintain the development as abstract as possible to make it relevant for all government entities. To mitigate this negative influence, the participated practitioners suggested if stakeholders from particular entities thought that some of the abstracted development standards are not enough for their entities, produce specific architecture development methodology for those entities in order for them to develop their own detailed standards. Additionally, the participants suggested drafting detailed terms of reference prior the development of the reference architectures and to get it agreed with the stakeholders.

**Table 6.4:** Technical alignment factors influence and recommendation validation

Factor	Nature of Influence	Participants Concluded Remark	Recommendation	Participants Concluded Remark
Standardization	a) Stakeholders from low standards adoption organizations resisted the new architecture standards as they see them as threat (-) b) Enterprise architects found it easier to sell the concept of EA and promoting its benefits for low standards adoption entities (+)	a) Rewrite “The technical implementation stakeholders from low standards adoption organizations resisted the new architecture standards as they see them as threat (-)” b) Rewrite “Enterprise architects found it easier to sell the concept of EA and promoting its benefits with senior managers in low standards adoption entities (+)”	a) Classify architecture standards to be optional and mandatory depending on entity technical maturity a) Consider the size of governmental entities as the small ministries can not comply with same standards as the large ministries	a) Rewrite “classify architecture standards to be optional and mandatory depending on technology technical maturity” a) Replace it with “consider the investment (budget, effort & technical complexity) required in entity to comply with the developed standards”
Principles	a) Used by the working group architects to assess the ideas and requirements of the working group stakeholders (+)	a) No remark	a) Involve the working group stakeholders in the development of the general GAF principles instead of get them agreed among working group architects only	a) Rewrite “Involve the working group stakeholders in the development of the general GAF principles depending on the architecture knowledge of the stakeholders”
Development scope	a) Since the scope was to develop an architecture for the whole government, it was used to accept needs or concerns related to the overall government (+) b) Small scale ministries resisted to have same standards for small and large ministries (-)	a) No remark b) Replace it with “challenge to maintain the development as abstract as possible to make it relevant for all entities (-)”	b) Draft detailed terms of reference prior the development of the reference architectures and get it agreed with the group stakeholders b) Develop two categories of standards; one for large ministries and another standards for small scale	a) No remark b) Replace it with “if stakeholders from particular entities thought that some of the abstracted development standards are not enough for their entities, produce specific architecture development methodology for those entities”

### 6.5.2.2 Organizational Alignment Factors Validation

After completing the technical validation, similar approach followed in the validation of the organizational alignment factors (governance, top management support and culture) along with their definitions. The three factors were discussed and accepted except for governance factor in which the practitioners suggested some changes in the definition as depicted in Figure 6.5.

**Table 6.5:** Organizational alignment factors validation

Factor	Definition	Accepted	Revised	Rejected	Participants Remark	Concluded
Governance	It discusses the distribution of decision authority given to IT regulatory body as it is considered like CIO for governmental entities		√		Rewrite “Authority given to the regulatory body that oversees the development/implementation of EA in the public sector ”	
Top management support	It refers to the buy-in and the commitment of the top management in different governmental entities to support the working groups and empower them during the development of GAF	√			No remark	
Culture	It refers to the organization norms and beliefs which are accumulated internally or been influenced by the surrounding community	√			No remark	

The second organizational validation form validated the influence and the recommendation to address each organizational factor as illustrated in Table 6.6.

The governance factor resulted in a negative influence as the working group stakeholders did not appreciate the governance role played by governing body. Thus, the recommendation was to escalate issues in which the working group stakeholders were not cooperative in the development of reference architecture to the project steering committee.

The top management support had a negative influence which was the resistance of the stakeholders to share organization data due to confidentiality concerns related to architecture integration standards. To tackle the negative influence, the practitioners suggested carrying out communication and changing management effectively to get the buy-in from stakeholders. On other hand, it had a positive influence specially the top management in the entities that bought the concept of EA by empowering their working group stakeholders to take the decisions related to reference architecture standards.

The culture factor had a negative alignment influence. First, the governmental culture did not recognize emails as communication channel and instead the architects had no choice except using formal letters. To reduce the negative influence, the practitioners suggest the utilization of communication channels that suits the stakeholders (calls, sms, etc.). The second negative influence was the bureaucracy in governmental process caused delayed in getting the nominations and also to book the working group stakeholders for engagement sessions. Hence, the architects recommended advance planning as governmental process is time consuming and the need to build an informal relationship with the participated entities to informally follow-up.

**Table 6.6:** Organizational alignment factors influence and recommendation validation

Factor	Nature of Influence	Participants Concluded Remark	Recommendation	Participants Concluded Remark
Governance	a)Working group stakeholders did not appreciate the governance role played by governing body (-)	a)No remark	a)Escalate issues in which the working group stakeholders were not cooperative to the project steering committee	a)No remark
Top management support	a)Resist sharing organization data due to confidentiality concerns related to architecture integration standards (-) b)Top management who buy-in the concept of EA, empowered their working group	a)No remark b)No remark	a)Avoid including governmental agencies that do not show willingness to participate	a)Replace it with “Carry out communication and change management effectively to get the buy-in from stakeholders ”

	stakeholders to take the decisions (+)			
Culture	a)Difficulty in utilizing services like email as a communication channel and instead sending formal letter (-) b)The bureaucracy in governmental process caused delayed in getting the nominations and also to book the working group stakeholders for meetings (-) c)The understanding of the main country's religion and traditions simplified agreeing on dropping architecture standards against them (+)	a)No remark b)No remark c)remove as it is not applicable	a)Advance planning as governmental process is time consuming and the need for a relationship to informally follow-up b)The utilization of communication channels that suits the stakeholders (calls, sms, etc.) c)Build an understanding about country values, religions and traditions	a)No remark b)No remark c)Remove as it is not applicable

### 6.5.2.3 Personal Alignment Factors Validation

Similar validation approach followed with personal alignment factors. The first form validated the personal factors (commitment, awareness, communication, value of EA, change management capability and experience). All factors were agreed with definition revision of communication, value of EA, change management capability and experience factors as shown in Table 6.7.

**Table 6.7:** Personal alignment factors validation

Factor	Definition Description	Accepted	Revised	Rejected	Participants' Comment
Commitment	the participation of working group stakeholders in the development of the reference architectures and their commitment in the assigned tasks	√			
Awareness	It covers the working group stakeholders' knowledge about EA	√			



	concept and its benefits.				
Communication	It refers to the influence of communication channel, language, and engagement type on the alignment between the working group architect and stakeholders		√		Remove “influence of”
Value of EA	It refers to the understanding of EA value and benefits both for the organization and the individual and how it is impacting the agreement with working group architects		√		Remove “and how it is impacting the agreement with working group architects”
Change Management Capability	It refers to the leadership skills, project management and architecture knowledge of working group architects to facilitate the discussions of reference architectures development with the working group stakeholders		√		-Rewrite “It refers to the leadership skills, project management compliance of working group architects to facilitate the discussions of reference architectures development with the working group stakeholders and achieve buy-in” -add enterprise architect architecture knowledge in experience factor.
Experience	It refers to the technical experience and the competence of the working group stakeholders in the domain of the four reference architectures BRA, IRA, ARA and TRA		√		Rewrite “It refers to the technical experience and the competence of the working group stakeholders in the domain of the four reference architectures business, information, applications and infrastructure. In addition, the architecture knowledge of the enterprise architects.”

The influence and recommendation validation of each personal factor were validated. Some of them were accepted with no remarks and others were advised to be changed based on the practitioners’ feedback shown in Table 6.8.

The commitment factor had two negative influences during the development of GAF. First, the working group stakeholders skipped some engagement sessions with working group architects because they were busy with tasks at their organizations. To address this negative influence, the recommendation was that the sponsor of the project (IT regulatory body) should send a formal letter to the ministries asking to nominate stakeholders as a full time for the development of GAF project. Second negative influence was the decline of interest with the working group stakeholders to actively participate as they did not realize benefits. The participants’

suggestion was to train the participants on EA and also ensure the right nomination in which the required skill sets are matched with the participants.

The awareness resulted in negative influence which was resisting and not participating in the development process. Thus, the practitioners proposed conducting training sessions to explain the concept of EA and its value for all ministries prior the nomination and development processes.

The communication factor was the most factors in terms of alignment influence during the development of GAF. First, it was difficult to communicate efficiently with working group stakeholders as the email was not formal channel of communication in the government. As alternative, the practitioners suggested the frequent use of face to face discussions. Second, the stakeholders faced difficulty to express their views in English and also to translate the requests of architects in Arabic. To eliminate the negative influence, the participants recommended providing list of requirements prior the start of the EA development project and translating them in Arabic and assigning translator to work with the working group architects in case the working group architect is not speaking the native language. Third, there was confusion due to absence of single person of communication between IT regulatory body and ministries. Hence, the recommendation was to assign a single person from IT regulatory body responsible for all communication with the ministries to answer any concern or clarification raised from working group stakeholders. The fourth was a positive influence. The pre-existing relationship with entities supported speeding up some requests required from entities.

The value of EA had a negative and another positive influence. The negative influence was the inability to see the individual benefits for some working group stakeholder's day to day tasks at the initial stage of the development. To address it, the recommendation was to explain the intent of the overall development and promote the concept in the government sector. Additional recommendation was to allocate monetarily incentives for the involved stakeholders. The positive influence was the experience and competence of the working group architects built confidence on the potential benefits of GAF development for stakeholders' entities.

The change management capability had positive influences. The working group stakeholders expressed their ideas and concerns freely because the working group architects were open to any comments. Furthermore, the stakeholder expressed the efficient management of brainstorming sessions by providing justifications to reject or accept particular requirement. The participants recommended also that the architects should visit other successful public sector architecture implementation and meet the enterprise architects to obtain the lessons learnt.

Similar to the communication factor, the experience factor had several influences. First, the lack of experience with some of the stakeholders resulted in a delay in entity data gathering. Second, there was a delay in decision making due to the lack of knowledge related to the reference architecture domain. Third, there was a difficulty in managing group stakeholders with different level of experience and competence. Fourth, some stakeholders who lack the experience provided theoretical info without practical basis that resulted in difficulty to digest the value of GAF standards. Thus, the practitioners recommended setting criteria for nomination and interviews to assess the nominees before accepting them. Furthermore, they proposed conducting awareness sessions for the government agencies about EA concept prior to the nomination process.

**Table 6.8:** Personal Alignment factors influence and recommendation validation

Factor	Nature of Influence	Participants' Comment	Recommendation	Participants' Comment
Commitment	a)Working group stakeholders skipped some engagement sessions with working group architects because they were busy with tasks at their organizations (-) b)The decline of interest with the working group stakeholders to actively participate as they do not realize benefits (-)	a)No remark b)No remark	a) & b) IT regulatory body should send a formal letter to the ministries asking to nominate stakeholders as a full time for the development of GAF project	b)Add "awareness and training for the participants on EA" b)Add "ensure the right nomination in which the required skill sets is matched with the participants"
Awareness	a)Resisting and not supporting the development process (-)	a)Rewrite "- resisting and not participating in the	a)Conduct awareness sessions to explain the concept of EA	a)Rewrite "conduct training sessions to explain the

		development process (-)"	and its value for all ministries prior the nomination and development processes	concept of EA and its value for all ministries prior the nomination and development processes"
Communication	<p>a)Difficulty to communicate efficiently with working group stakeholders as the email was not formal channel of communication in the government (-)</p> <p>b)Stakeholders faced difficulty to express their views in English and also to translate the requests in Arabic (-)</p> <p>c)Confusion due to absence of single person of communication between IT regulatory body and ministries (-)</p> <p>d)Pre-existing relationship with entities supported speeding up some requests required from entities (+)</p>	<p>a)No remark</p> <p>b)No remark</p> <p>c)No remark</p> <p>d)No remark</p>	<p>a)Frequent use of face to face discussions</p> <p>b)Provide list of requirements prior the start of the project and translate them in Arabic</p> <p>b)Assign translator to work with the working group architects</p> <p>c)Assign single person from IT regulatory body responsible for all communication with the ministries to answer any concern or clarification raised from working group stakeholders</p>	<p>a)No remark</p> <p>b)Rewrite "assign translator to work with the working group architects in case the working group architect is not speaking the native language"</p> <p>c)No remark</p>
Value of EA	<p>a)Inability to see the individual benefits for working group stakeholder's day to day tasks at the initial stage of the development (-)</p> <p>b)The experience and competence of the working group architects built confidence on the potential benefits (+)</p>	<p>a)No remark</p> <p>b)No remark</p>	<p>a)Explain the intent of the overall development and promote the concept in the government sector</p> <p>b)Allocate incentives for the involved stakeholders</p>	<p>a)No remark</p> <p>b)Rewrite "allocate monetarily incentives for the involved stakeholders"</p>
Change Management Capability	<p>a)The working group stakeholders expressed their ideas and concerns freely because the working group architects were open to any comments (+)</p> <p>b)Efficient management of brainstorming</p>	<p>a)No remark</p> <p>b)No remark</p>	<p>-Visit other governments and meet the enterprise architects to obtain the learnt lessons</p>	<p>-Rewrite "visit other successful public sector architecture implementation and meet the enterprise architects to obtain the lessons learnt"</p>

	sessions by providing justifications to reject or accept (+)			
Experience	a) Delay in entity data gathering (-) b) Delay in decision making due to the lack of knowledge related to the reference architecture domain (-) c) Difficulty in managing group stakeholders with different level experience and competence (-) d) Providing theoretical info without practical basis that results in difficulty to digest the value of GAF standards (-)	a) No remark b) No remark c) No remark d) No remark	a) & b) Conduct awareness sessions for the government agencies about EA concept prior to the nomination process c) Set criteria for nomination and interviews to assess the nominees before accepting them d) Involve group stakeholders subordinates if needed	a) & b) No remark c) No remark d) Remove as recommendation c) will address it

## 6.6 Research Trustworthiness & Ethical Considerations

As highlighted in Section 3.4.7, the researcher followed the guidelines explained by Shenton (2004) to achieve Guba's trustworthiness constructs. Additionally, the researcher considered Creswell (2012) ethical considerations steps. Thus, this section is discussing the taken trustworthiness and ethical steps by the researcher throughout the research different phases.

### 6.6.1 Internal Validity

The internal validity focuses on how the results reflect the actual reality on the ground. Table 6.9 summarizes the suggested steps of Shenton (2004) in regards to internal validity and the actual actions taken by the researcher.

**Table 6.9:** Internal validity actions taken by the researcher

<b>Shenton (2004) Suggested Steps</b>	<b>Actions Taken by Researcher</b>
The employment of well established research methods in data collection and analysis	The use of case study approach, interviews, documentation review and mix of deductive and inductive analysis approach which are widely used in the area of EA academic studies
Getting familiar of participants culture or organization culture prior data collection through preliminary study.	The selected case study from researcher's country. Additionally, the researcher conducted preliminary study to explore the case prior the main phase of case study.
Random sampling of participants to neglect the researcher bias in selection.	The selection of the participants was based on their availability and their willingness to participate
Triangulation: the use of different data collection methods with the use of wide range and diverse participants.	The use of documentation review and interviews as main data collection instruments. Also, interviews with participants that represented the four GAF working groups.
Explain and give the right for the participants to refuse to participate and also to withdraw from interview session at any time.	In the invitation letter, it was explained clearly that the participant has the freedom to withdraw at any time without a comment or a penalty
The use of rephrased question to uncover deliberate lies.	Researcher asked re-phrased questions during interviews e.g. asking about the factors hindering the alignment and another question asking about the challenges faced the development of GAF
Refine the constructs or the initial categories and revisit them along with data analysis	The constructs specially the child nodes were revised frequently and improved till the conclusion of final constructs which were slightly changed after conducting inter-coding reliability with 2 <sup>nd</sup> coder
Frequent discussion with the supervisor(s) to discuss ideas, actions and approach to minimize own bias and preference	The supervision team always kept in the picture and researcher considered their comments during the research different stages. Also, the supervisor helped to conduct the inter-coder reliability test.
Peer review or feedback should be welcome through the duration of the project to challenge researcher assumptions.	The researcher through publications and participation in DC PACIS2017 shared the research findings and get feedback from DC panel members to improve the research outcomes
The use of researcher reflective commentary about data collection session.	The researcher used commentary after each interview but in a low scale for the purpose of identify data collection saturation
The investigator's background, qualification and experience for the phenomenon under investigation.	The researcher is certified TOGAF 9.1 and had previous basic knowledge about EA
Ask informant to read and confirm the interview transcript. Second check is to verify with the respondents the emerging	All interviews questions were sent in advance. Also, all interviews transcripts sent to participants for their comment if they

theory and concepts.	would like to delete, modify or add any info. The researcher conducted a focus group session with working group architects to validate the obtained alignment factors.
Detailed description of phenomenon under investigation to understand its context	The researcher described the research objective and also developed research questions (RQ1 and RQ2) to build a clear picture of the case context
Examination of previous research findings	The researcher conducted SLR to identify potential alignment factors discussed in EA literature

### 6.6.2 External Validity

The external validity refers to the confidence of the reader to get use of the findings of the case study outcomes in similar situation but in different context. Table 6.10 pointed out the steps taken by the research to ensure the external validity against what was recommended by Shenton (2004).

**Table 6.10:** External validity actions taken by the researcher

<b>Shenton (2004) Suggested Steps</b>	<b>Actions Taken by Researcher</b>
Number of participated organization and their location	The selected case study (GAF) is a project done for the whole government. 15 interviewees participated who represent 7 government entities
Any restrictions from informants who provided the data	Some of the interviewees asked to ensure the anonymity of their identity and project name if possible in any publications
Number of participants involved in the study	15 interviews were conducted and no new insights obtained from interview number 14
The used data collection methods	Detailed case study protocol used that explained the questions and the preparations for the interviews and documentations
The length and number of data collection sessions	The average duration of all 15 interviews was one hour
The period of time the data are collected	The data collection done between June to November 2016

### 6.6.3 Reliability

Reliability refers to the ability to obtain the same case study results if used the same data collection instruments and procedures. Table 6.11 discussed out the steps taken by the research to ensure the reliability against what was recommended by Shenton (2004).

**Table 6.11:** Reliability actions taken by the researcher

<b>Shenton (2004) Suggested Steps</b>	<b>Actions Taken by Researcher</b>
Describe in details the research design and implementation	Research design was detailed in terms of case study selection, description, preparation and validation of case study protocol, analysis procedures and trustworthiness procedures (refer to chapter 6)
Operational details of data gathering	The researcher described all details related to participants selection, invitation, questions, consent, recording, transcription, etc. refer to Appendix A
Reflective appraisal of inquiry process	Detailed procedures of analysis were discussed with the supervisor and the outcome of analysis were presented at DC PACIS 2017 and shared with the supervisors for their feedback to minimize researcher's bias. Moreover, the researcher conducted inter-coding reliability (refer to Section 5.2)

### 6.6.4 Construct Validity

Construct validity refers to ensure that the findings are results of informants' experiences and ideas rather than researcher's preferences. Table 6.12 shows the suggested steps of construct validity against the actions taken by the researcher.

**Table 6.12:** Construct validity actions taken by the researcher

<b>Shenton (2004) Suggested Steps</b>	<b>Actions Taken by Researcher</b>
The employment of triangulation here is helpful to reduce investigator bias.	The researcher employed documentation review to understand the development process of GAF and triangulate the findings of this process by interviews. In relation to alignment factors, the main source of data was interviews only so the researcher conducted a focus group session to validate the outcome (refer to section 6.8)



Admission of researcher's beliefs and assumptions	The researcher explained the employment of an initial theoretical model to provide initial guidance in data collection. Details of the conceptual model are in Chapter 2 and utilized in preliminary and case study findings phases.
Recognition of shortcomings in study's methods and their potential effects	-Known shortcoming in case study approach is the inability to generalize the findings beyond case study context -The researcher was targeting to identify the alignment factors during GAF development so the interview questions were general and not specific to a particular development process step but used NVivo matrix query to identify the potential interrelationship
In-depth methodological description to allow integrity of research results to be confirmed	Description of research methodology, case study design, instruments and protocol and findings are discussed in depth. The supervisors continually reviewing the methodology at all stages and provided feedback on the findings at different stages
Use of diagrams to demonstrate "audit trail"	The research employed initial theoretical model to provide initial guidance in data collection and analysis

### 6.6.5 Ethical Considerations

Lapan *et al.* (2011) and Benbasat *et al.* (1987) stressed that the researcher should provide an assurance of no harm to the participated organization. As discussed earlier, the research followed Creswell (2012) suggested steps to ensure no harm to the participants or their organizations. Table 6.13 clarified the actions taken by the researcher during the research to address the ethical aspects.

**Table 6.13:** Ethical steps taken by the researcher

Creswell (2012) Suggested Steps	Actions Taken by Researcher
Gain approval from the participated organization and consent from participants before conducting the study.	The selection of the participants was based on their willingness to participate and all participants signed consent form prior interviews sessions
Explain the purpose of the study, respect others and do not force them to sign consent forms	As part of interviews preparation, the researcher sent description of the research, its purpose, confidentiality of the participants, expected benefits, gave chance to participant to ask questions before the interview session and shared the consent

	form details before the interview.
Avoid disturbing on the site, respect the participants and be honest with them	The interview date and time was selected based on the participant convenience
Be neutral with all participants and respect their privacy	The researcher was asking open questions and dealt with respect with all participants. Also, since some of the participants mother language were Arabic, the researcher offered to the participants the freedom to speak the language that they mostly comfortable with.
Use clear language in reporting the findings, do not plagiarize and do not disclose information that harms the participants	The researcher assured the privacy of the participants' identity in all research stages. Also, the researcher was complying with ethical standard in all research stages.
Share the findings with others through publication and comply with ethical standards	The research findings were published at different research stages. Also, the researcher presented and shared the research findings with DC PACIS 2017 committee.

## 6.7 Researcher Bias

Researches whether quantitative or qualitative are subject to human failings similar to any other human activities and there is no way to eliminate error or bias (Norris, 1997). In qualitative research, the researcher has to spend sufficient time in preparation and planning otherwise will open the door for greatest threat in research trustworthiness (Chenail, 2011). Moreover, the sample of interviews should be representing the actual experience in the case study and intensive enough to base the conclusions (Daly & Lumley, 2002). Johnson (1997) described strategies to minimize the researcher bias e.g. data triangulation, theory triangulation, peer review and participants feedback. As discussed earlier, the qualitative researchers widely utilized Guba's trustworthiness constructs creditability, transferability, dependability and confirmability to address researcher bias.

Considering the research problem context and also the researcher as being certified in the area of EA, the risk of researcher's biasness was high. Thus, at the initial stage of the research, the researcher followed well established strategy suggested by Shenton (2008) that addresses every aspect of the Guba's four constructs as detailed in Section 6.6.1, Section 6.6.2, Section 6.6.3 and Section 6.6.4. Furthermore, the researcher bias in the analysis and interpretation of the results was

inevitable. Thus, the focus group session was organized with the GAF architects to verify the applicability of the concluded factors and their influences to the case context and reduce researcher's analysis bias.

As pointed out, the biasness is associated with the human activities in the researches which can be accepted to some extent if there is a strategy in place to control it.

## **6.8 Summary**

This chapter discussed the interrelationships of the GAF development process, roles of the architects and the stakeholders and the alignment factors. It also covered the potential interrelationship between the alignment factors. It explained the development of the final alignment framework and its main components. It discussed the focus group validation process used by the researcher to validate the factors and their influence. Furthermore, it elaborated the actions taken by the researcher to address internal validity, external validity, reliability, construct validity and ethical considerations throughout the different research phases.

## **CHAPTER 7**

### **CONCLUSION AND RECOMMENDATIONS**

#### **7.1 Overview**

This chapter summarizes the research findings and recommendations for the future studies. Specifically, it recaps the findings of each research question. Furthermore, it discusses how the final developed alignment framework can be used by the enterprise architects. It summarizes the research contribution from three different perspectives; theoretical, methodological and practical. Also, it points out the limitations of the research and also advises on the future topics or areas that can be built on the research findings. Finally, it concludes the chapter by key remarks.

The purpose of the research was to develop a framework that supports the alignment between the enterprise architects and the stakeholders during EA development process to produce an acceptable architecture by both parties. Hence, the research was intending to answer the main research question along with the supporting questions (RQ 1, RQ 2, RQ 3 & RQ 4) discussed in Chapter 1. The research utilized a case study approach to address the research questions. The summary of findings for each research question was discussed in details in the next sections (7.2, 7.3, 7.4 and 7.5).

## 7.2 GAF Development Process

Since the research was targeting to develop alignment framework to support the development process of EA, it was essential to answer RQ1 “*What is the development process of EA in the public sector?*” to understand the development process of EA in the selected case study. As pointed out in Chapter 2, the development and adoption of EA is widely expanding in the public sector but the development process is rarely discussed in academic literature. Using interviews and project documentation review, the overall development process of the GAF is illustrated in Figure 5.1. The details of each development process step discussed in Section 5.3. In summary, the GAF development began by architecture knowledge institution within architects team and EA frameworks & IT standards analysis. These steps were followed by proposing a high-level architecture framework in which general design principles, stakeholders’ nomination process and expected deliverables were agreed among the architects. Then, the formation of the working group took place by execution the stakeholders’ nomination process and conducting the awareness sessions. The last step was the development of detailed architecture documents (business architecture, information architecture, application architecture and technical architecture) that formed GAF. The investigation of the development process supported the understanding of the case context in which the alignment factors were identified.

## 7.3 Stakeholders and Enterprise Architects Roles

As discussed earlier, since the development process of EA especially in the public sector varies between governments that result sometimes in differences in the roles of both the enterprise architects and the stakeholders. Thus, it was essential to realize the roles of enterprise architects and the stakeholders in the selected case study by answering RQ2 “*What are the roles of stakeholders and enterprise architects in the development process of EA in the public sector?*” The roles of both the enterprise architects and the stakeholders were investigated during the preliminary study phase (Section 4.4.2) and the main case study phase (Section 5.4).

The roles of enterprise architects during the development process and the tasks underneath each role were summarized in Table 5.2. Likewise, the roles of the stakeholders and the tasks underneath each role were summarized in Table 5.3.

#### 7.4 Alignment Factors in GAF Development Process

Since the research was aiming to develop alignment framework to align the development process between the enterprises architects and the stakeholders, it was crucial to identify the factors that characterize the alignment between the two parties during the development process. Hence, the research answered RQ3 “*What are the factors influencing the alignment between the enterprise architects and the stakeholders in the development process of EA in the public sector? How these factors are interrelated with the development process and the roles of stakeholders and enterprise architects?*”. The researcher utilized the theoretical model that provided initial guidance to investigate the alignment factors using the technical, organizational and personal lenses. The interviews with the stakeholders, enterprise architects and GAF documentation review supported to conclude the alignment factors under each perspective. These factors and their influence were validated through a focus group session with the enterprise architects who participated in the development of GAF. Under technical perspective, there were three factors identified which are standardization, development scope and principles. In organizational perspective, the identified factors were governance, top management support and culture. Commitment, awareness, communication, value of EA, change management capability and experience were the factors identified under the personal perspective. The summary of the final validated alignment factors along with their definitions is depicted in Table 7.1.

**Table 7.1:** Final alignment factors along with their definition

Factor	Definition
Standardization	The lack of standardization at different government entities in infrastructure, applications and data
Development scope	It refers to the influence of project scope and deliverables on the expectations of both working group stakeholders and architects

Principles	It refers to the design boundaries that both working group stakeholders and architects should comply with during the development of reference architectures
Governance	Authority given to the regulatory body that oversees the development/implementation of EA in the public sector
Top management support	It refers to the buy-in and the commitment of the top management in different governmental entities to support the working groups and empower them during the development of GAF
Culture	It refers to the organization norms and beliefs which are accumulated internally or been influenced by the surrounding community
Commitment	the participation of working group stakeholders in the development of the reference architectures and their commitment in the assigned tasks
Awareness	It covers the working group stakeholders' knowledge about EA concept and its benefits.
Communication	It refers to the communication channel, language, and engagement type on the alignment between the working group architect and stakeholders
Value of EA	It refers to the understanding of EA value and benefits both for the organization and the individual
Change Management Capability	It refers to the leadership skills, project management compliance of working group architects to facilitate the discussions of reference architectures development with the working group stakeholders and achieve buy-in
Experience	It refers to the technical experience and the competence of the working group stakeholders in the domain of the four reference architectures business, information, applications and infrastructure. In addition, the architecture knowledge of the enterprise architects.

## 7.5 Alignment Framework

Utilizing the answers of RQ1, RQ2 and RQ3, the researcher addressed RQ4 “*What framework can be used to support the alignment between enterprise architects and the stakeholders in the development process of EA in the public sector?*” The final developed alignment framework is illustrated in Figure 6.1. It shows the GAF development process and demonstrates that the first three development steps were performed by architects but the fourth and fifth steps performed by both the architects and the stakeholders. Moreover, it illustrated the alignment factors that influenced the GAF development process as discussed in Section 7.4. The interrelationship between the GAF development process, roles and the alignment factors establishes a comprehensive knowledge on the influence of the alignment factors on each development step as discussed in Section 6.2. The influences of the alignment factors on the development process and the recommendation to address the negative influence were validated through a focus group session with case study

practitioners. Table 7.2 summarizes the validated influence and recommendation for each alignment factor.

**Table 7.2:** Validated alignment factors influences and recommendations

Factor	Nature of Influence	Recommendation
Standardization	<ul style="list-style-type: none"> <li>-The technical stakeholders from low standards adoption organizations resisted the new architecture standards as they see them as threat (-)</li> <li>- Enterprise architects found it easier to sell the concept of EA and promoting its benefits with senior managers in low standards adoption entities (+)</li> </ul>	<ul style="list-style-type: none"> <li>-Classify architecture standards to be optional and mandatory depending on technology technical maturity</li> <li>-Consider the investment (budget, effort &amp; technical complexity) required in entity to comply with the developed standards</li> </ul>
Development scope	<ul style="list-style-type: none"> <li>-Since the scope was to develop an architecture for the whole government, it was used to accept needs or concerns related to the overall government (+)</li> <li>-Challenge to maintain the development as abstract as possible to make it relevant for all entities (-)</li> </ul>	<ul style="list-style-type: none"> <li>-Draft detailed terms of reference prior the development of the reference architectures and get it agreed with the group stakeholders</li> <li>-If stakeholders from particular entities thought that some of the abstracted development standards are not enough for their entities, produce specific architecture development methodology for those entities</li> </ul>
Principles	<ul style="list-style-type: none"> <li>-used by the working group architects to assess the ideas and requirements of the working group stakeholders (+)</li> </ul>	<ul style="list-style-type: none"> <li>Involve the working group stakeholders in the development of the general GAF principles depending on the architecture knowledge of the stakeholders</li> </ul>
Governance	<ul style="list-style-type: none"> <li>-Working group stakeholders did not appreciate the governance role played by governing body (-)</li> </ul>	<ul style="list-style-type: none"> <li>-Escalate issues in which the working group stakeholders were not cooperative to the project steering committee</li> </ul>
Top management support	<ul style="list-style-type: none"> <li>-Resist sharing organization data due to confidentiality concerns related to architecture integration standards (-)</li> <li>-top management who buy-in the concept of EA, empowered their working group stakeholders to take the decisions (+)</li> </ul>	<ul style="list-style-type: none"> <li>-Carry out communication and change management effectively to get the buy-in from stakeholders</li> </ul>
Culture	<ul style="list-style-type: none"> <li>-difficulty in utilizing services like email as a communication channel and instead sending formal letter (-)</li> <li>- The bureaucracy in governmental process caused delayed in getting the nominations and also to book the working group stakeholders for meetings (-)</li> </ul>	<ul style="list-style-type: none"> <li>-advance planning as governmental process is time consuming and the need for a relationship to informally follow-up</li> <li>-The utilization of communication channels that suits the stakeholders (calls, sms, etc.)</li> </ul>
Commitment	<ul style="list-style-type: none"> <li>-working group stakeholders skipped some engagement sessions with working group architects because they were busy with tasks at their organizations (-)</li> <li>-The decline of interest with the working group stakeholders to actively participate as they do not realize benefits (-)</li> </ul>	<ul style="list-style-type: none"> <li>-Request government entities to nominate stakeholders as a full time for the development process.</li> <li>-Awareness and training for the participants on EA</li> <li>-Ensure the right nomination in which the required skill sets is matched with the participants</li> </ul>



Awareness	-Resisting and not participating in the development process (-)	-Conduct training sessions to explain the concept of EA and its value for all ministries prior the nomination and development processes
Communication	-difficulty to communicate efficiently with working group stakeholders as the email was not formal channel of communication in the government (-) -stakeholders faced difficulty to express their views in English and also to translate the requests in Arabic (-) -confusion due to absence of single person of communication between IT regulatory body and ministries (-) -pre-existing relationship with entities supported speeding up some requests required from entities (+)	-frequent use of face to face discussions -Provide list of requirements prior the start of the project and translate them in Arabic -Assign translator to work with the working group architects in case the working group architect is not speaking the native language. -Assign single person from IT regulatory body responsible for all communication with the ministries to answer any concern or clarification raised from working group stakeholders
Value of EA	-Inability to see the individual benefits for working group stakeholder's day to day tasks at the initial stage of the development (-) -The experience and competence of the working group architects built confidence on the potential benefits (+)	-explain the intent of the overall development and promote the concept in the government sector -allocate monetarily incentives for the involved stakeholders
Change Management Capability	-The working group stakeholders expressed their ideas and concerns freely because the working group architects were open to any comments (+) -Efficient management of brainstorming sessions by providing justifications to reject or accept (+)	- visit other successful public sector architecture implementation and meet the enterprise architects to obtain the lessons learnt
Experience	-delay in entity data gathering (-) -delay in decision making due to the lack of knowledge related to the reference architecture domain (-) -difficulty in managing group stakeholders with different level experience and competence (-) -Providing theoretical info without practical basis that results in difficulty to digest the value of GAF standards (-)	-conduct awareness sessions for the government agencies about EA concept prior to the nomination process -set criteria for nomination and interviews to assess the nominees before accepting them

In summary, the framework guides the enterprise architects on the followed GAF development process that consisted of five development steps targeting to build the architecture framework for the public sector of Oman. Before kicking-off the development process, the enterprise architects should get a full understanding of the alignment factors and their influence on the development process to ensure the developed architecture documents are aligned with the stakeholders' goals.

## 7.6 Research Contribution

This section discusses the research contribution and uniqueness from three different aspects; theoretical, methodological and practical.

### 7.6.1 Theoretical Contribution

The research theoretical contribution includes the utilization of MPT to support the development of the alignment framework and addressing the gap in the EA academic literature by developing and validating alignment framework. Despite the emphasis of the top IS journals that IS researchers need to ground their work on theories, IS literatures are still under-theorized (Lim et al. 2009). Additionally, the utilization of theory helps to expand the field's knowledge base (Fielt *et al.*, 2014). The researcher employed MPT to build the initial theoretical alignment framework. MPT emphasized that to study a phenomenon within a socio-technical system like organizations, three perspectives (technical, organizational and personal) should be considered. Thus the researcher utilized these three perspectives to study and develop the alignment framework in GAF development process.

One of the critical challenges facing the success of EA is the misalignment between enterprise architects and the stakeholders in the developed architecture that result in unused architecture (Du Preez *et al.*, 2014). Therefore, the research investigated comprehensively the alignment between the enterprise architects and the stakeholders to support them during the development process. The research developed a holistic view on the factors shaping the alignment between the enterprise architects and the stakeholders during the development process. Furthermore, it detailed the influence of each factor and provided recommendations for the enterprise architects to address each factor. Except for standardization factor, almost all of the other identified alignment factors were claimed whether empirically or none empirically in EA literature to have an influence on the alignment between the enterprise architects and the stakeholders, e.g. development scope (Löhe & Legner, 2014), design principles (Zadeh *et al.*, 2014), governance (Du Lee & Kwon, 2013),

top management support (AlSoufi & Ahmed, 2012), culture (Aier, 2014), commitment (Nakakawa & van Bommel, 2010), value of EA (Foorthuis *et al.*, 2012), change management capability (Zijl & Belle, 2014) and experience (Iyamu & Mphahlele, 2014) . Hence, the research is confirming empirically these factors in the context of the Omani public sector and also investigated their influence in each development step. Moreover, it enriches the literature by identifying new factor which is standardization which discussed in Chapter 6.

Using matrix coding query in NVivo 11, the research also studied the potential interrelationship between the alignment factors in Section 6.3 and the interrelationship between the alignment factors, roles and the development process in Section 6.2. Such interrelationships enhance building a holistic knowledge on the alignment factors and their characteristics.

The development of EA has its own uniqueness in the public sector as there are several government entities and the current popular EA frameworks (e.g. TOGAF & Zackman) are mostly used to develop EA for a specific organization (Langermeier *et al.* 2015). Hence, it was very important to understand the development process of EA and the roles of the enterprise architects and the stakeholders prior investigating the alignment factors to have clear understanding of the development context. Additionally, despite the rapid expansion of EA in public sector, the academic studies did not give enough attention towards EA in public sector (Bakar & Selamat, 2016). Thus, the research provided a detailed development process that took place in GAF case along with the roles of the enterprise architects and the stakeholders which can be used as a learning to develop EA in different public sector context.

### **7.6.2 Methodological Contribution**

The research utilized MPT to develop the initial theoretical model as initial step prior the data collection to provide the initial guidance on how to address the alignment phenomenon in the development process of EA. Moreover, the researcher followed well established guidelines throughout the different research stages. For

example, the researcher followed the guidelines of Yin (2009) to develop the case study protocol, the guidelines of Miles *et al.* (2014) for data analysis, the guidelines of Shenton (2004) to address Guba's trustworthiness constructs and the guidelines of Rosemann & Vessey (2008) to conduct the focus group session. Thus, the research showed practical examples on how to apply these guidelines which can be used as learning for the novice researchers in the qualitative field.

The traditional triangulation methods in qualitative studies like using multiple data sources and cross cases comparison are prone for researcher bias while doing the analysis. To have a better control over the researcher bias, the research promotes the employment of the focus group as instrument to confirm the findings applicability to the case context. The researcher organized focus group session with the GAF architects to verify the relevancy of the final findings in the GAF context.

The academic studies of EA in Oman are rare. The research gathered a rich data about the studied case which can be a foundation for future research studies within or outside Oman. In addition, it is also attracting the Omani researchers towards the field of EA by using the findings of the research as a base for their future studies.

Finally, the developed framework can be used as a foundation in the future especially validating the framework in different public or private contexts. Moreover, it can be utilized in EA quantitative studies to measure the influence of each alignment factor and build alignment maturity tool to measure the alignment prior and after the development of EA.

### **7.6.3 Practical Contribution**

As discussed, the current industrial EA frameworks (e.g. TOGAF, Zachman) lack the tool or model to support the enterprise architects to align the development of EA with the stakeholders needs (Buckl *et al.*, 2010b; Nakakawa *et al.*, 2013). This is

supported by Gartner report that explained the development of EA without the agreement of the stakeholders as one of the top EA pitfalls (Gosselt, 2012). Hence, the developed alignment framework addressed this gap by showing the factors that influence each development step at GAF. The initial two development steps namely the architecture knowledge establishment and EA frameworks & IT standards analysis were the preparation steps which were done by the architects only. So there were not influenced by any alignment factors. The rest of the development steps; high-level architecture framework, working group formation and development of architecture documents were influenced by twelve factors as illustrated in Table 6.1. These factors were principles, experience, development scope, awareness, communication, culture, commitment, value of EA, top management support, governance, change management capability and standardization. The research explained the characteristics of each factor along with the recommendations for the architects on how to address the negative influence as depicted in Table 7.2.

Another gap in the current EA frameworks is the limitation of their development focus on a particular organization and cannot be used to develop EA without intensive customizations when to be used for wide government. Thus, the research proposed development process of EA for the public sector based on the development steps that took place in GAF as described in Section 5.3.

Thus, the alignment framework is expected to provide two main contributions for the practitioners. First, it shares the development approach that could be utilized to develop EA for wide government in other countries. Second, it builds a comprehensive understanding for the architects on the alignment aspects along with the recommendations that need to be considered prior the start of the development to reduce the chances of any misalignment challenges with the stakeholders during the development. Table 7.3 provides a high-level comparison between GAF alignment framework, Zachman and TOGAF from development and stakeholders' alignment perspectives.

**Table 7.3:** GAF alignment framework comparison with Zachman and TOGAF

<b>Framework Comparison Aspect</b>	<b>Zachman</b>	<b>TOGAF</b>	<b>GAF Alignment Framework</b>
EA development	Provides enterprise taxonomy for developing EA but lacking guiding process (Rouhani <i>et al.</i> 2015)	Provides development process (ADM cycle) to develop EA for an enterprise (TOGAF, 2009; Langermeier <i>et al.</i> 2015)	Provides development process to develop EA for wide government (Section 5.3)
Stakeholders Alignment	Classify the stakeholders for each architecture aspects (e.g. business, data) but lacking how to manage & align the stakeholders with the development (Zachman, 2008)	Provides guideline to identify, classify and manage the stakeholders but lacking how to align the development with the stakeholders (TOGAF, 2009)	Provides in-depth understanding for EA practitioners on how to align the development process with the stakeholders and equip them with recommendations to address the influence of alignment factors on each development step (Section 6.4 & 6.5)

## 7.7 Research Limitations

Despite the theoretical, methodological and practical contributions but the study still has some limitations. The researcher is knowledgeable in the topic of EA and he is TOGAF 9 certified. Though such knowledge is necessary to ease the understanding of different research aspects, e.g. development process and roles of the participants but it increased the risk of the researcher's biasness. However, the researcher tried his best to minimize it through the employment of different techniques, e.g. validated the framework using focus group. Moreover, there was

scarcity of EA literature in the context of Oman and the Gulf countries in general. The absence of the academic studies forced the researcher to utilize none academic sources, e.g. websites, published reports, etc. to understand the contextual settings of EA in Oman. Some of the guidelines in qualitative research recommend that the researcher should undertake training on how to conduct interview sessions to gain the interviewing skills which was not the case in this study. Nevertheless, the researcher attempted to address this drawback by gaining the experience through the two interviews in the preliminary study and also the usage of tight case study design. Finally, Rosemann and Vessey (2008) suggested to use independent facilitator (other than the researcher) to facilitate the focus group session to reduce the risk of biasness. However, the researcher was unable to secure independent facilitator to run the focus group session.

## **7.8 Recommendations**

As highlighted, the developed alignment framework is aiding the absence of alignment framework in EA development process for the public sector. It can be used as a base for future IS academic studies, topics could cover:

1. Case study approach to validate the developed alignment framework in different public sector context.
2. Case study approach to verify the relevancy of the developed alignment framework for the private sector of Oman.
3. Quantitative study to generalize the alignment factors and test their sensitivity while using different EA development approach e.g. TOGAF.
4. Quantitative study to measure the weight of each alignment factor influence and develop alignment maturity matrix to measure the extent of alignment between the enterprise architects and the stakeholders before and after the development which can be used as an input to measure stakeholders' satisfaction.
5. Quantitative study to further examine the potential interrelationship between the alignment factors.

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## APPENDIX A

### INITIAL CASE STUDY PROTOCOL

**Table A.1:** Research team members

<b>Hamood Al Kharusi</b> Researcher/PhD candidate <a href="mailto:kharousi@gmail.com">kharousi@gmail.com</a> Phone:	<b>Dr. Suraya Miskon</b> Main Supervisor <a href="mailto:suraya@utm.my">suraya@utm.my</a> Phone:	<b>Dr. Mahadi Bahari</b> Co-Supervisor <a href="mailto:mahadi@utm.my">mahadi@utm.my</a> Phone:
Universiti Teknologi Malaysia (UTM), Faculty of Computing, Department of Information Systems, Skudai, 81310 Johor, Malaysia.		

#### Overview:

This initial protocol is designed to be validated as part of preliminary case study phase.

The objectives of this phase are as follows:

- To test and validate the case study protocol
- To gather and analyze the initial findings for the research objectives:

The research objectives are as follow:

- *Objective 1: To understand the development process of EA in the public sector*
- *Objective 2: To explore the stakeholders' and enterprise architects' roles in the development process of EA in the public sector*

- *Objective 3: To identify the factors influencing the engagement between the enterprise architects and the stakeholders in the development process of EA in the public sector*
- *Objective 4: To propose and validate the final engagement framework in the development process of EA in the public sector*

This protocol consists of the following:

- Consent form
- Pre-analysis Plan
- Pre-interview Preparation
- Interview questions
- Interviewee details
- Call-for participation
- Field notes templates
  - iv) Contact Summary Form
  - v) Observation Checklist
  - vi) Document Summary Form

## A.1 Consent form

### Engagement Framework between Enterprise Architects and Stakeholders in Enterprise Architecture Development

#### Research Team Contacts

Name & Position: Hamood Al-Kharusi (PhD Candidate)	Name & Position: Suraya Miskon (Principal Supervisor)
Phone: *****	Phone: *****
Email: <a href="mailto:kharousi@gmail.com">kharousi@gmail.com</a>	Email: <a href="mailto:suraya@utm.my">suraya@utm.my</a>

#### Description

This project is being undertaken as part of PhD project for the student named Hamood Al-Kharusi at Universiti Teknologi Malaysia (UTM). The purpose of this project (research) is aiming to develop an engagement framework that can be later utilized by the enterprise architects to support them while engaging with EA stakeholders.

The research team requests your kind assistance to participate in the interview session and your input would be valuable interest to the research study and will aid in producing a descriptive report on current engagement practices followed by enterprise architects, factors influencing the engagement, capturing stakeholders view on these practices and the influencing factors.

#### Participation

Your participation in this project is voluntary. If you do agree to participate, you can withdraw from participation at any time during the project without comment or penalty. Your decision to participate will in no way impact upon your current or future relationship with the research team.

Your participation will involve a face-to-face interview at your workplace. A possible follow-up interview may also be conducted if deemed necessary.

The project will extend over 6 months commencing as soon as convenient. The interview session will take on average around 90 minutes.

### **Expected benefits**

It is expected that this project will benefit directly/indirectly the participants' organization. You will receive all publications published by the research team associated in different research stages.

### **Confidentiality**

All comments and responses are anonymous and will be treated confidentially. The names of individual persons are not required in any of the responses. Only the research team will have access to the information you provide. Your anonymity and confidentiality will be safeguarded in any publication of the result of this research. No individual will be referred to (except through the use of pseudonyms), only the aggregated results will be reported, and even then any specific comments are to be verified by the participants prior to final inclusion.

In our interview sessions, audio recordings will be involved. The audio recordings will NOT be used for any other purposes. Such recordings will be destroyed once the contents have been transcribed. The contents of such recordings are to be verified by the participants (after audio is transferred to transcripts) prior to final inclusion for accuracy and access to such recording will be restricted to only members of the research team.

### **Consent to Participate**

We would like to ask the participants to sign a written consent form (enclosed) and email it back to us to confirm your agreement to participate. Then, the interview schedule will be arranged and informed to the participants.

### **Questions / further information about the project**

Please contact the researcher team members named above to have any questions answered or if you require further information about the project.

## Engagement Framework between Enterprise Architects and Stakeholders in Enterprise Architecture Development

### Statement of consent

By signing below, you are indicating that you:

- have read and understood the information document regarding this project
- have had any questions answered to your satisfaction
- understand that if you have any additional questions you can contact the research team
- understand that you are free to withdraw at any time, without comment or penalty
- understand that the project will include audio recording

**Name**

.....

**Signature**

.....

**Date**

..... / ..... / .....

## A.2 Pre-analysis Plan

**Table A.2:** Pre-analysis data collection plan

Goals	How
<b>Evidences gathered when preparing for the case study</b>	
<ul style="list-style-type: none"> <li>▪ To understand the organizational background of the selected cases:               <ul style="list-style-type: none"> <li>• Organizational structure</li> <li>• Corporate mission and vision</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Case participant organization's official website.</li> </ul>
<b>Evidences gathered during the case study</b>	
<ul style="list-style-type: none"> <li>▪ To further understand the information related with the interview sessions.               <ul style="list-style-type: none"> <li>• Participant's profile.</li> <li>• Enterprise Architecture experience</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ The targeted participant's profile from their organization's official website.</li> <li>▪ Other organization's website (Linkedin.com)</li> <li>▪ Field notes taken during the interview</li> </ul>
<b>Evidences gathered after the case study</b>	
<ul style="list-style-type: none"> <li>▪ To further understand the organization of the case sites               <ul style="list-style-type: none"> <li>• History of the organization</li> <li>• Extended information of the ongoing projects mentioned at the interviews</li> </ul> </li> <li>▪ To further understand other activities related to EA with the case organization (either within or external to the case organization)</li> <li>▪ To analyze in-depth the case study findings.</li> <li>▪ To write-up the case study report.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Interview transcripts.</li> <li>▪ Case organization's official website.</li> <li>▪ Any published articles, booklets, pamphlets related with the implementation of EA with the case organizations.</li> </ul>

### A.3 Pre - interview Checklist

Venue:

Date:

Accessed from:

**Table A.3:** Pre-interview checklist

		<b>Note</b>
1	Background of the interviewee	
2	Organization Chart	
3	Organization website	
4	Role in EA project	
5	EA project status	



## A.4 Interview Questions

Date: DD MM YYYY

### Interview introduction (by the interviewer):

1. Thank interviewee for consenting to the interview and taking time off to do it.
2. Ask for permission to record the interview session (explain the consent form and get it filled and signed).
3. Discuss what this study aims to do – and how the <organization name> case fits in the bigger picture.
4. The candidate should also state what benefits <organization name> will get from this and mention how the data will be collected and handled (i.e. ethics, anonymity etc).

**Note: (All interview questions will be sent in advance to the participated interviewees prior meeting them)**

**Part A: Common questions to build a shared understanding of research key elements and will be asked in the interviews of both enterprise architects and stakeholders:**

Question 1: How do you define **Enterprise Architecture** in your organization?

Question 2: What is the definition or the role of **enterprise architect** in your understanding?

Question 3: What is the role of **stakeholders** in the development of Enterprise Architecture in your organization?

Question 4: What do you understand from the term “**engagement**” in context of EA development in your organization?

(Interviewer will keep hard copy of answers for the above questions as backup and will be presented **only** in case the interviewee is not able to answer or different understanding).

**Part B:** These questions are dedicated for interviews conducted with Enterprise Architects and designed to obtain the necessary data to answer the research questions:

Question 1: What is your role in Enterprise Architecture development project? And for how long you have been in this role?

Question 2: How did you identify the key EA stakeholders as part of the EA project at <organization name>?

Question 3: What are the challenges facing the identification of stakeholders at <organization name> and how they are addressed?

Question 4: What type of stakeholders you are dealing with?

Question 5: What are the EA activities (or EA phases e.g. ADM phases in TOGAF) in which you need stakeholders' engagement and participation to execute them?

Question 6: How do you engage with stakeholders during the development of EA at <organization name> in different EA stages?

Question 7: In your opinion, what are the key aspects support the engagement with the stakeholders? Similarly, what are the key aspects hindering the engagement with the stakeholders?

Question 8: How did you address the challenges of engagement with the stakeholders?

Question 9: What do you recommend to improve the engagement with the stakeholders?

Question 10: Could you share any documents related to our discussion?

**Part C:** These questions are dedicated for interviews conducted with the stakeholders and designed to obtain the necessary data to answer the research questions:

Question 1: What is your role in the Enterprise Architecture development at <your organization>? And for how long you have been in this role?

Question 2: What is your opinion on the process of stakeholders' identification or selection?

Question 3: How did you engage with the enterprise architects during the development of EA models at <organization name>?

Question 4: In your opinion, what are the key aspects support the engagement with the enterprise architects? Similarly, what are the key aspects hinder the engagement with the enterprise architects?

Question 5: How did you address the challenges of engagement with the enterprise architects?

Question 6: What do you recommend to improve the engagement with the enterprise architects?

Question 7: Could you share any documents related to our discussion?

### A.5 Interviewees Details

Name:

Organization:

Position:

EA's Role:

Phone number:

Email:

### A.6 Call for Participation

Dear <Responsible person >,

This is **Hamood Al Kharusi** a PhD candidate conducting research at Universiti Teknologi Malaysia (UTM), Johor, Malaysia with my supervisors are Dr. Suraya Miskon and Dr. Mahadi Bahari.

**Research purpose:** My research topic is titled “*Engagement Model between Enterprise Architects and Stakeholders in Enterprise Architecture Development*”.

The main objective of this research is to develop an engagement model that supports the Enterprise Architecture (EA) practitioners engaging with key stakeholders while developing EA models. This objective will be achieved through investigating the EA stakeholders' identification approach, explain the process or practices used to collaborate with the stakeholders and identify the factors influencing the engagement between the enterprise architects and the stakeholders. Hence, the focus of the study

will be on EA project, EA team and key EA stakeholders (involved or contributed to EA models/architectures).

**Data collection:** As we plan to gather similar data across several organizations, the data will also enable us to perform cross organizations analysis and provide insights on the factors influencing the engagement between the enterprise architects and the stakeholders and the process/practices followed in the collaboration to build EA models. The study would entail mainly qualitative evidence from documents and interviews. Though the evidence collection is expected to be evolutionary, and thus not entirely predictable, every effort would be made to minimize demands on <organization name> staff. Agreement on a small number of meetings/interviews would be sought well in advance; these meetings would be professionally organized. Kindly find here as attached a permission of data collection letter from UTM, which is addressed to your organization.

**Privacy:** The detailed findings will be reported in research students' thesis and related papers, over which <organization name> will have veto; anything sensitive being anonymized, excluded or embargoed.

**What we need from your organization?:**

1. Request for your kind participation in the research.
2. Provide names/contact details of enterprise architects and key stakeholders who built/building the EA models.

For further clarifications, please do not hesitate to contact me via email at kharousi@gmail.com or call me at (). As we intend to carry out data collection in the period from May 2016 to October 2016, I would appreciate it if you can reply, indicating your potential support and participation before [20<sup>th</sup> March 2016], so I can

start the preparation process.

Kind Regards,

**Hamood Al Kharusi**

**Researcher/PhD Candidate (TOGAF Certified)**

Faculty of Computing, Universiti Teknologi Malaysia (UTM),

Skudai, 81310 Johor, Malaysia.

Email: kharousi@gmail.com

## **A.7 Field Notes Summary**

### **A.7.1 Contact Summary**

Contact (visit, phone, email)

Type:

Detail of the contact person:

Name: \_\_\_\_\_ Position:

\_\_\_\_\_ Contact (phone)

\_\_\_\_\_ Detail:

(email) \_\_\_\_\_

Site: \_\_\_\_\_

**Table A.4:** Field notes questions

		Reflection
1	What were the main issues that struck you in this contact?	
2	Summarize the information you got (or failed to get) on each of the target questions you had for this contact.	
3	What new emerging issues about the field situations were suggested by the contact?	
4	Anything else that struck you as salient, interesting, illuminating or important in this contact	
5	What new (or remaining) target questions do you have in considering the next contact with this site?	

Contact \_\_\_\_\_ Date:

Today's \_\_\_\_\_ Date:

### A.7.2 Observation Checklist

Venue:

Date:

**Table A.5:** Observation checklist

		Note
1		
2		
3		
4		
5		

### A.7.3 Documents Summary Form

Venue:

Date:

**Table A.6:** Documents summary form

		Notes
1	Name of the document	
2	Importance of the document	
3	Summary of the document	
4	Additional comments	



## APPENDIX B

### REVISED INTERVIEW QUESTIONS

#### B.1 Enterprise Architects (working group architects) interview questions

Date:

Interview introduction (by the interviewer):

1. Thank interviewee for consenting to the interview and taking time off to do it.
2. Ask for permission to record the interview session (explain the consent form and get it filled and signed).
3. Discuss what this study aims to do.
4. The candidate should also state what benefits the interviewee will get from this and mention how the data will be collected and handled (i.e. ethics, anonymity etc).

**Note: (All interview questions will be sent in advance to the participated interviewees prior meeting them)**

#### **Key Study Definitions:**

*Alignment: develop EA models in an appropriate and timely way in harmony with stakeholders' goals.*

*Enterprise Architect: individuals responsible of collecting information about EA. They evolve the EA through a set of models and play the role of managing, communicating, leading and modeling*

*Stakeholder: an individual, team, or organization (or classes thereof) with interests in, or concerns relative to, the outcome of the architecture*

These questions are dedicated for interviews conducted with the GAF project manager and (business or data or applications or technical) Enterprise Architects and designed to obtain the necessary data to answer the research questions:

Question 1: Can you provide an overview of GAF purpose and its current status in general and (business or data or application or technology) reference architecture in specific?

Question 2: What is your role in (business or data or application or technology) reference architecture development?

Question 3: Who are the main stakeholders (directly influence or impacted by GAF) during the phase of GAF development?

Question 4: How do you identify the nominees/members of (business or data or application or technical) working group?

Question 4: What are the challenges facing the identification/nomination of (business or data or application or technical) working group stakeholders?

Question 5: What is the role of (business or data or application or technology) working group stakeholders in the development of Enterprise Architecture in GAF?

Question 6: What is the process of developing (business or data or application or technology) reference architecture?

Question 7: What are the challenges facing the development of (business or data or application or technology) reference architecture?

Question 8: How do you align the development of (business or data or application or technology) reference architecture with the government goal of integrating the government entities?

Question 9: What are the factors that support the alignment between (business or data or application or technology) working group stakeholders' perspective and working group architect perspective? From both architecture perspective

and social perspective?

Question 10: What are the factors that hinder the alignment between (business or data or application or technology) working group stakeholders' perspective and working group architect perspective? From both architecture perspective and social perspective?

Question 11: What do you recommend to improve the alignment between (business or data or application or technology) working group stakeholders' perspective and working group architect perspective?

Question 12: Could you share any documents related to our discussion?

## **B.2 Stakeholders (working group stakeholders) interview questions**

Date:

Interview introduction (by the interviewer):

1. Thank interviewee for consenting to the interview and taking time off to do it.
2. Ask for permission to record the interview session (explain the consent form and get it filled and signed).
3. Discuss what this study aims to do.
4. The candidate should also state what benefits the interviewee will get from this and mention how the data will be collected and handled (i.e. ethics, anonymity etc).

**Note: (All interview questions will be sent in advance to the participated interviewees prior meeting them).**

### **Key Study Definitions:**

Alignment: *develop EA models in an appropriate and timely way in harmony with stakeholders' goals.*

Enterprise Architect: *individuals responsible of collecting information about EA.*

*They evolve the EA through a set of models and play the role of managing, communicating, leading and modeling*

Stakeholder: *an individual, team, or organization (or classes thereof) with interests in, or concerns relative to, the outcome of the architecture*

These questions are dedicated for interviews conducted with the (business or data or applications or technical) stakeholders which are designed to obtain the necessary data to answer the research questions:

Question 1: Can you provide an overview of GAF purpose and its current status?

Question 2: What is your role in (business or data or application or technical) reference architecture development?

Question 3: What was the role of enterprise architect (IT regulatory body working group architect) in the development of (business or data or application or technology) reference architecture?

Question 4: In order to start the development of reference architectures, the first step is to formulate a working group. What is your opinion on the process of group stakeholder's selection done by IT regulatory body?

Question 5: During the development of (business or data or application or technology) reference architecture, what are your organization needs, requirements or concerns that you provided the working group?

Question 6: How do you communicate your (business or data or application or technical) organization requirements during development of (business or data or application or technology) reference architecture?

Question 7: How do you align your organizations needs with the standards provided by IT regulatory body enterprise architect as part of (business or data or application or technology) reference architecture development?

Question 8: What are the factors that support the alignment between (business

or data or application or technology) working group stakeholders and enterprise architect? From architecture perspective or social perspective?

Question 9: What are the factors that hinder the alignment between (business or data or application or technology) working group stakeholders and enterprise architect? From architecture perspective or social perspective?

Question 10: What do you recommend to improve the alignment between (business or data or application or technology) working group stakeholders and enterprise architect?

Question 11: Could you share any documents related to our discussion?

## APPENDIX C

### FOCUS GROUP VALIDATION PROTOCOL

#### Alignment Framework in Enterprise Architecture Development Process

**Table C.1:** Research team members

<b>Hamood Al Kharusi</b> Researcher/PhD candidate <a href="mailto:kharousi@gmail.com">kharousi@gmail.com</a>	<b>Dr. Suraya Miskon</b> Main Supervisor <a href="mailto:suraya@utm.my">suraya@utm.my</a>	<b>Dr. Mahadi Bahari</b> Co-Supervisor <a href="mailto:mahadi@utm.my">mahadi@utm.my</a>
Universiti Teknologi Malaysia (UTM), Faculty of Computing, Department of Information Systems, Skudai, 81310 Johor, Malaysia.		

#### Overview:

This protocol is designed for a focus group session (Framework Validation) that aims to

- . To validate the concluded alignment factors and their relevancy to the case study
- . To validate their influence and the recommendation to address the influence

This protocol consists of the following:

- . Call-for participation
- . Consent form
- . Participants profile
- . Pre-focus group checklist
- . Focus group agenda
- . Focus group session ground rules
- . Focus group evaluation process
- . Observation Checklist

## C.1 Focus Group Call for Participation

Dear **Enterprise Architects**,

This is **Hamood Al Kharusi** a PhD candidate at Universiti Teknologi Malaysia (UTM), Malaysia. First I would to express my gratitude for your cooperation in the last period of the data collection (interviews). Now, we reach the final stage of the research that aims to share the final results and validating them based on your feedback.

As a reminder, the purpose of the research is to develop an alignment framework that supports the enterprise architects to align EA development process with the stakeholders to develop an agreed architecture. Since the developed framework will be potentially used by the enterprise architects, your participation is crucial to validate the relevancy of the findings with the studied case of GAF. A focus group is planned with GAF enterprise architects only for the sake of results validation at *<location of session>* on 5<sup>th</sup> of September 2017 at 5:00 PM. The session is expected to take around 2 hours and will be followed by a dinner at the club to express my thanks to the participants. So please confirm your availability on this date. Upon agreement on the date, further details (location coordinates of session, research results, agenda, etc.) will be shared with you.

For further clarifications, please do not hesitate to contact me via email at [kharousi@gmail.com](mailto:kharousi@gmail.com) or call me at *<mobile number>*.

I will be looking forward to see you.

Kind Regards,

**Hamood Al Kharusi**

**Researcher/PhD Candidate (TOGAF Certified)**

Faculty of Computing, Universiti Teknologi Malaysia (UTM),

Skudai, 81310 Johor, Malaysia.

Email: [kharousi@gmail.com](mailto:kharousi@gmail.com)

## C.2 Focus Group Consent Form

### Alignment Framework in Enterprise Architecture Development

#### Research Team Contacts

Name & Position: Hamood Al-Kharusi (PhD Candidate)	Name & Position: Suraya Miskon (Principal Supervisor)
Phone: <i>Mobile number</i>	Phone: <i>Mobile number</i>
Email: <a href="mailto:kharousi@gmail.com">kharousi@gmail.com</a>	Email: <a href="mailto:suraya@utm.my">suraya@utm.my</a>

#### Description

This project is being undertaken as part of PhD project for the student named Hamood Al-Kharusi at Universiti Teknologi Malaysia (UTM). The purpose of this project (research) is aiming to support the enterprise architects to align the development process of EA with the stakeholders' expectations by developing an alignment framework. Since the main users of the alignment framework are the enterprise architects, the focus group will be restricted to the enterprise architects of GAF only. The research team requests your kind assistance to participate in the focus group session in which the produced alignment framework will be presented. Your input will aid to validate the framework in context of GAF.

#### Participation

Your participation in this project is voluntary. If you do agree to participate, you can withdraw from participation at any time during the project without comment or penalty. Your decision to participate will in no way impact upon your current or future relationship with the research team.

The focus group session will take on average around 2 hr.

#### Expected benefits

The participants will get the opportunity to gain knowledge on the developed alignment framework that they can utilize it in the future EA development.

#### Confidentiality

All comments and responses are anonymous and will be treated confidentially. The names of individual persons are not required in any of the responses. Only the



research team will have access to the information you provide. Your anonymity and confidentiality will be safeguarded in any publication of the result of this research. No individual will be referred to, only the aggregated results will be reported.

In our focus group session, audio recordings will be involved. The audio recordings will NOT be used for any other purposes. Such recordings will be destroyed once the contents have been transcribed.

**Questions / further information about the project**

Please contact the research team members named above if you have any question related to the focus group session or the research.

## Alignment Framework in Enterprise Architecture Development

### Statement of consent

By signing below, you are indicating that you:

- have read and understood the information document regarding this project
- have had any questions answered to your satisfaction
- understand that if you have any additional questions you can contact the research team
- understand that you are free to withdraw at any time, without comment or penalty
- understand that the project will include audio recording

**Name**

**Signature**

**Date**

.....  
.....  
..... / ..... / .....  
.....



### C.4 Pre-Focus Group Checklist

Venue:

Date:

Accessed from:

**Table C.3:** Pre-focus group checklist

No.	Task	Note
1	Invite the participants and agree on date and time	
2	Book convenient room for the focus group session	
3	Validate the focus group session protocol with expert	
4	Share in advance agenda, research results and questions of the focus group session to participants prior the session	
5	Arrange all logistics for the focus group session (room preparations, drinks, etc.)	

### C.5 Focus Group Agenda

17:00 – 17:15
✓ Welcoming and outline of agenda
✓ Objective of session
✓ Consent form signature
✓ Session rules
17:15 – 17:30
✓ Presentation on findings
✓ Process of evaluation
17:30 – 17:55
✓ Technical alignment factors
17:55 – 18:25
✓ Organizational alignment factors
18:25 – 19:00
✓ Personal alignment factors
19:00 – 19:30
✓ Closing and dinner

### C.6 Focus Group Session Ground Rules

1. Privacy and confidentiality of the participants are assured
2. Please share your view, there is No right or wrong answer
3. We want to hear from everyone
4. The discussion of the factors is restricted on the development phase of GAF

### C.7 Focus Group Evaluation Process

*Step 1 (Understand the purpose):* The purpose of the focus group session is to validate the alignment factors that influenced the development of GAF project, their nature of influence and the recommendations to address each factor. The obtained factors were highlighted by the interviewees (directly or indirectly). These factors

categorized into technical alignment factors (form A), organizational alignment factors (form B) and personal alignment factors (form C).

*Step 2 (key study definitions):* Before filling the form, consider the key study definition to ensure mutual understanding as follow:

- **Alignment:** developing EA in an appropriate and timely way in harmony with stakeholders concerns and needs
- **Enterprise Architects:** individuals who play the role of leading and managing the architecture development process and represented by working group architects from IT regulatory body
- **Stakeholders:** individuals who support the development process by providing as-is state of their organization, challenges and provide feedback on the developed architecture documents and represented by governmental entities nominees.

*Step 3 (fill evaluation forms):* Each form consists of two parts; part 1 which focuses on validating the obtained factor and its definition and part 2 which covers the nature of influence and the recommendation to address each factor.

**For Part 1 (factors definitions):**

Please select one of the three options (Accepted, Revised and Rejected) by placing (X) and write comment against it. The definition of each selection is described as follow:

- **Accepted:** confirm the relevancy of the alignment factor with no additional comment on its definition description
- **Revised:** confirm the relevancy of the alignment factor with additional comment on its definition description
- **Rejected:** no relevancy of the alignment factor to the case study with comments to describe the reason of rejection.

**For Part 2 (factors influence and recommendation):**

This part details the nature of influence (negative (-) influence or positive (+) influence) of each alignment factor and the recommendation to address each factor as obtained from interviews session. Please add your comment on nature of influence and the recommendation for each factor.

*Step 4 (group discussion):* as a group starts discussing form A that details technical alignment factors. For each factor, confirm if the factor is relevant and adjust its

definition description if required. Repeat the same with form B (organizational alignment factors) and form C (personal alignment factors).

### C.7.1 Technical Alignment Evaluation (Form A)

**Table C.4:** Personal factors definition validation

Factor	Definition	Accepted	Revised	Rejected	Participant's comment
Standardization	The level of standardization at different government entities in infrastructure, applications and data				
Development scope	It refers to the influence of project scope and deliverables on the expectations of both working group stakeholders and architects, which created some challenges during the development of GAF				
Principles	It refers to the design boundaries that both working group stakeholders and architects should comply with during the development of reference architectures				

**Table C.5:** Personal factors nature of influence and recommendation validation

Factor	Nature of Influence	Participant's Comment	Recommendation	Participant's Comment
Standardization	-stakeholders from low standards adoption organizations resisted the new architecture standards as they see		- classify architecture standards to be optional and mandatory depending on entity technical maturity -Consider the size of governmental entities as	

	them as threat (-) -Enterprise architects found it easier to sell the concept of EA and promoting its benefits for low standards adoption entities (+)		the small ministries can not comply with same standards as the large ministries	
Principles	-used by the working group architects to assess the ideas and requirements of the working group stakeholders (+)		-Involve the working group stakeholders in the development of the general GAF principles instead of get them agreed among working group architects only	
Development scope	-Since the scope was to develop an architecture for the whole government, it was used to accept needs or concerns related to the overall government (+) -small scale ministries resisted to apply same standards for small and large ministries (-)		-draft detailed terms of reference prior the development of the reference architectures and get it agreed with the group stakeholders -develop two categories of standards; one for large ministries and another standards for small scale	

### C.7.2 Organizational Alignment Evaluation (Form B)

**Table C.6:** Organizational factors definition validation

Factor	Definition	Accepted	Revised	Rejected	Participant's comment
Governance	It discusses the distribution of decision authority given to IT regulatory body as it is considered like CIO for governmental entities				
Top management support	It refers to the buy-in and the commitment of the top management in different governmental entities to support the working groups and empower them during the development of GAF				



Culture	It refers to the organization norms and believes which are accumulated internally or been influenced by the surrounding community				
---------	---	--	--	--	--

**Table C.7:** Organizational factors nature of influence and recommendation validation

Factor	Nature of Influence	Participant's Comment	Recommendation	Participant's Comment
Governance	-working group stakeholders did not appreciate the governance role played by IT regulatory body (-)		-escalate issues in which the working group stakeholders were not cooperative to the project steering committee	
Top management support	-Resist sharing organization data due to confidentiality concerns related to architecture integration standards (-) -top management who buy-in the concept of EA, empowered their working group stakeholders to take the decisions (+)		-avoid including governmental agencies that do not show willingness to participate	
Culture	-difficulty in utilizing services like email as a communication channel and instead sending formal letter (-) - The bureaucracy in governmental process caused delayed in getting the nominations and also to book the working group stakeholders for meetings (-) -The understanding of the main country's religion and traditions simplified agreeing on dropping architecture standards against them (+)		-advance planning as governmental process is time consuming and the need for a relationship to informally follow-up -The utilization of communication channels that suits the stakeholders (calls, sms, etc.) -build an understanding about country values, religions and traditions	

### C.7.3 Personal Alignment Evaluation (Form C)

**Table C.8:** Personal factors definition validation

Factor	Definition Description	Accepted	Revised	Rejected	Participant's Comment
Commitment	the participation of working group stakeholders in the development of the reference architectures and their commitment in the assigned tasks				
Awareness	It covers the working group stakeholders' knowledge about EA concept and its benefits.				
Communication	It refers to the influence of communication channel, language, and engagement type on the alignment between the working group architect and stakeholders				
Value of EA	It refers to the understanding of EA value and benefits both for the organization and the individual and how it is impacting the agreement with working group architects				
Change Management Capability	It refers to the leadership skills, project management and architecture knowledge of working group architects to facilitate the discussions of reference architectures development with the working group stakeholders				
Experience	It refers to the technical experience and the competence of the working group stakeholders in the domain of the four reference architectures BRA, IRA, ARA and TRA				

**Table C.9:** Personal factors nature of influence and recommendation validation

Factor	Nature of Influence	Participant's Comment	Recommendation	Participant's Comment
Commitment	<ul style="list-style-type: none"> <li>-working group stakeholders skipped some engagement sessions with working group architects because they were busy with tasks at their organizations (-)</li> <li>-The decline of interest with the working group stakeholders to actively participate as they do not realize benefits (-)</li> </ul>		<ul style="list-style-type: none"> <li>- IT regulatory body should send a formal letter to the ministries asking to nominate stakeholders as a full time for the development of GAF project</li> </ul>	
Awareness	<ul style="list-style-type: none"> <li>-resisting and not supporting the development process (-)</li> </ul>		<ul style="list-style-type: none"> <li>-conduct awareness sessions to explain the concept of EA and its value for all ministries prior the nomination and development processes</li> </ul>	
Communication	<ul style="list-style-type: none"> <li>-difficulty to communicate efficiently with working group stakeholders as the email was not formal channel of communication in the government (-)</li> <li>-stakeholders faced difficulty to express their views in English and also to translate the requests in Arabic (-)</li> <li>-confusion due to absence of single person of communication between IT regulatory body and ministries (-)</li> <li>-pre-existing relationship with entities supported speeding up some requests required from entities (+)</li> </ul>		<ul style="list-style-type: none"> <li>-frequent use of face to face discussions</li> <li>-to provide list of requirements prior the start of the project and translate them in Arabic</li> <li>-assign translator to work with the working group architects</li> <li>-assign single person from IT regulatory body responsible for all communication with the ministries to answer any concern or clarification raised from working group stakeholders</li> </ul>	
Value of EA	<ul style="list-style-type: none"> <li>-Inability to see the individual benefits for working group stakeholder's day to day tasks at the initial stage of the development (-)</li> <li>-The experience and competence of the</li> </ul>		<ul style="list-style-type: none"> <li>-explain the intent of the overall development and promote the concept in the government sector</li> <li>-allocate incentives for the involved stakeholders</li> </ul>	

	working group architects built confidence on the potential benefits (+)			
Change Management Capability	<ul style="list-style-type: none"> <li>-The working group stakeholders expressed their ideas and concerns freely because the working group architects were open to any comments (+)</li> <li>-Efficient management of brainstorming sessions by providing justifications to reject or accept (+)</li> </ul>		<ul style="list-style-type: none"> <li>-visit other governments and meet the enterprise architects to obtain the learnt lessons</li> </ul>	
Experience	<ul style="list-style-type: none"> <li>-delay in entity data gathering (-)</li> <li>-delay in decision making due to the lack of knowledge related to the reference architecture domain (-)</li> <li>-difficulty in managing group stakeholders with different level experience and competence (-)</li> <li>-Providing theoretical info without practical basis that results in difficulty to digest the value of GAF standards (-)</li> </ul>		<ul style="list-style-type: none"> <li>-conduct awareness sessions for the government agencies about EA concept prior the nomination process</li> <li>-set criterion for nomination and interviews to assess the nominees before accepting them</li> <li>-involve group stakeholders subordinates if needed</li> </ul>	

## C.8 Focus Group Notes Summary

### C.8.1 Focus Group Notes Questions

**Table C.10:** Focus group notes questions

No.	Question	Reflection
1	What were the main issues that struck you during the session?	
2	Summarize the information you got (or failed to get) on each of the target questions	

### C.8.2 Focus Group Observation Checklist

Venue:

Date:

**Table C.11:** Observation checklist

No.	Observation	Note
1		
2		
3		
4		
5		

## APPENDIX D

### OVERVIEW OF CASE STUDY DOCUMENTATIONS

**Table D.1:** List of GAF project documentations

Document Name	Main Document's Elements
Introduction to GAF	<ul style="list-style-type: none"> <li>• GAF benefits</li> <li>• Components of GAF</li> <li>• Guide to use reference architectures</li> <li>• Governance</li> <li>• Development approach</li> <li>• Guiding principles</li> <li>• Checklists for reference architectures standards</li> </ul>
BRA Booklet	<ul style="list-style-type: none"> <li>• Target audience</li> <li>• Objectives and Benefits of BRA</li> <li>• Relation to other GAF reference architectures</li> <li>• Scope of BRA</li> <li>• BRA design principles</li> <li>• BRA governance</li> <li>• Structure of BRA</li> <li>• Description of lines of business</li> <li>• Description of government functions</li> </ul>
EAM Book	<ul style="list-style-type: none"> <li>• Target audience</li> <li>• Objectives of EAM</li> <li>• Relation between GAF and Agency EA</li> <li>• Scope of EA methodology</li> <li>• EAM development principles</li> <li>• Development phases of EAM</li> </ul>
IRA Booklet	<ul style="list-style-type: none"> <li>• Objectives and benefits of IRA</li> <li>• Target audience</li> <li>• Relation to other GAF reference architectures</li> <li>• Scope of IRA</li> <li>• IRA design principles</li> <li>• Governance of IRA</li> <li>• Data dictionary</li> <li>• Data hub</li> <li>• Current and target architectures</li> <li>• Code table</li> <li>• Design principles</li> <li>• Standards classification</li> <li>• Architecture design considerations</li> <li>• Technical and general standards</li> <li>• Technology watch</li> </ul>
ARM Booklet	<ul style="list-style-type: none"> <li>• Objectives and benefits of ARM</li> <li>• Target audience</li> <li>• Relation to other GAF reference architectures</li> <li>• Scope of ARM</li> <li>• Structure of ARM</li> </ul>

	<ul style="list-style-type: none"> <li>• Design principles</li> <li>• Governance of ARM</li> <li>• Current application portfolio</li> <li>• Target application portfolio</li> <li>• Design principles</li> <li>• Application development methodology</li> <li>• Architecture design considerations</li> <li>• Standards classifications</li> <li>• Technical and general standards</li> <li>• Technology watch</li> </ul>
TRA Booklet	<ul style="list-style-type: none"> <li>• Objectives and benefits of TRA</li> <li>• Target audience</li> <li>• Relation to other GAF reference architectures</li> <li>• Scope of TRA</li> <li>• Design principles governance of TRA</li> <li>• Standards classification</li> <li>• Architecture design considerations</li> <li>• Technical and general standards</li> <li>• Technology watch</li> </ul>