

Universidade do Minho
Escola de Engenharia

Pedro Miguel Faria Magalhães

**Solution Architecture Development in the
Retail Sector**



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É AUTORIZADA A REPRODUÇÃO INTEGRAL DESTA DISSERTAÇÃO APENAS PARA EFEITOS DE INVESTIGAÇÃO, MEDIANTE DECLARAÇÃO ESCRITA DO INTERESSADO, QUE A TAL SE COMPROMETE;

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ABSTRACT

Enterprise Architecture is a guide to an organization's competitive fitness. It is the dynamic process of managing enterprise IT change through a planned transformation. This transformation is supported by templates, techniques and recommendations to start from the ground up. The aim of putting an enterprise through this process is to create or boost its competitive edge, but this cannot be accomplishment over the night. The most important assets to this process are the people, namely the architects with their end-to-end vision abilities. The line separating the several roles' level, especially the Enterprise, Solutions and domain architects is not clear to the industry and each project has its interpretation.

The industry demands a new consultancy role, the Solutions Architect which is not older than 2005 (Alison 2007), to answer the requests for a role that is more than a specialist in a certain technology, the request is for a role with transverse business process knowledge. What this means is that Wipro's customers want this kind of consultants to be able to attend a certain topic, transversally to all business processes, no matter what tools will be used to accomplish the solution. One of the challenges is exactly to find a unified definition for this role, since Wipro's architects revealed to have very different, very correct perspectives on the topic, mainly due to their projects experience.

With international, more influential customers, the maturity level of a service provider must evolve accordingly. Thus, Wipro seeks for an Enterprise Architecture that gives the support and confidence needed, and part of this challenge aims to map Wipro's practice to an industry leading framework and evolve their Architecture Competency Center to a more standards compliant state.

Keywords: Enterprise Architecture, Solutions Architecture, Framework, Retail, Oracle

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RESUMO

As arquitecturas organizacionais são um guia para o "bem-estar" organizacional. A construção deste tipo de arquitectura é um processo dinâmico de gerir a mudança tecnológica através de uma transformação planeada. Esta transformação é suportada por templates, técnicas e recomendações para começar a elaboração, qualquer que seja o estado actual.

O objectivo de colocar uma organização no centro deste processo é o de criar ou aumentar a sua vantagem competitiva, mas este é um esforço não alcançável imediatamente. Os activos mais importantes neste processo são os profissionais, nomeadamente mas não só, os arquitectos com a sua visão "end-to-end". A linha que separa os vários tipos de papéis não é clara, especialmente os papéis de Arquitecto Organizacional, de Soluções e dos vários domínios, principalmente pelas várias interpretações que os profissionais transportam das experiências em projectos muito distintos.

A indústria pede claramente um novo tipo de papel de consultoria, o de Arquitecto de Soluções, sem expressão até 2005, de forma a responder aos pedidos de um papel que seja mais do que um especialista em determinada tecnologia, um papel que abarque o conhecimento transversal dos processos de negócio. Isto significa que os clientes da Wipro, empresa na qual este processo de dissertação foi desenvolvido, pedem que este tipo de consultores seja capaz de endereçar um determinado tópico, transversalmente a todos os processos de negócio, independentemente das tecnologias escolhidas para alcançar a solução.

Um dos desafios propostos foi precisamente o de encontrar uma definição base para os arquitectos de soluções da Wipro, uma vez que estes possuem perspectivas distintas derivadas das experiências em projectos muito únicos.

Com a maioria dos clientes de base internacional, o nível de maturidade de um prestador de serviços deve evoluir no mesmo sentido. Assim, a Wipro procura estabelecer uma Arquitectura Organizacional que forneça o suporte e a confiança necessárias para responder a questões metodológicas e a fundamentar as suas opções em standards, evoluindo assim o seu Centro de Competências de Arquitectura para um estado em concordância com um referencial comprovado e standards respeitados.

Palavras-chave: Arquitectura Organizacional, Arquitectura de Soluções, Framework, Retalho, Oracle

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CONTENTS

LIST OF FIGURES.....	ix
LIST OF TABLES.....	xi
NOTATION ABBREVIATION AND SYMBOLS	xiii
INTRODUCTION.....	1
1.1. Problem Conceptualization and Objectives	3
1.2. Methodological approach.....	4
STUDY DESCRIPTION.....	6
2.1. Roles definition.....	6
2.2. Wipro’s methodology/Best practices	7
2.3. Survey Strategy	8
LITERATURE REVIEW.....	9
3.1 Enterprise Architecture context	9
3.1.1. Zachman Framework	12
3.1.2. The Open Group Architecture Framework (TOGAF).....	16
3.1.3. Federal Enterprise Architecture Framework (FEAF).....	24
3.1.4. Gartner Framework.....	26
3.2. Solution Architecture and Enterprise Architecture.....	29
3.3. Solutions Architecture Lifecycle	31
3.3.1. Life cycle artifacts	31
3.4. Solutions Architect.....	32
3.4.1. Technological Role.....	35
3.4.2. Business strategist	36
3.4.3. Organizational politics.....	37
3.4.4. The consultant role	38
3.4.5. The leader role	38
RESULTS.....	41
4.1. Wipro’s Methodology/ Best practices	41
4.1.1. Enterprise Architecture Methodology	42
4.1.2. Task description.....	43
4.1.3. Wipro’s Methodology Mapping	49

4.1.4. High-Level Completeness	57
4.2. Survey Results- Methodology wise.....	60
4.3. Roles definition	63
4.3.1 Survey Results- Role Definition	64
CONCLUSIONS.....	67
5.1. Future Work	73
REFERENCES	75
ANNEXES	83
Annex 1	83
Annex 2	87
APPENDIXES.....	90
Appendix 1	90

LIST OF FIGURES

Figure 3.1 - Zachman’s framework. Source: Zachman International (810)231-0531.....	15
Figure 3.2- TOGAF Architecture Domains (McSweeney 2010)	17
Figure 3.3- Foundation Architecture (Greenslade 2002).....	19
Figure 3.4 - ADM structure (Group 2009)	19
Figure 3.5- ADM phases’ activity sequence	20
Figure 3.6- Enterprise Continuum structure (Group 2009)	21
Figure 3.7- TOGAF Iteration process (McSweeney 2010).	22
Figure 3.8- Architecture Repository (Group 2009).	23
Figure 3.9- FEAF Structure (Langston 1999).	25
Figure 3.10- FEAF’s architecture products (Langston 1999).....	26
Figure 3.11 - Gartner Process Model (Wikidot 2011).....	27
Figure 3.12 - Solutions Architecture Approach (Office of Systems Integration 2008).	30
Figure 3.13- SA life cycle and artifacts.....	31
Figure 3.14- SA toolkit workflow.	32
Figure 3.15- Complexity evolution of business over software (Capgemini 2009)	34
Figure 3.16- Breadth of a Solutions Architect.....	40
Figure 4.1 - Wipro Retail main methodology divided into its seven sub-methodologies.	41
Figure 4.2 - Wipro’s Enterprise Architecture Methodology.	43
Figure 4.3 - Preliminary Phase.	50
Figure 4.4- Data Architecture artifacts	56
Figure 4.5 – TOGAF’s ADM Method.....	58
Figure 4.6 - Wipro’s TOGAF Document coverage.....	59
Figure 5.1- Solutions Architect project involvement in Wipro’s practice.	69
Figure 5.2- Enterprise and Solutions Architect role depth within a standard project.	70

Figure 5.3- RACI Matrix example regarding Solution Architecture Framework artifacts' governance 71

LIST OF TABLES

Table 3.1- Technological nature of a Solutions Architect role.....	36
Table 3.2- Strategic nature of a Solutions Architecture role.	37
Table 3.3- Politic nature of a Solutions Architecture role.	37
Table 3.4- The consultant side of a Solutions Architect.....	38
Table 3.5- The leader's role.....	39
Table 4.1 Business Architecture Vision summarized.....	44
Table 4.2- Data Architecture summarized.....	46
Table 4.3- Business Architecture summarized.	47
Table 4.4- Application Architecture summarized.	48
Table 4.5- Version Control summarized	49

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NOTATION ABBREVIATION AND SYMBOLS

EA- Enterprise Architecture

EArch- Enterprise Architect

SA- Solutions Architecture

SArch- Solutions Architect

EAF- Enterprise Architecture Framework

SME- Subject Matter Expert

SEI- Software Engineering Institute

CMM- Capability Maturity Model

TOGAF- The Open Group Architecture Framework

ADM- Architecture Development Method

TRM- Technical Reference Model

ZF- Zachman Framework

FEAF- Federal Enterprise Architecture Framework

GF- Gartner Framework

TAFIM- Technical Architecture Framework for Information Management

SIB- Standards Information Base

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INTRODUCTION

The dissertation process here presented was conducted at Wipro Portugal, retail IT consultant and one of the several Wipro Limited's branches.

Wipro Limited is an Indian conglomerate performing as a global Information Technology services company with its headquarters in Bangalore.

The corporation was founded in 1945, with its core business being sunflower Vanaspati oil and soaps production. Since then, Wipro branched into several areas such as computer hardware (Wipro Infotech), Business Process Outsourcing (Wipro BPO), consumer services (Wipro Consumer Care & Lightning), energy (Wipro EcoEnergy), healthcare (Wipro GE Medical Systems Limited), retail (Wipro Retail), etc.

Wipro Technologies is the conglomerate's technology and consulting services division and one of the top three Indian outsourcing companies. By 2000, it was declared the largest publicly listed software expert in India and the software services provider to be assessed at SEI CMM Level 5¹ in the world (Jhal 2001). Wipro Technologies now cover a number of key verticals such as Wipro Retail. This vertical is a rapidly growing division within Wipro Technologies, dedicated to provide business solutions to retailers from around the world, such as food or fashion retail chains. Wipro Retail is having a substantial growth in recent years due to, not only new business, but also increased penetration within their major transformational programs. One of their key differentiators is their position as a leading Oracle Retail specialist, enjoying a tier 1 Oracle partner status.

When an organization, especially multinational ones, runs for projects around the world, working side-to-side with those customers and handling huge amounts of sensible data, there must be a way to protect both the customer and the service provider, decision wise. This way of protecting both parties is through standards, references and frameworks. In this particular case, where worldwide retailers and a service provider like Wipro are involved, Enterprise Architecture is the way to go, not only because IT-Business alignment has never been so important and Information is everywhere but getting access to the right information at the right time is very difficult, but also because the cost and complexity of IT Systems have exponentially increased while the chances of deriving real value from the systems has

¹ The Capability Maturity Model (CMM) is a service mark registered with the U.S. Patent and Trademark Office by Carnegie Mellon University (CMU). The levels are: 1- Initial (chaotic), 2-Repeatable (little documented), 3-Defined, 4- Managed, 5-Optimizing.

decreased. It is important to keep in mind that Enterprise Architecture is not a project, it is a continuum where it is going to pass through all of organization's business processes, over several iterations.

In this specific case, where an IT service provider is being taken under consideration, the primordial analysis view is precisely IT, whereas Enterprise Architecture and IT governance must be considered together. Besides, due to the immense complexity that these customers have, with several stores, often in several countries, it is crucial to adopt an Enterprise Architecture practice to optimize resources, reduce complexity in IT infrastructure and mostly, to reduce the inability to respond to business change. This business change panorama is critical nowadays, where the main lesson to be drawn from this worldwide financial crisis is that an enterprise must be flexible in order to adapt to business process change, decommission an application, and initiate a merger or acquisition. Whatever the decision a C-level executive must do, with an Enterprise Architecture, it is possible to have an overview of all the changes one must make from roles and responsibilities to database level.

The bottom line is that Enterprise Architecture provides a strategic, top-down view of an organization to enable executives, planners, architects, and engineers to coherently coordinate, integrate, and conduct their activities (McSweeney 2010).

Within the discipline of Enterprise Architecture, there are several specific "sub-architectures" that need to be attended in order to create a solid structure. The most common architectures are Data Architecture, Technology Architecture, Application Architecture and Business Architecture.

The study underlined in this thesis focuses on Solution Architecture, a newly accepted field that is still surrounded by discussion (Bucher, Fisher et al. 2006) and has been adopted within Wipro's practice. Even its relationship with Enterprise Architecture is not clear, where its position on the same level as Enterprise Architecture but with a smaller scope is accepted by some (Alison 2007; Campbell 2007) and put alongside the previously mentioned architectures on the other hand. Being this subject a core to this research, methodologies and role definition will be discussed and comparisons with Enterprise Architecture will be drawn as deemed reasonable.

A big part of this challenge will be mapping Wipro's practice to an Enterprise Architecture Framework and a big portion of this study is based on a survey sent to Wipro's Architecture pool where several architects exposed their experience and concerns regarding past projects.

This survey will also be used to assess, at a primordial stage, the architects' awareness regarding best practices. If the opportunity arises, essential “moving” steps will be presented in order to move Wipro's practice to a standard compliant reality.

This first section introduced the study context to the reader, enabling the first contact with the challenges and the reality surrounding this study. Section 1.1 presents the problems conceptualization and why they are important to attend. Section 1.2 presents a methodology to attain said problems. Section 2 presents the study description where each challenge is dissected and planned

Section 3 presents the theoretical background needed to understand both the industry maturity level and its context within this research, culminating in Section 4, with the results of each study. Section 5 presents the main conclusions and suggested future steps.

1.1. Problem Conceptualization and Objectives

The baseline for this study is settled by the following objectives:

- How to develop the discipline of Solution Architecture in a multinational organization operating in the retail sector?
 - Architects' roles and activity range;
 - Organization's process mapping to an industry leading set of Best Practices;

This objective came divided into two approaches proposed by the Solutions Architecture Competency Center, where in one hand, there is the need to unify the roles of the Enterprise and Solutions Architects as much as possible and on the other hand, analyze Wipro's *modus operandi* and confront it against a selected EAF, thus measuring the gap between Wipro's practice and industry's standards.

The first approach relies on the fact that there is yet to be a unified role definition, mainly on the Solutions Architect field since the Enterprise Architect is a more matured role than the latter. The Solutions Architect concept is not much older than 2005 (Alison 2007) but since, its scope and typical responsibilities have not been correctly defined. Besides this, its placement within other architectural roles has not been clarified.

Regarding the second approach, it relies on the fact that a full “As-Is” reckoning must be performed to assess what is documented architecture-wise, what is in fact being applied, how

it has been applied and by whom. Besides, there is the framework selection task which will be made after gathering all the mentioned information, in order to assess whether to start from the beginning or adapt the reality of Wipro's practice.

This specific problem gains even more momentum when realizing that Wipro deals with very distinct and unique customers, whereas with the Northern Europe customers, certification and standards compliance are mandatory. Even knowing that in Southern Europe it might not always be the case, an organization like Wipro must be prepared to any reality and be capable of grounding its decisions based on the appropriate set of standards and practices. This requirement's relevance grows proportionally to customer's size, new business units, and collaborative work with other service providers and higher demands. Those are the main reasons why an organization like Wipro must not be caught off guard.

These two approaches will be managed while dealing with the system with more variables: the human being, instead of a static one, since their know-how is the added value to this research.

Although the result might be an instance of the EA and SA in the retail sector, it will have something to be added to the ongoing discussion of these topics, representing another view towards a unified definition of both.

1.2. Methodological approach

The Dissertation process will start with a qualitative approach, while studying past project's documentation from a wide range of customers. Since one of the goals of this process is towards methodological recommendations, the study will focus on one project at a time and extract specific knowledge from each. After being comfortable with Wipro's way of implementing business and being aware of customers' size, complexity and needs, two parallel researches will occur. On one hand, try to understand what is documented regarding Wipro's methodologies, how are they applied in a project, when are they applied (in every project or negotiated with the customer), the maturity level and acceptance of those methodologies. On the other hand, the influence and the typical role definition of a Solutions Architect will be explored, always having in mind its methodology execution. To support these two parallel activities, a survey will be developed with several goals. These goals range from general methodological best practices and how architects are using them, thus assessing

their maturity level. Also, this survey will attend the role's distinction between an Enterprise Architect and a Solution Architect, which is not even clear to the industry (Slot 2010).

Finally, this survey will have open questions where architects can comment on past projects' success and what should have been done methodologically and role definition wise.

One of the purposes of the aforementioned survey is to set a baseline for forthcoming interviews, mainly to explore the answers to the open questions. This marks the end of this methodological approach's step, the current state analysis.

With the knowledge of how current Wipro's methodologies are dealt with and managed with different customers and how architects are involved and organized throughout the project, it is time to analyze EA methodology industry and assess which enterprise architecture framework should be adopted.

This selection process will take into account industry's main frameworks, identified in the Literature Review section, and Wipro's retail business needs and particularities.

After choosing the enterprise architecture framework, the mapping between the chosen framework and Wipro's current methodologies will be made. With this methodology mapping and the process of gathering industry's best practices for each methodological phase, a list of suggested best practices will be elaborated. Alongside best practices elaboration, a set of recommendations on how to proceed from Wipro's current methodologies towards compliance with the selected enterprise architecture framework will be elaborated.

For the purposes and scope of this research, the study will focus on the analysis of the Enterprise Architecture methodology. This decision to limit the research is only logical since Wipro's architecture pool is accountable for this specific methodology, but some references to its adjacent methodologies will be done, while lightly.

Finally, a *Focus Group* like strategy will be used, scheduling a presentation session with Architecture Competency Center's stakeholders and project's Solutions and Enterprise Architects to present the research results and propositions. Due to time limitations, both the results and propositions won't be implemented and adequately tested in time for this process conclusion. Nevertheless, the validation method taken into account will be the approval process done by said stakeholders.

STUDY DESCRIPTION

This chapter intends to present the steps' description towards the challenge proposed by Wipro. This Study is divided into three distinctive parts. The first one being to analyze and develop a unified architectural role definition, followed by Wipro's methodology analysis and best practice suggestion, supported partly by the survey analysis sent to the Architecture pool.

2.1. Roles definition

Every now and then, the time comes for a fresh-off college student or a professional between jobs, to apply for a position or an internship at a multinational corporation. Mainly on the first case, where the student, often with the perception that every company follows or agrees with the theoretical principles he was taught, finds himself dazzled with the variety of practices and the panoply of applications a certain aspect or definition now has. This was the case when the practical definition of a Solution Architect's role began. This study rapidly evolved to a multiple role definition when several touch-points between two other roles were detected and thus, the need to identify the boundaries between them. Those roles are the Enterprise Architect and the Domain Architect.

For timeline purposes, the study conducted around these definitions started with a meeting with the pool manager, who explained her view of how these roles were used across different projects, giving an enterprise-practical sight. Next, a handful of meetings with Wipro's supervisor were held to provide the practical input from the retail sector, the diversity and most of all, the size of past and ongoing projects and their needs, and a glimpse of the main technology surrounding Wipro's business, Oracle Retail and its modules. Samples of these meetings are presented in Annex 2. Following this stage, a series of meetings with Solution Architects allocated to different projects took place, not only to get familiar with the concepts and field expertise they have but also to gain awareness of the differences between projects. The surveyed architects were suggested both by the pool manager and Wipro's supervisor, ranging from national to international projects and more than three different customers, thus giving a considerable set of different experiences to explore. The meetings followed a simple pattern, having a minimum of thirty minutes, starting with respondent's opinion about the differences between Enterprise and Solution Architect, instantiate those differences in the project the architect was involved in, inquire about the sensibility to EA, SA and their correlation with the other architectures, understand to what intent that architecture sensibility

should be brought to Wipro's practice, in the case of customer's own methodologies were being used, and finally, ask the architects what would they change, if any and if they could, regarding past projects.

With the great opportunity to conduct this kind of study at a multinational corporation, where several projects run at the same time, with different challenges and uniqueness, making an internal survey was deemed essential, not only to get a practical view of how Wipro's architects operate, but mainly to have a glimpse of the misalignment there was, if any, methodological and roles definition wise.

At this time, as the individual answers started to arrive, new meetings with the inquired architects were scheduled to explore their answers, because at this stage, with the knowledge from the first meetings, the continued research of the subjects and the broader awareness of the topic, the forthcoming meetings and research path were even more focused.

2.2. Wipro's methodology/Best practices

The study conducted to analyze Wipro's methodology was guided by three main phases. The first one involved a methodology's current state analysis. This analysis focused on its phases, dependencies and business coverage. The second phase of this study involved the comparison between the aforementioned analyzed methodology and industry's Enterprise Architecture Frameworks for developing an enterprise methodology, resulting in a direct mapping of the company's methodology to one of the industry's leading EAF described in Section 3.

Although the study of the EAF selection started with more than one in analysis, the Zachman Framework, FEAF, TOGAF and Gartner Framework, it rapidly became a one player game, since Wipro's methodology had begun its development with a mildly focus on TOGAF. It was only logical to follow this direction and adopt it as the framework to measure its alignment with Wipro's methodology. The Open Group Methodology, TOGAF, was initially chosen by for being one the most solid references on the Enterprise Architecture Framework market.

The third main phase involved the elaboration of a list containing a set of best practices applicable to Wipro's practice. These best practices were gathered through industry's EAF certified experiences, a specific set of questions answered with the aforesaid survey, and through Wipro's architects experience, in the event that certain tasks were done and were not

formally designated as a best practice *per se* but helped to achieve a certain goal and thus, should be formally designated as a best practice.

This study, however, has a limitation, since the available time did not allow the complete assessment of the best practices and the methodological suggestions' application to a real project, these evaluations took place in the form of a pool meeting, held at the end of May, where the pool manager, Wipro's supervisor and the architecture's pool architects evaluated the suggestions, the critics and the roles definition, giving their judgments and advices.

2.3. Survey Strategy

The aforementioned survey was released to a group of fourteen solution architects, with the help of the architecture's Competency Center Manager. The survey sent to the architecture pool members, available in Appendix 1, had several goals. The first one was to aggregate and discuss the different understandings that Enterprise and Solution Architecture have on IT professionals. Through role instantiation, a set of scenarios were described and the participants were urged to choose, with no limitations, those which they thought were correct. Most of the scenarios had overlapped ideas and the boundaries were not clearly defined so that the architects felt the need to add a bit of their experience in the corresponding open field for additional information. The second part of the survey aimed specifically at the architect's maturity levels, where in one hand, a set of activities from both SA specific methodologies and non-specific project methodologies were used to assess the architect's awareness of using best practices, even not knowing that he or she is doing so. On the other hand, project background questions were used to measure the seniority and experience of the sample to be analyzed.

The third objective was to assess whether there are critical success factors involved in the retail sector, in the form of specific definitions, needs or issues that affect SA's development. The fourth objective was to debrief the architects about their "field" experiences and concerns regarding not only role descriptions but also previous projects' thoughts on methodological decisions.

The last objective was to set a baseline for upcoming interviews, where meetings lasting as long as thirty minutes were conducted with broader understanding of the topics. Samples of these meetings are presented in Annex 2.

LITERATURE REVIEW

This chapter aims to give a concept snapshot of the topics that will be used within the research. The study will focus on the EA concept and relevance, the main EA frameworks used and will drill down on one specific architecture, the Solutions Architecture, since it is one of the main focuses.

3.1 Enterprise Architecture context

Enterprise Architecture is a more than twenty years old discipline, but still very young and evolving (Bucher, Fisher et al. 2006) (Raadt, Slot et al. 2007), that conquered its place in the information management discipline by solving two main problems, which at the time already raised concerns. The first problem arises with the Information Systems' ever-growing complexity management. The second problem circles around those same systems and the usability challenges they continue to augment when adding business value. When an organization has information running within every corner of its structure and most of times from several providers, whether they are enterprise resource planning systems or custom-made niche products, its interconnections are numerous and heterogeneous. Unfortunately, these emerging enterprise-wide IT systems have typically not evolved through a planned approach, rather each business unit has developed and acquired the IT systems they need individually (Linthicum 2000; Johnson, Ekstedt et al. 2004).

Since the scenario of a considerable number of systems poorly connected arises, where the redundant data and different technologies nightmares play a big role, is crucial to set a unified communication channel based on standards (Linthicum 2000; McGovern, Ambler et al. 2003; Lindstrom, Johnson et al. 2006).

To correctly understand the comprehensiveness and the not consensual position that EA has within organizations, the presentation of a set of definitions is deemed essential.

At the very first abstraction level, Enterprise Architectures are like blueprints, drawings or models (Spewak 1993).

Given that there is yet to be a consensus about EA's definition (Wagter, Berg et al. 2005), an overview of most consenting ones is presented below.

Thus, in 2000, IEEE published the IEEE 1471 recommended practice, a set of guidelines for describing an architecture rather than being a standard for EA by “The fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principle guiding its design and evolution relationships to each other and to the environment and the principles guiding its design and evolution.”(IEEE 2000)

Building on IEEE’s 1471 recommended practice, Lankhorst defines 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.”(Lankhorst 2005)

In the Enterprise Edition of TOGAF, one of the most influential consortiums in the EA fields, advocates that “The formal description of the system, or a detailed plan of the system at component level to guide its implementation. The structure of components, their interrelationships, and the principles and guidelines governing their design and evolution over time.” (TOGAF 2004)

Enterprise architectures refer to an organized set of elements, rules and principles with clear relationships to one another, which together form a whole defined by its finality (Vernadat 1996).

Wagter et. al, stated that Enterprise Architecture is the practice of developing and applying a consistent set of rules and models that guide the design and implementation of processes, organizational structures, information flows, and technical infrastructure within an organization (Wagter, Berg et al. 2005)

A similar, more focused on technology definition was given by Ross et al, stating that EA is “[...] the organizing logic for business processes and IT infrastructure, reflecting the integration and standardization requirements of the company's operating model. The enterprise architecture provides a long-term view of a company's processes, systems, and technologies so that individual projects can build capabilities - not just fulfill immediate needs”(Ross, P.Weill et al. 2006) whereas the mentioned operating model is defined as “[...] the necessary level of business process integration and standardization for delivering goods and services to customers”(Wagter, Berg et al. 2005).

With a different approach, Berg and Steenbergen argue that it is not that important which definition an organization adopts, but how that definition serves the purposes of the organization (Berg and Steenbergen 2006). Indeed, considering on one hand the wide

spectrum of possible architectural endeavors that fall under the general umbrella of EA and on the other the diverse needs of different organizations (Boucharas, Steenbergen et al. 2010), it seems plausible to ascertain that “any given organization, in choosing a definition, should indicate as concretely as possible the nature and the scope of the architecture” (Berg and Steenbergen 2006).

Based on the presented definitions, it’s clear that EA discipline is maturing and with an ongoing debate for its unified definition. However, the definition given by Ross et al, combined with the sense that the correct definition is one that serves the organization’s purposes, is the one that serves this project the best, due to its link at projects’ level and the concern to consider capabilities instead of just fulfilling immediate needs.

Along with this definition decision, comes Slot’s understanding that Enterprise Architecture is the practice of applying a standard approach for and describing in a standard way the current and/or future structure and behavior for an organization's processes, personnel and organizational sub-units, information systems and technical infrastructure. This definition doesn't make a distinction between business and IT architecture, it encompasses them both. It should be seen as one discipline, addressing both business and IT (Slot 2010).

The need for this kind of architecture grows alongside with the information systems’ complexity level. When considering building an information system, if the desired solution is a non-distributed, not so scalable choice, (usually what one may call a “home-grown solution” within the company) maybe the solution architect’s role is rendered useless, however, if the goal is to build a distributed system branching through several transversal business units, several architectural roles may be required, for instance, a data architect, an infra-structure architect, a business architect and even, reaching the first level of abstraction, an enterprise architect (Sessions 2007).

During the last decade, Enterprise Architecture gained its momentum and established itself as a primordial approach for information systems’ management on the enterprise world.

Enterprise Architecture provides the knowledge base and support for decision making within the enterprise and it serves as the blueprint of current situation and strategy for future directions of tech enterprise (Council 2001).

According to Boucharas *et. All*, the term EA was coined in order to describe the scientific discipline that concerns itself with the principles that govern the complex constructs of modern business organizations or simply, enterprises (Boucharas, Steenbergen et al. 2010).

One of the references on the Enterprise Architecture field is John Zachman, who wrote the historic paper published on IBM Systems Journal, “A Framework for Information Systems Architecture”. He was one of the first to preconize the exploration and explanation of the Enterprise Architecture concept. Zachman was then challenged to define the EA discipline, where he stated that the challenge itself was not correct, since he stated that there is not only one EA discipline, but a panoply of them with different contexts, perspectives and granularity levels (Zachman 1987).

His work’s extensions and elaborations on Enterprise Architecture Frameworks (EAFs) in the early 90’s (Sowa and Zachman 1992) and later on (Zachman 1996) are widely known as the *EA Framework* or *Zachman’s Framework* (Boucharas, Steenbergen et al. 2010).

EAs are based on diagrammatic descriptions of the surrounding environment and systems, which are the core of this approach. These descriptions, or models, allow a greater business and information systems’ understanding, but also help the decision making process (Zachman 1987) (Sessions 2007).

For this understanding to be more accurate and organized as possible, Joly Hoogervorst (Hoogervorst 2004) proposed an EA composition made by four domains, namely, Business Architecture (principles and standards which drive business engineering), Service Architecture, Data Architecture and Technology Architecture. This division is also supported by Winter and Fischer (Winter and Fischer 2006), who claim that most EA frameworks, the broader way to schematically understand EA’s practice, differentiate the several layers of Enterprise Architecture by the four mentioned ones.

In the EA field, multiple frameworks exist, however, the industry analysis being made only takes into account the four main methodologies. Such methodologies represent about 90% of enterprise choices (Sessions 2007).

In the following section, four EA frameworks will be presented.

3.1.1. Zachman Framework

One of the very first precursors to raise questions about Information Systems’ management challenges was John Zachman. He identified the main reasons as being the systems’ ever-growing size, complexity and propensity to distribution, caused by organizational operation’s automation (Sessions 2007; Churbanau 2010).

The phrase “Enterprise Architecture” was first used in 1987 by John Zachman in the already mentioned IBM Systems Journal article titled “A Framework for Information Systems Architecture”. That phrase intends to address two problems (McSweeney 2010):

- 1- **System complexity**- organizations were spending more and more money building IT systems;
- 2- **Poor business alignment**- organizations were finding it more and more difficult to keep increasingly expensive IT system aligned with business needs.

Zachman’s referential was first introduced in 1987, proposed in the famous article “A framework for Information Systems Architecture” (Zachman 1987). Many iterations of this referential were released and it continues to evolve nowadays. Although the main concepts remain unchanged, this evolution focused more on graphical representation refinements in addition to more precise language and dimensions in order to adapt to constant change (Zachman 2009).

The first detail to notice about Zachman’s framework, is that it is not a framework *per se*. According to the American Heritage Dictionary, a framework is defined as: “A structure for supporting or enclosing something else, especially a skeletal support used as the basis for something being constructed; An external work platform; a scaffold; A fundamental structure, as for a written work; A set of assumption, concepts, values and practices that constitute a way of viewing reality.” (Dictionary 2006). On the other hand, a taxonomy is defined as “The classification of organisms in an ordered system that indicates natural relationships; The science, laws or principles of classification; systematic; Division into ordered groups or categories” (Dictionary 2006). This is the reason why Zachman’s framework is actually more a taxonomy for architectural artifacts (project documents, specifications and models), that takes into account both who the artifact targets (for example, business owner and builder) and what particular issue (for example, data and functionality) is being addressed (Sessions 2007).

John Zachman, in a retrospective type analysis, described his work as “A framework that applies to enterprises which is a simple logic structure to classify and organize the descriptive representations of an organization, which are significant to said organization as well as to its systems’ development (Zachman 2006).

Many Zachman’s supporters see this framework, or taxonomy as multi-disciplinary, with an influence well beyond the Information Technologies (IT) market. In a very reputable book, Zachman states that in the given time, people will realize that this framework is present within

everything they perform, not only in IT projects. Whenever people understand the framework entirely, they will become more efficient in every task they perform. This means everything. This statement wasn't said lightly (O'Rourke, Fishman et al. 2003). Zachman stated in an interview back in 2006 that the framework schema has been around for thousands of years and he is sure that it is going to be around for a thousand more. The variability relies on the understanding that we have of the framework and even how to use it for enterprise engineering and in the industry in general (Zachman 2006). Zachman even made an analogy to the civil contractor's industry stating that in this specific industry, the architectural artifacts are implicitly organized using two dimensions. One of them is the "players in the game" dimension" where for one building, some actors are for example, the owner (the one paying for the project), the constructor (the one coordinating the construction project) and a supervisor (the one who ensures guidelines' compliance). A civil contractor's architect prepares several types of artifacts for these said actors. Each one of them demands complete information, but what stands for integrity differs from one another. The owner is interested in a full description regarding building's functionality and aesthetics. The constructor is interested in a full description of supplies and construction's process. The owner doesn't care about nail setting and the constructor doesn't care about window alignment with the sunrise. Zachman reaffirms that each architectural representation differs from the others in its essence, not just detail wise (Zachman 1987). The second dimension concerns the descriptive focus of the artifact: the what, how, where, who, when and why of the project. This dimension is independent from the first one. Both the owner and the constructor need to know the "what", but the need for the "what" differs for both of them.

Zachman's referential proposes six main descriptive focuses (data, function, network, people, time and motivation) and six actor's perspectives (planner, owner, designer, builder, subcontractor and enterprise). These two dimensions can be disposed as presented in Figure 3.1.

For the owner, the "data" focus refers to business entities. This may include information regarding customers and products or information regarding the relationships between those entities, like demographic groups or inventories. If we are talking to a business owner about "data", this is the kind of language we should use.

For the person who works with databases, "data" focus doesn't mean business entities, but lines and column arranged into tables and connected through mathematical links and

projections. If we are talking with a database designer about “data” focus, customer demographic groups shouldn’t come up.

By this, Zachman said that the people are having difficulties communicating with each other about systems architecture because there is a set of architectural representations instead of a single architecture (Zachman 1987).







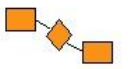
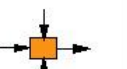
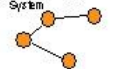
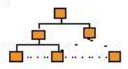


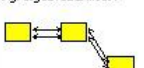
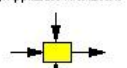
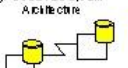
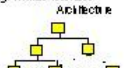

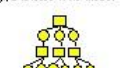
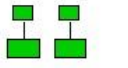
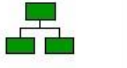
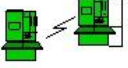
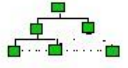

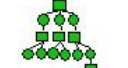






	DATA <i>What</i>	FUNCTION <i>How</i>	NETWORK <i>Where</i>	PEOPLE <i>Who</i>	TIME <i>When</i>	MOTIVATION <i>Why</i>	
SCOPE (CONTEXTUAL) <i>Planner</i>	List of Things Important to the Business 	List of Processes the Business Performs 	List of Locations in which the Business Operates 	List of Organizations Important to the Business 	List of Events Significant to the Business 	List of Business Goals/Strat. Critical Success Factor 	SCOPE (CONTEXTUAL) <i>Planner</i>
ENTERPRISE MODEL (CONCEPTUAL) <i>Owner</i>	e.g. Semantic Model 	e.g. Business Process Model 	e.g. Business Logistics System 	e.g. Work Flow Model 	e.g. Market Schedule 	e.g. Business Plan 	ENTERPRISE MODEL (CONCEPTUAL) <i>Owner</i>
SYSTEM MODEL (LOGICAL) <i>Designer</i>	e.g. Logical Data Model 	e.g. Application Architecture 	e.g. Distributed System Architecture 	e.g. Human Interface Architecture 	e.g. Processing Structure 	e.g. Business Rule Model 	SYSTEM MODEL (LOGICAL) <i>Designer</i>
TECHNOLOGY MODEL (PHYSICAL) <i>Builder</i>	e.g. Physical Data Model 	e.g. System Design 	e.g. Technology Architecture 	e.g. Presentation Architecture 	e.g. Control Structure 	e.g. Rule Design 	TECHNOLOGY MODEL (PHYSICAL) <i>Builder</i>
DETAILED REPRESENTATIONS (OUT-OF-CONTEXT) <i>Sub-Contractor</i>	e.g. Data Definition 	e.g. Program 	e.g. Network Architecture 	e.g. Security Architecture 	e.g. Timing Definition 	e.g. Rule Specification 	DETAILED REPRESENTATIONS (OUT-OF-CONTEXT) <i>Sub-Contractor</i>
FUNCTIONING ENTERPRISE	e.g. DATA	e.g. FUNCTION	e.g. NETWORK	e.g. ORGANIZATION	e.g. SCHEDULE	e.g. STRATEGY	FUNCTIONING ENTERPRISE

Figure 3.1 - Zachman’s framework. Source: Zachman International (810)231-0531

As you can see in the previous figure, Zachman’s framework is composed by thirty six cells—one for each point of intersection between actors and focuses. If we travel along horizontally, it’s possible to perceive different system description, all in the same actor’s perspective. Vertically, it’s perceivable the interaction between a given focus and several perspectives.

Each cell represents an architectural design element. Each cell is an outcome of an architectural activity based on a given system’s aspect for a defined group of people. This framework trails a concise path to model and structure the architecture of an organization and its systems (Tang, Chen et al. 2004)

Zachman's framework was used as the ground stone for several other frameworks like the Federal Enterprise Architecture Framework (FEAF) or The Open Group Architecture Framework (TOGAF) but despite that, the framework does not perceive certain elements such as tradeoffs and logical documentation for architecture's design. It does not explicitly perceive the support for non-functional requirements for the architecture's evolution. There is no distinction between architecture modeling and detailed design activities. As opposed to TOGAF, Zachman's framework only gives a brief distinction of the architectural outcomes and doesn't mention any architectural process' description (Zachman 1998; Tang, Chen et al. 2004).

3.1.2. The Open Group Architecture Framework (TOGAF)

TOGAF is one of the most reputable referential, a detailed method garnished with a set of support tools to develop a structured Enterprise Architecture. But, TOGAF focuses on both the "what" and the "how" (McSweeney 2010). TOGAF is The Open Group's property and it is developed and maintained by this consortium.

The first version of this framework was developed in 1995 and was based on the United States Department of Defense framework called Technical Architecture Framework for Information Management (TAFIM). Back when TOGAF was being developed, the US Department of Defense gave specific permission and even encouraged the Open Group to use TAFIM as a reference, making a stand and partially justifying the millions of dollars and many years spent developing the latter framework.

TOGAF provides a set of methods and the necessary tools to help develop, use and maintain an Enterprise Architecture. It is based on an iterative model supported by its best practices and an existing reusable set of architectural components.

According to ISO/IEC 42010:2007, architecture is defined as "The fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution."(ISO/IEC 2007). TOGAF fits in this description but does not strictly adhere to this terminology. In the Open Group's framework, the architecture concept has two different meanings, depending on the context (Josey 2009):

- 1- A formal description of a system, or a detailed system plan at component level, to guide its implementation.
- 2- Components' structure, its inter-relations and the guiding principles to the project and evolution.

TOGAF's Structure

TOGAF is designed to support four types of architecture, such as the ones shown in Figure 3.2

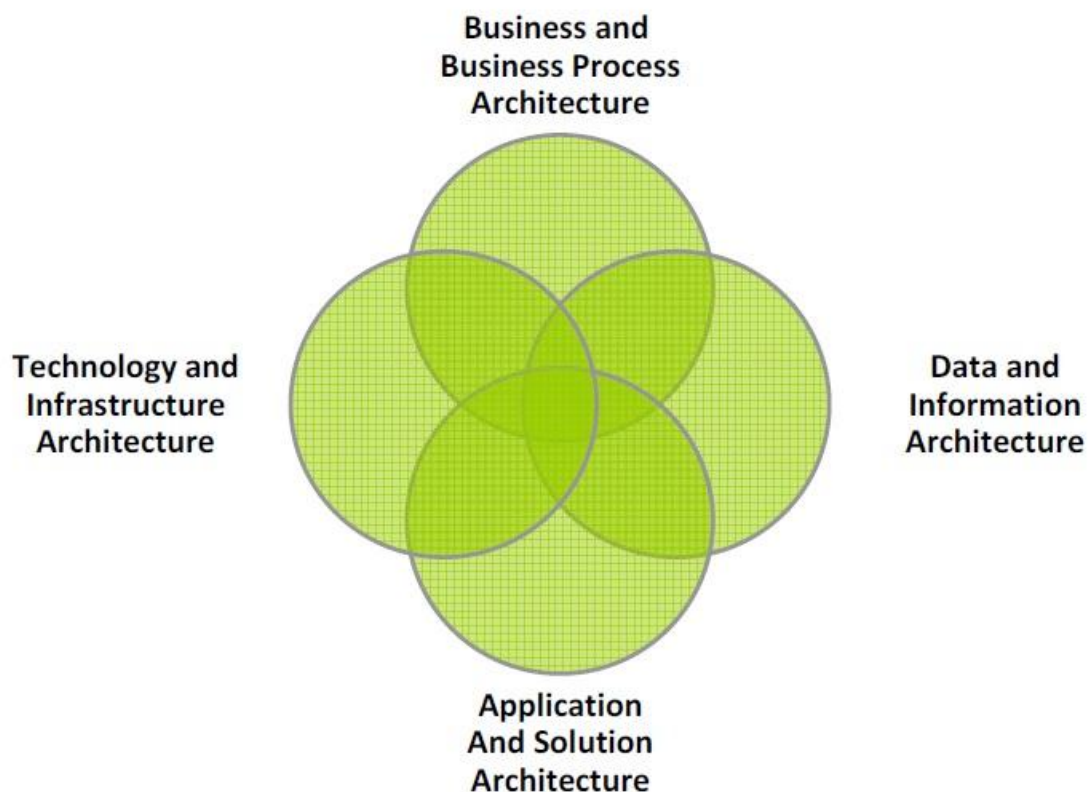


Figure 3.2- TOGAF Architecture Domains (McSweeney 2010)

Business and Business Process Architecture- Defines the business strategy, the governance, the organization and the key business processes.

Application and Solution Architecture- Provides a model to develop and implement application systems, its interactions and its dependencies with the organization's core business.

Data and Information Architecture- Describes a company's logical and physical components structure and data management resources.

Technical and Infrastructure Architecture- Describes software and hardware's logical capabilities needed to support business, data and application services' development and implementation. This includes IT infrastructure, middleware, communication networks, standards, etc. (McSweeney 2010)

Architecture Development Method (ADM)

TOGAF is categorized as a framework and its core feature is called the Architecture Development Method (ADM). This method is basically a "recipe" on how to develop an Enterprise Architecture and it can be classified as a process. ADM includes structure establishment for the architecture, content development, its content and guidelines to build the several architectures. Every activity, introduced right next, takes part of an iterative cycle of continuous definition which enables organizations to transform its projects in such way that makes them answer the customer's objectives and business opportunities with greater control. This method allows, for each iteration, to decide the breadth of organizations' coverage to be defined, the detail level to be defined, the extent of the time period aimed at, including the number and extent of any intermediate time periods and lastly, can be used to populate the Foundation Architecture, of an organization Figure 3.3. This Foundation Architecture in an architecture of generic services and functions that provides a foundation on which more specific architectures and architectural components can be built. This Foundation Architecture has three main elements:

- 1- The Technical Reference Model (TRM), which provides a model and taxonomy of generic platform services;
- 2- The Standards Information Base (SIB), which provides a database of standards that can be used to define the particular services and other components of an organization-specific architecture that is derived from the TOGAF Foundation Architecture.
- 3- Building Blocks Information base, of several nature within information-driven processes, where systems are built up from collections of building blocks, so most building blocks have to interoperate with other building blocks (Group 2010).

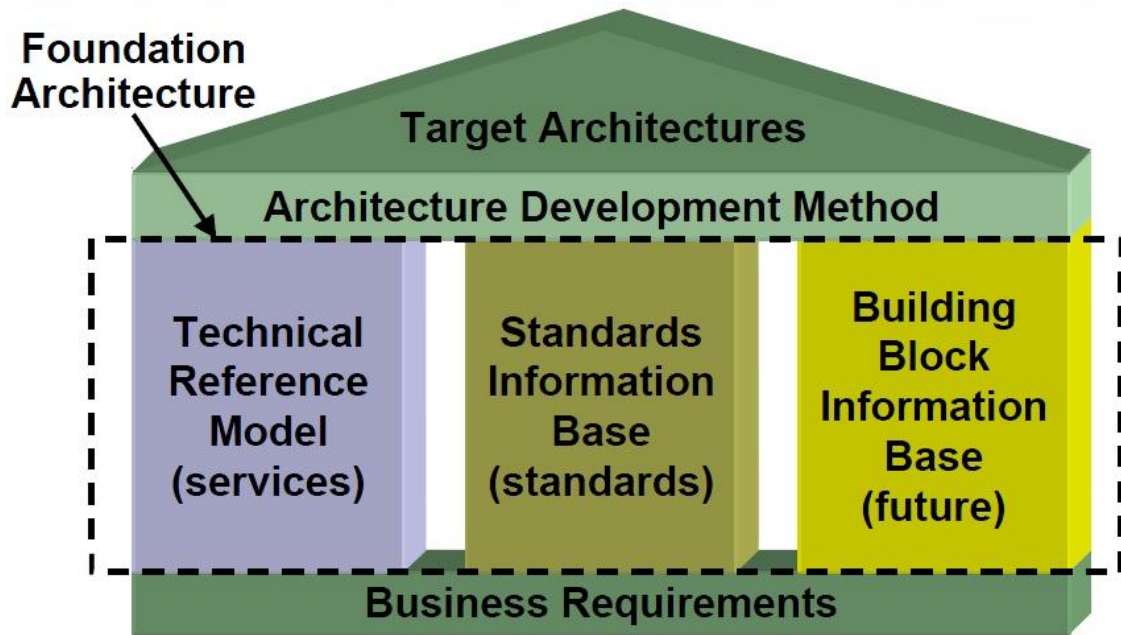


Figure 3.3- Foundation Architecture (Greenslade 2002)

TOGAF’s ADM structure is presented in Figure 3.4.

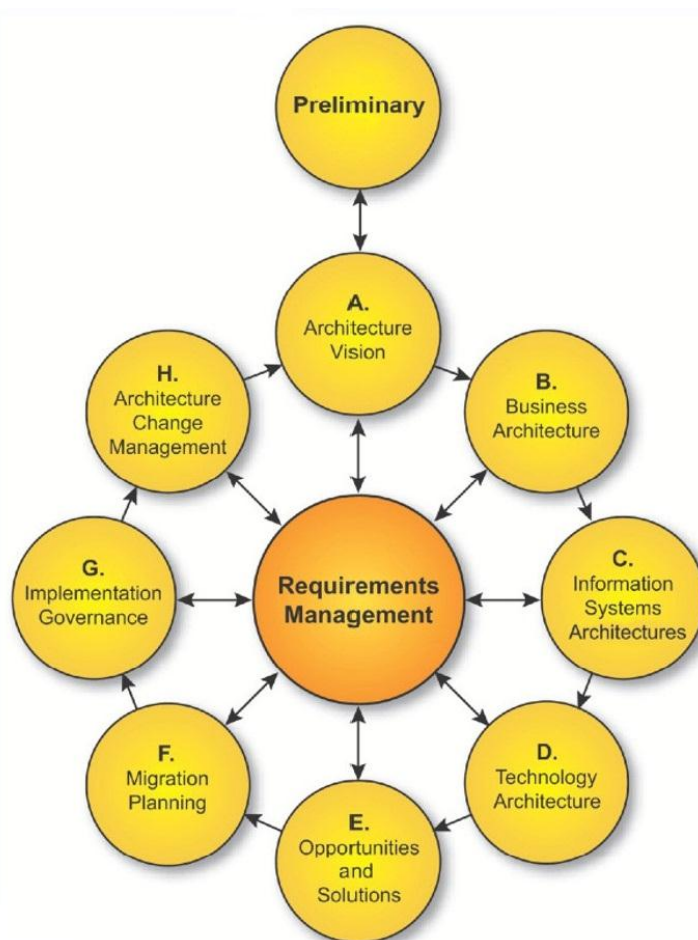


Figure 3.4 - ADM structure (Group 2009)

For each ADM phase, there is a set of activities designed to complete it in a structural way, giving the organization a sequence to build each phase coherently. The sequence used within each ADM phase is presented in Figure 3.5:

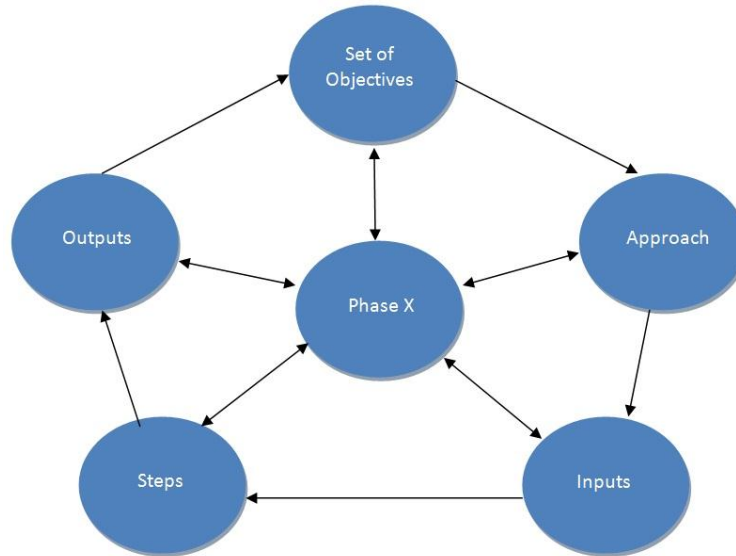


Figure 3.5- ADM phases' activity sequence

If we see TOGAF as a process, we notice that it ends up complementing Zachman's framework, given that the latter proposes how to categorize the artifacts and TOGAF provides a process to create them.

Other aspect to point out is the fact that TOGAF deals with the EA world as a *continuum* of architectures, varying from the extremely generic to an impressive level of detail. This continuity is called *Enterprise Continuum*, which provide a structure and a support context to the most important architectural components' within ADM's execution. These components can include architectural descriptions, models and patterns based on several sources.

Thus, *Enterprise Continuum* is a categorizing tool to be applied to the produced architectures, such as TOGAF repository's contents or industry's reference models ported to the organization's environment. Figure 3.6 presents the *Enterprise Continuum* structure.

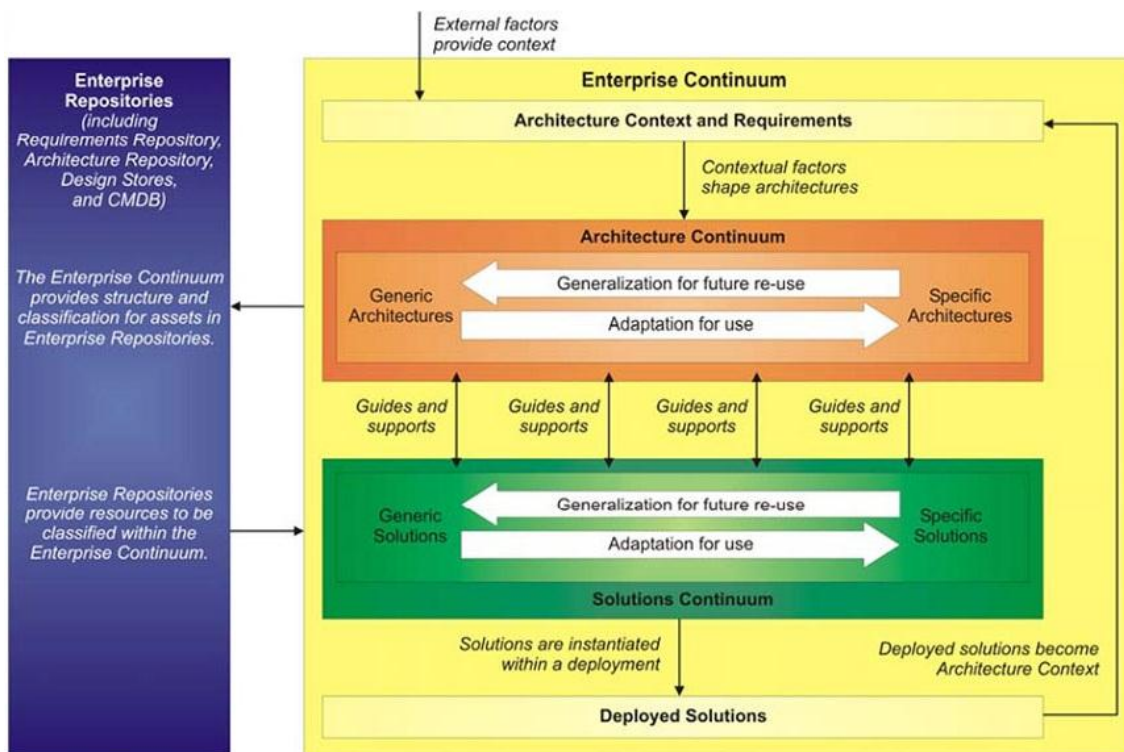


Figure 3.6- Enterprise Continuum structure (Group 2009)

The practical use and representation of this tool takes the form of an Architecture Repository, which includes specific architectures, models and reference patterns which were accepted to be used within the organization and also the architectural work that was developed by the architecture team throughout the times, if that was the case. One of the key features of this kind of repository is its advisable nature of re-use, in fact, the organization’s architecture team is urged to proceed this way, mainly because the criteria for including source materials in an organization's Architecture Repository will typically form part of the enterprise architecture governance process. These governance processes should consider available resources both within and outside the enterprise in order to determine when general resources can be adapted for specific enterprise needs and also to determine where specific solutions can be generalized to support wider re-use (Group 2009).

Nonetheless, it is important not to forget that, since ADM is an iterative process the first execution of ADM will often be the hardest, since the architecture assets available for re-use will be relatively scarce. Even at this stage of development, however, there will be architecture assets available from external sources such as TOGAF, as well as the IT industry at large, that could be leveraged in support of the effort. But ADM execution has to properly prepared, since the Preliminary Phase and the Architecture Vision definition should be

structurally closed before advancing to the following phases. Figure 3.7 presents the recommended iteration process for executing ADM coherently.

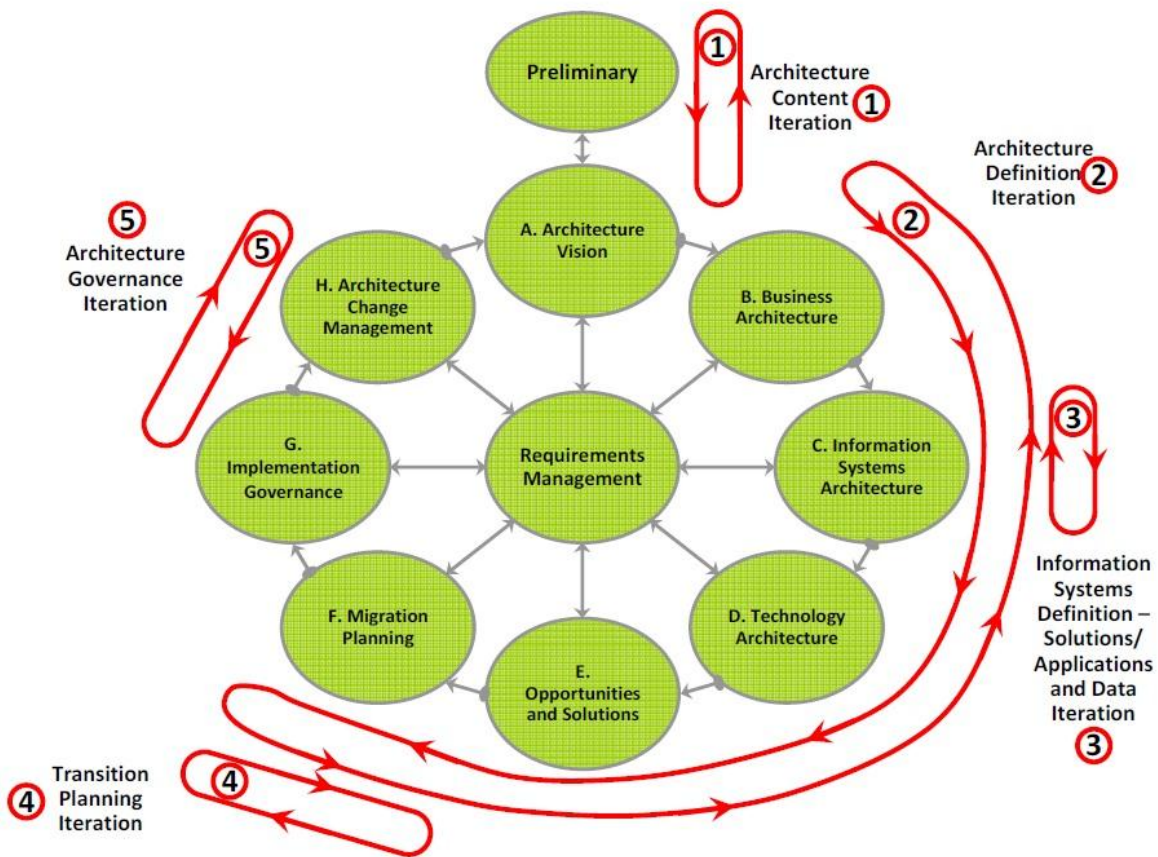


Figure 3.7- TOGAF Iteration process (McSweeney 2010).

Subsequent executions will be easier, as more and more architecture assets become identified and used to populate the organization's Architecture Repository, thus being available for future re-use.

In Figure 3.8, The Architecture Repository is presented.

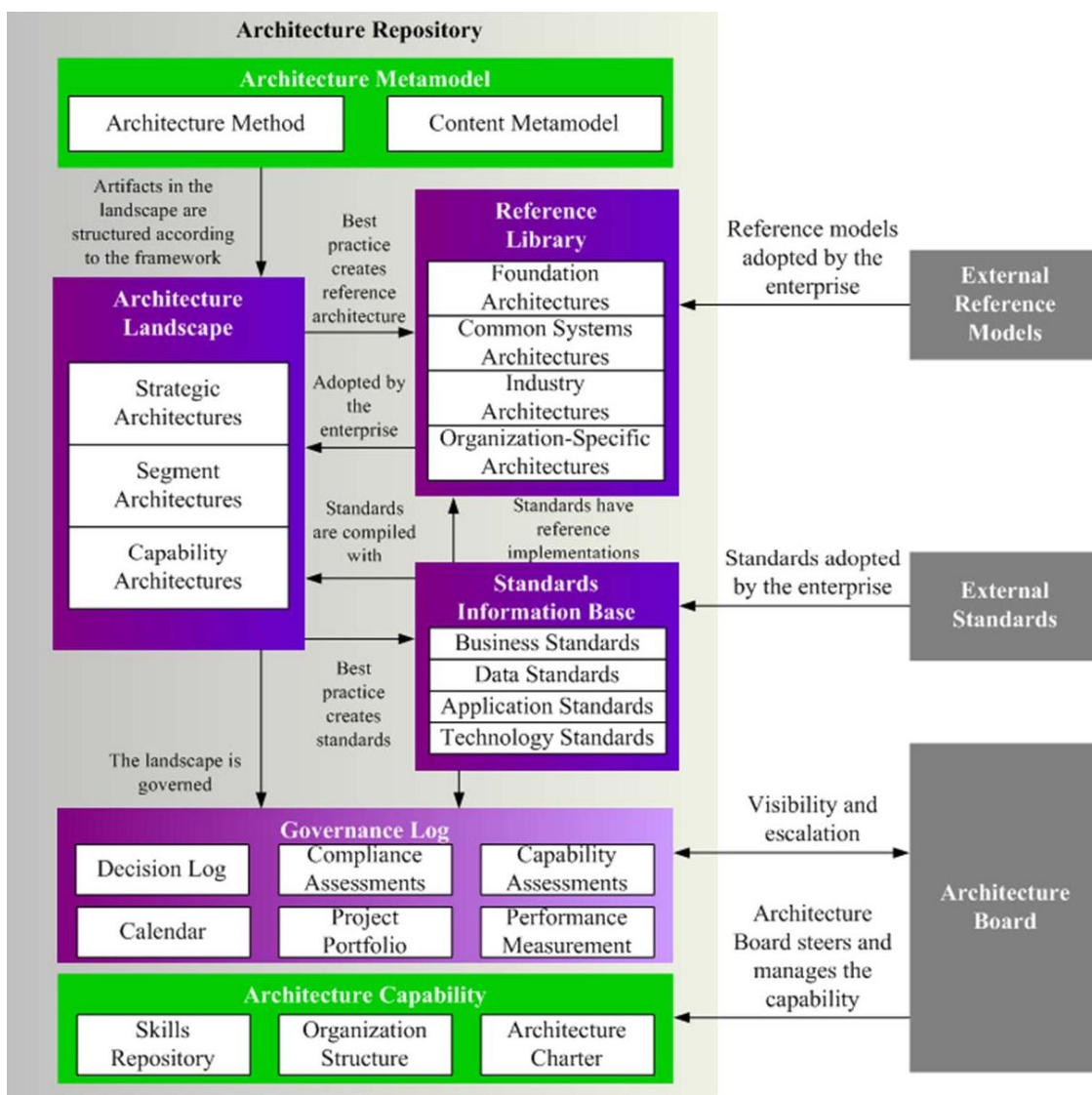


Figure 3.8- Architecture Repository (Group 2009).

TOGAF provides a flexible architecture development process. It allows the organization, without process and needs’ attendance prejudice, to choose from which level to start designing the architecture, skip not applicable phases and even rearrange and combine them (Group 2009) (Sessions 2007).

Like Udayan Banerjee states, the first doubt going across a team’s mind must have been how this process could be different from what you do in a typical “requirement analysis” phase of software development? If the team considers that many of techniques recommended in TOGAF are what they already use, like UML modeling such as Activity and Use-Case models, the team might think why bother with TOGAF?

Actually, TOGAF takes a much wider perspective of the requirement. There are three important things that a team needs to do:

1. Explicitly document the current state, the expected future state and identify the gap;
2. Assess impact of the change on other projects and other organizational initiatives;
3. State the change from the perspective (viewpoint) of different stakeholders and get their buy in.

And while doing so, the team must keep in mind the following:

1. Are we adhering to all the relevant organizational standards & guidelines?
2. Have we made an explicit attempt of reuse?

By this time, all team members are reading TOGAF's specification (Banerjee 2011).

3.1.3. Federal Enterprise Architecture Framework (FEAF)

The Federal Enterprise Architecture Framework (FEAF) was established in 1999 by the Chief Information Officers (CIO) in response to the Clinger-Cohen Act of 1996. The purpose of the FEAF is to facilitate shared development of common processes and information among Federal Agencies and the other government agencies (Services 2011).

FEAF's objective is to facilitate shared processes and information's development between government agencies. FEAF is the most comprehensive framework at the moment, due to its taxonomy like Zachman's framework and the existence of an architectural process like TOGAF.

This framework can be understood as an EA creation methodology or the result of applying its process on a particular organization.

Many authors simply describe this framework as being divided into business, technology, data and application architectures, and possessing five models for business, services, components, technical and data. However this a quite a narrow view because this framework also comprises:

- A perspective on how EAs should be addressed;
- A set of references created to describe different EA perspectives (five models mentioned previously);
- A general process to create an EA;
- A transition process from the pre-EA state to a post-EA paradigm;

- An approach to measure the success derived from using the EA to generate greater value to the business.

Thus, it is easy to conclude that FEAF is much more than a conglomerate of standard models. It includes all the necessary artifacts to build, and as successfully done so, an EA for possibly the single most complex organization on this planet: The United States Government.

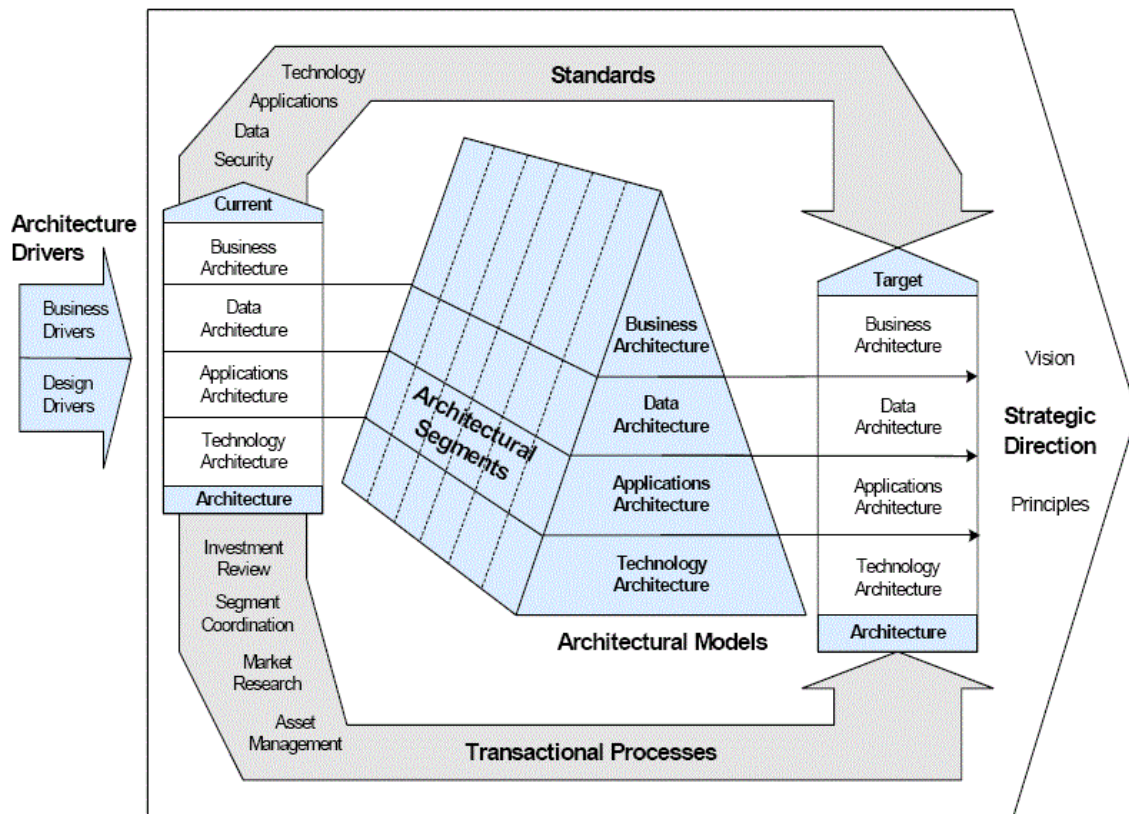


Figure 3.9- FEAF Structure (Langston 1999).

FEAF's process focuses on the architecture's creation, segmented to "feed" an organization's several departments, such as described in FEAF Practice Guidance (OMB 2007).

- **Step 1:** Architectural Analysis- Vision definition of the segment which is then reported to the organizational plan;
- **Step 2:** Architectural Definition- Segment status definition, objectives' documentation and EA segment development, including business, data, application and technology architectures;
- **Step 3:** Investment and Funding Strategy: General financial considerations;

- **Step 4:** Program Management Plan and Execute Projects: Project execution plan development.

Figure 3.10 shows FEAF's architecture matrix, which exposes the sub-architecture products to be developed.

	Data Architecture	Applications Architecture	Technology Architecture
Planner Perspective	List of Business Objects	List of Business Processes	List of Business Locations
Owner Perspective	Semantic Model	Business Process Model	Business Logistics System
Designer Perspective	Logistic Data Model	Applications Architecture	System Geographic Deployment Architecture
Builder Perspective	Physical Data Model	Systems Design	Technology Architecture
Subcontractor Perspective	Data Directory	Programs	Network Architecture

Figure 3.10- FEAF's architecture products (Langston 1999)

3.1.4. Gartner Framework

The Gartner EA Framework started its journey when in 2004, the Meta Group was bought by Gartner. In 2005, with the transaction consummated, Meta Group's architecture practice was embedded into Gartner's research community. Gartner proposes a little different framework. It is not a taxonomy like Zachman's, not a process like TOGAF nor a methodology like FEAF. Instead, it is a practice since Gartner applies the know-how gathered throughout years of successful consulting and research (Sessions 2007). It has since, evolved to enhance usability and join the framework with extensive process work and clearly presents a top-down decomposition (Weiss 2006).

The 2005 Gartner Enterprise Architecture Framework defines itself as a "business context" consisting of the business strategy and external trends that provides the overall context for the EA. The Gartner Group advocates the development of a minimum of three independent view points:

- a business view point, which is concerned with the processes and the organization of the business;
- an information viewpoint, which is concerned with the information that runs the enterprise;
- a technology viewpoint which is concerned with the hardware and software components that support the enterprise.

The aspect-oriented approach allows for the articulation of additional viewpoints, should the organization require them. An important aspect of the 2005 Gartner EAF is the recognition that the “Solution Architecture”, where the systems that support the enterprise are actually specified and designed, takes place at the intersection of the viewpoints (Lapkin 2005).

Gartner bets that decision makers consider its framework, not for being or a not a taxonomy or a process and not only for the support given. Gartner believes their services are requested, specifically regarding the EAF, because they are well-known in their field, and have developed a community that encourages collaboration and best practices (YouSigma 2010).

Gartner’s EA Process Model (Figura 2), created in 1996, provides organizations with a logical approach to developing an EA. It is a multiphase, iterative and nonlinear model, focused on EA process development, evolution and migration, and governance, organizational and management sub processes.

It represents key characteristics and a synthesis of best practices of how the most successful organizations have developed and maintained their EA. Gartner's body of applied research knowledge increases with each exposure to their clients' EA issues. This leads to the recognition of consistent approaches beyond the original scope of their EA Process Model that was developed in 1996 (Bittler and Kreizman 2005).

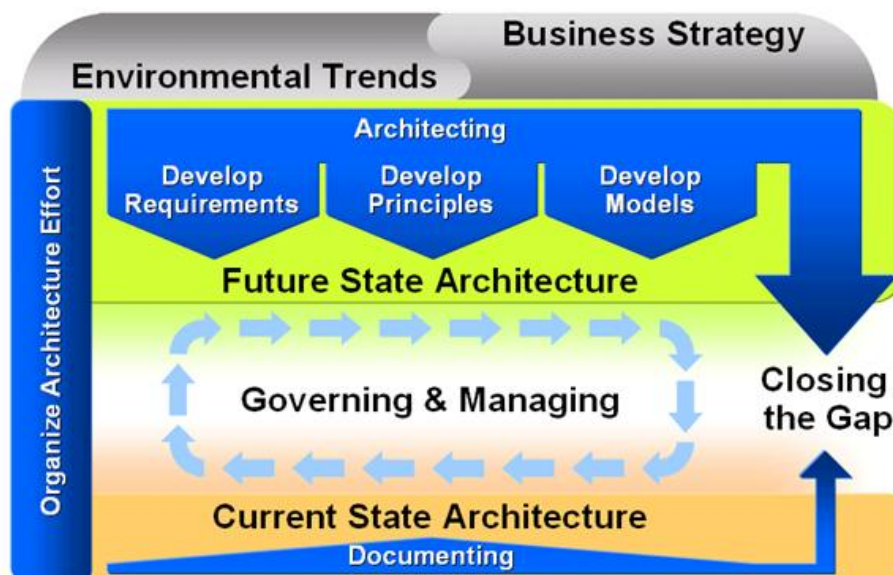


Figure 3.11 - Gartner Process Model (Wikidot 2011)

The Gartner EA Process Model has been synthesized from best-practice research to document the EA process in the form of a high-level model. The mentioned model is basic cycle, making an analysis between present and future, its misalignment and making a portfolio management based on misalignment analysis and recommendations.

This model aims to bridge the gap between business strategy and its implementation, with a holistic process in all its coverage and having the organization as its scope. This holistic vision should cover business strategy change impact better and the technology itself. It is not just the aim to create a model that satisfies a set of aggregated requirements within projects, but to infer the state of the future organizational architecture's business strategy, contributing to a common objective (Bittler and Kreizman 2005).

Gartner believes that an EA concerns three different professional groups: business owners, information specialists and technology implementers. Its conviction is that by bringing these three groups together and unifying them behind a common vision that drives business value, success will be achieved.

Gartner believes that the enterprise architectures must start with where an organization is going, not with where it is. If we are going to clean house, we don't need to exhaustively document everything we are throwing out. Let's focus our energy on what we want to end up with. As soon as we know our goal, we can see how what we have relates to that goal.

Most organizations are facing major changes in their business processes. The process of creating an enterprise-architecture vision is the organization's opportunity to sit down, take a collective breath, and ensure that everybody understands the nature, the scope, and the impact of those changes.

As soon as an organization has this single shared vision of the future, it can consider the implications of this vision on the business, technical, information, and solutions architectures of the enterprise. The shared vision of the future will dictate changes in all of these architectures, assign priorities to those changes, and keep those changes grounded in business value.

Enterprise architecture, in the Gartner view, is about strategy, not about engineering. It is focused on the destination. The two things that are most important to Gartner are *where an organization is going* and *how it will get there*. Any architectural activity that is extraneous to these questions is irrelevant. "Just enough enterprise architecture, just in time," is another often heard saying from a Gartner analyst (Sessions 2007).

3.2. Solution Architecture and Enterprise Architecture

Enterprise and Solution Architecture have become key elements in today's business and IT portfolio of activities. The purpose of these initiatives is to improve business and IT alignment, which is assumed to result in a more effective and efficient use of the business and IT assets of a company. Enterprise Architecture is the discipline that aligns business strategy with execution. Solution Architecture is the discipline that aligns the Enterprise Architecture with business and IT implementation projects (Slot 2010).

The Solution Architecture topic is a newly discussed theme (Bucher, Fisher et al. 2006), and growing attention to this topic is due to the identified need to increase individual project's focus regarding EAs. As such, Solution Architecture definition is not consensual yet, however, it is already possible to envisage the path many authors are following, claiming that Solution Architecture diverges from Enterprise Architecture by the scope being addressed by the organization. EA covers all business lines, while SA focuses on building a unique architecture which is project specific, decomposing the EA's development in manageable and measurable segments (Office of Systems Integration 2008). By this, we can infer that within each EA framework exists a set of methods, steps, etc. that are common to solutions architecture (Sessions 2007).

According to Campbell (Campbell 2007), EA are focused on the enterprise-as-a-whole, modeling the enterprise's future architecture vision, at least for a five year period. Regarding the Zachman framework, the EA discipline focuses mainly on the cells of the first two rows, which are the company's scope and conceptual model.

On the other hand, Solutions Architecture is typically focused on the single business solution, a specific domain, which is acquired or developed by a software development project.

Regarding Zachman's framework, Solutions Architecture focuses on the last three rows, which are the technology model, detailed representation and functioning enterprise and deals with the specific needs of a business area or specific business.

As the development projects reaches its end and the solution handover to production, the solution architecture model is "harvested" by Enterprise Architects who update the current enterprise architecture status.

The most usual SA approach uses the definitions of business drivers and strategic plans, focusing them to a specific project to create service like solution and produce standardized

deliverables. These deliverables create a holistic vision of the project solution created (business, data, etc.) and provides the inputs for the project's sponsor company to use as input on their business, data, service and technology architectures.

Figure 3.12 summarizes the statements made so far regarding projects' architectures and inputs.

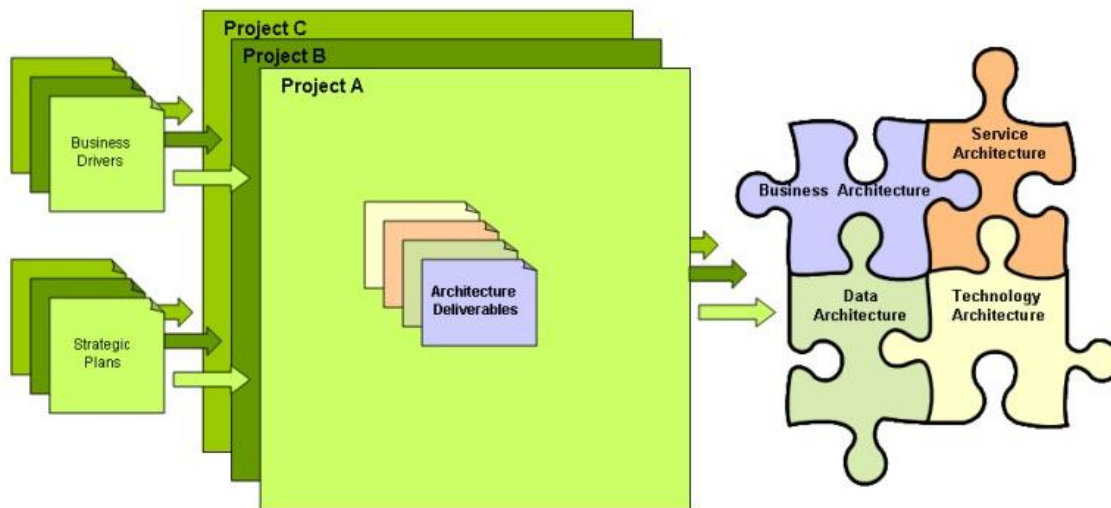


Figure 3.12 - Solutions Architecture Approach (Office of Systems Integration 2008).

There was a confusion involving the suspicion that an EA could actually be a SA within the organization's scope. There is still the misunderstanding, on people beginning the journey in the EA world, that an Enterprise Architect is someone working with Microsoft PowerPoint, who harvests Solution Architect's information and "wastes" the majority of his/her time in meetings reporting what was collected (Morgan 2007).

After introducing and contextualizing the SA concept, it becomes crucial to present the available recommendations or methodologies to support this organizational effort. The first big obstacle relies on the fact that a resource pool with those methodologies adequately validated and ready to be deployed might not exist. The only methodology, currently in validation process, is the one created and used by the Californian Department Office of Systems Integration.

This methodology is based on the life cycle concept, the Solutions Architecture Life Cycle (SALC), explored next. This methodology starts with solution concepts' models, based on the activities and business drivers of the organization being studied. Next, the logical models which define data, applications and technologies needed evolve to physical models which will define the solution after its development. This methodology is synchronized in a way that the

mentioned models are developed at the same time as Project Management Life Cycle (PMLC) and System Development Life Cycle (SDLC) phases. This methodology use assures a balanced solution architecture activity sequence and model availability to support the project. The models created by the Solution Architect represent a set of diagrams made available as artifacts for the project team to use them to develop the solution (Integration 2010).

3.3. Solutions Architecture Lifecycle

The SA life cycle, namely the one being presented, has five phases: conceptual, logical, physical, monitoring and updating and transition. Each phase comprehends a panoply of activities which produces a set of diagrammatic artifacts aimed at the project's solutions. Figure 3.13 presents the said life cycle phases as well as the produced artifacts.

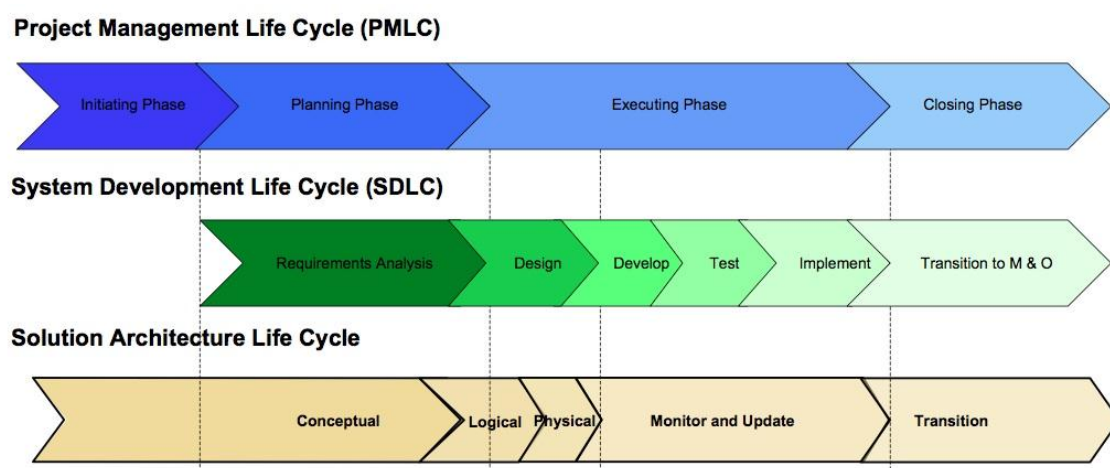


Figure 3.13- SA life cycle and artifacts.

3.3.1. Life cycle artifacts

This methodology uses a toolkit to produce the aforementioned architectural artifacts. The range of tools provide templates and instruction which are used to create models to describe the project's solution concept, logical and physically.

The gathered information is introduced into the templates during the corresponding phase, transported along the process to be used as an input on the models developed in the next phase, the SALC.

This toolkit's templates are not only used to create solution models, but also to help the solution architect select the crucial information to be extracted from customer's organizational architecture. Template instructions boost the architect to consider which business components, performance, data, services and technology and standards that should be part of the proposed solution.

Figure 3.14 presents the high-level workflow which a solution architect uses to create the set of models that describe the project's solution (Integration 2010).

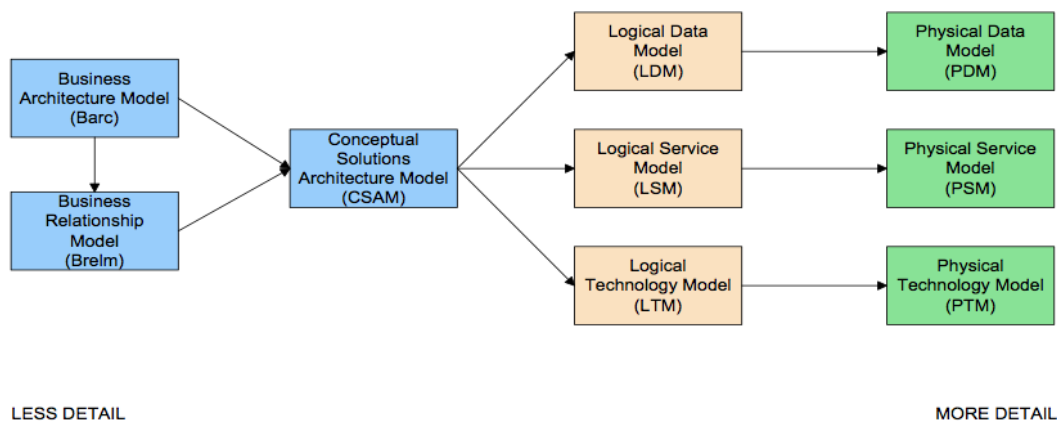


Figure 3.14- SA toolkit workflow.

3.4. Solutions Architect

We often find it useful to look at building architecture and see if lessons learned there apply in our domain.

Though there have been building architects for as long as we have built structures, the regulated profession of building architecture is less than 150 years old. Ancient, traditional cultures and languages used the same word for both builder and architect.

Construction was an integrated craft. The master mason or carpenter knew how to design structures, estimate costs, assemble labor and materials, and manage the construction process from foundation to roof.

With the industrial revolution came new materials, machines, techniques, regulations, etc. And along with all this came a proliferation of highly specialized subcontractors, who handled

each specialized problem. This redefined the role of the general contractor, whose labor force built less and less of the building.

The specialized details of construction became matters for experts while the role of the architect became more clearly focused on providing overall conception of structures, and managing the relationship between the client and the builder/contractor (Lewis 1998; Bredemeyer 1999).

Bredemeyer continues saying that is quite easy to see the parallels in software and enterprise architecture. Not that long ago, an individual or a small group could design and develop an application or some bigger systems, but due to increasing complexity, project size, higher levels of integration, the need for new roles and processes associated with software development drastically increased, reaching a role of overall integrity assurance.

Taking the previous statement into perspective, only 29% of software projects in large enterprises produced acceptable results (that were close to agreed time and budget). 53% were significantly over budget and schedule, and 18% did not deliver any usable result. The projects outside the 29% have an average budget overrun of 56% (Standish 2004). There are two main causes for those numbers, actually, two big trends that have tremendous impact on enterprise grade solution development:

- **Globalization of software development**- where ideally, people work close to each other and any problems are quickly solved through personal contact. The problems begin when distributed development enters the equation and idealism falls short (Herbsleb 2007).
- **Exponential increase in software complexity due to service orientation**- where Glass claims that for every 25% increase of complexity in the business domain, there is an increase of 100% in the software complexity for the systems that needed to support that business, like presented in Figure 3.15. The service orientation is known for its richer interdependencies between business (Glass 2002).

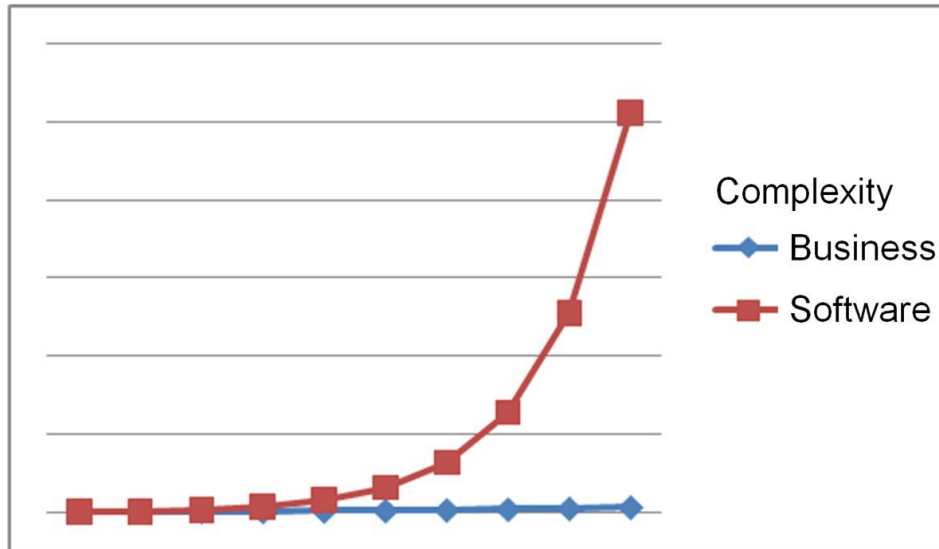


Figure 3.15- Complexity evolution of business over software (Capgemini 2009)

The width of the solution delivery must be understood as the challenge of delivering a given solution within time and budget and to align the understanding of the business, which attends the several tasks to identify business needs (IIBA 2006), the application of engineering on the IT solution, by applying a systematic and disciplined approach to software development (IEEE 2004) and the management of solution delivery, the typical domain of Project Management (PMI 2008).

While Project Managers remain the primary role for managing solution delivery, architects will play an increasing role in leading projects – like the construction architects example presented already, who remain at the side of the project leaders until completion of the building – ensuring quality, usability and time to market.

The solution architect takes architectural, quality and feasibility responsibility for a given domain or system, integrating the views and capabilities of various groups of specialists. It is the role's objective to make sure a solution is delivered with acceptable overall quality for all the stakeholders.

In order to do this successfully, and form a well-balanced team with the project manager, the solution architect should have a leading role on the Business Analysis domain and System Engineering, making sure that requirements, design and construction stay aligned and are feasible. Additionally he should have a supporting role in the project management domain,

making sure that planning, resources, commitments and risk recognition stay in line with the solution under construction.

For a typical IT project his span of control will have to travel across a great number of knowledge areas in order to be able to take responsibility for the solution's architecture, quality and feasibility (Capgemini 2009).

A simplistic vision of the Solutions Architect role is that he or she "just" creates architecture blueprints, and his/her responsibilities encompass all the activities of doing so. This includes architectural vision articulation, conceptualize and try alternative approaches and validate the resultant architecture against business requirements. However, every experienced architect knows that the role does not cover technical aspects only, but also more political and strategic, on one hand, and a consultant role, on the other.

For many developers, the most requested role is the Solutions Architect. This type of architect is the one that manages the development effort and is responsible for the baseline vision and its execution in order to create the solution itself.

The core of a Solutions Architect is to convert requirements into architecture and design, which later become the blueprints of the solution to be created (Bogue 2005).

According to Bredemeyer and Malan, the solutions architect has to perform several sub-roles, such as a technophile, a business strategist, organization politics, a consultant and of leadership (Bredemeyer and Malan 2009).

3.4.1. Technological Role

In the kind of role, the architect needs a detailed knowledge about the organization's products, relevant technologies and development processes. This role includes articulating architectural vision, conceptualize, experiment and change architectural approaches. Thus, the architect must have the architectural background to correctly deal with problems of this nature and lead the collaboration towards the solution.

Table 3.1 summarizes several dimensions of the technological role.

What you KNOW	What You DO	What You ARE
In-depth understanding of the domain and pertinent technologies	Identify and address architectural challenges	Creative
Understand what technical issues are key to success	Create models and assess alternative approaches	Investigative
Development methods and modeling techniques	Prototype/experiment/simulate	Practical/pragmatic
	Prepare architectural documents and presentations	Insightful
	Technology trend analysis	Tolerant of ambiguity, willing to backtrack, seek multiple solutions
	Take a system viewpoint	Good at working at an abstract level

Table 3.1- Technological nature of a Solutions Architect role.

In most of the cases, this technological role is viewed as the main one. But actually, if a junior architect plays the aforementioned type of role, then a senior architect will be a strategist, contributing to the business strategy.

3.4.2. Business strategist

This kind of role falls into architects' hands when he/she is well aware of the company's business strategies. The main knowledge category need is market perception, thus knowing the organization's target market(s), its products and strategies and most of all, its competitors. Also, it is crucial to be aware of the crucial business factors that influence the organization and be capable of translating all that factors into architecture requirements. However, the circumstance that will dictate an architect's success at this particular stage will actually be a skill: His/her entrepreneurial genius and the ability to bring business requirements into the technical domains (Seliger 1997). Seliger also advocated that the underlying thought of a solutions architect should be to sell, sell, sell.

This role's description summary is presented in Table 3.2.

What you KNOW	What You DO	What You ARE
Your organization's business strategy and rationale	Influence business strategy	Visionary
Your competition (products, strategies and processes)	Translate business strategy into technical vision and strategy	Entrepreneurial
Your company's business practices	Understand customer and market trends	
	Capture customer, organizational and business requirements on the architecture	

Table 3.2- Strategic nature of a Solutions Architecture role.

3.4.3. Organizational politics

This organizational politic side of an architect must be based on the motivation to seek agreement amongst collaborators. This role’s resemblance to a charismatic leader is no coincidence. The architect must convey passion to the team and support them while dealing with any kind adversity.

Whenever an architect “fills this shoes” he or she must have an considerable influence with the stakeholders, understanding each key-people’s personal and organizational goals. Table 3.3 presents a summarized description of this kind of role (Bogue 2005; Bredemeyer and Malan 2009).

What you KNOW	What You DO	What You ARE
Who the key players are in the organization	Communicate, communicate, communicate!	Able to see from and sell to multiple viewpoints
What they want, both business and personal	Listen, network, influence	Confident and articulate
	Sell the vision, keep the vision alive	Ambitious and driven
	Take and retake the pulse of all critical influencers of the architecture project	Patient and not Resilient
		Sensitive to where the power is and how it flows in your organization

Table 3.3- Politic nature of a Solutions Architecture role.

This competency domain creates the necessary organizational support to obtain the required architecture. The next role aims to execute what architectural designs were produced in this section.

3.4.4. The consultant role

The main group of collaborators that uses the architectures are the developers, who create products or components, not with the intent of making them successful but to attain the required functionalities, schedule and quality requirements. The task, as an architect, includes reckoning that developers are his or her first customers and that the architecture should provide a good solid base to work.

What you KNOW	What You DO	What You ARE
Elicitation techniques	Build "trusted advisor" relationships	Committed to others' success
Consulting frameworks	Understand what the developers want and need from the architecture	Empathetic, approachable
	Help developers see the value of the architecture and understand how to use it successfully	An effective change agent, process savvy
	Mentor junior architects	A good mentor, teacher

Table 3.4- The consultant side of a Solutions Architect.

What really helps achieving success in this role's perspective is to be committed to other's success and acknowledge how groups adopt new processes (Bredemeyer and Malan 2009).

3.4.5. The leader role

The top role, which manages the aforementioned ones, the one that passes the dynamics is the leadership. Every team needs a leader. This type of leader is crucial to communicate the team's vision and to motivate both the main and support teams.

This is one of those roles that the architect, or every other leader, must be, instead of wanting to be.

Table 3.5 presents a view of what a leader Solutions Architect must be.

What you KNOW	What You DO	What You ARE
Yourself	Set team context (vision) Make decision (stick) Build teams Motivate	You and others see you as a leader Charismatic and credible You believe it can and should be done, and that you can lead the effort You are committed, dedicated, passionate You see the entire effort in a broader business and personal context

Table 3.5- The leader’s role.

Paul Teeuwen and Raymond Slot claim, in a study regarding the influence of enterprise and all domain architectures on project variables such as budget overrun and time, that one of the most significant facts of the cause-and-effect mechanism they designed is that enterprise and domain architectures do not have a direct influence on improving time and budget of the project. The effect works through having a Solution Architecture. Theoretically, it is possible to have a solid Solution Architecture without enterprise and domain architectures, but in practice that will not happen. They added that the solution architect’s expertise in the project’s business field had an influence on the percentage delivered as well as some influence on the customer satisfaction. A solution architect’s experience in projects of the same size strongly influences customer satisfaction. We can explain this from the fact that more experienced architects are used for the bigger projects.

These two facts indicate that the choice of solution architect is an important one in staffing the project. In the pre-project phase, having a solution architect involved in the project’s technical calculation reduces the sigma in its budget (Teeuwen and Slot 2010).

After analyzing what a Solutions Architect should be, it’s important to take a moment to reflect on who should be a Solutions Architect. Figure 3.16 describes the context of a solution for administrative systems. Within this context you see an example for a solution architect with a custom software background and who has developed a breadth of understanding across all the domains the need to be aligned for project success. The deep knowledge of custom software is the vertical bar of the “T”, the wide knowledge across the domains is the

horizontal bar of the “T”. Hence he/she has become a “T-Shaped” professional (Capgemini 2009).

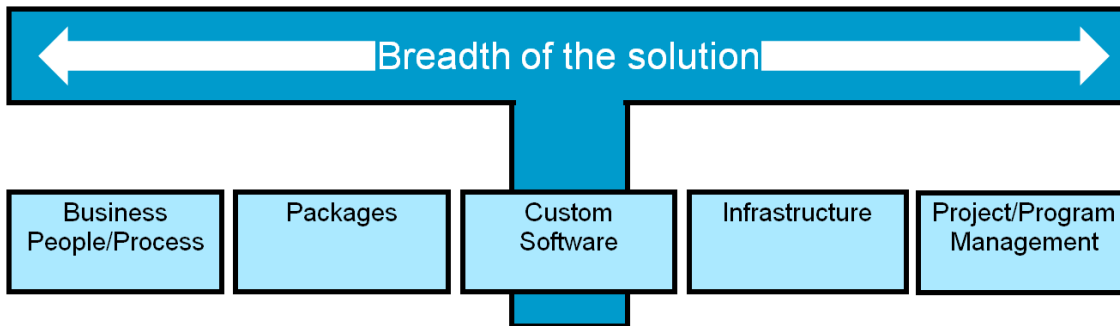


Figure 3.16- Breadth of a Solutions Architect

Coming from undergraduate or graduate level, a professional needs years of maturing to understand there is more to reality than just their current role or discipline. The nice thing though, there is no perfect discipline from which a solution architect should come. Any discipline like engagement management, packages, business analysis, custom software, and infrastructure is fine.

What should be a personal driver behind this is an authentic interest in the other people and their disciplines and the willingness and ability to align very different individuals whose world is sometimes very small compared to the real problems at hand (Weel and Wiersema 2009).

RESULTS

4.1. Wipro’s Methodology/ Best practices

In the first main phase, described in the previous section as Wipro’s current state methodology analysis, the contextual session resulted in the following: Wipro’s methodology and procedures are to be followed in a project for a retail customer, and exists around the implementation of Oracle Retail Products.

This methodology is in its primordial phase and started when in-house parties mirrored their project experience and selected TOGAF as a reference to define a formal methodology.

There are seven methodologies available that can be applied in a Retail project. These methodologies are applied by Wipro Retail whenever the customer does not impose his own methodology. This, however, does not preclude that in particular projects, one or more sub-methodologies can’t be integrated with customer’s own methodologies, filling or attending some gaps or particular structural needs.

Figure 4.1 presents the way methodologies can be applied in a retail project.

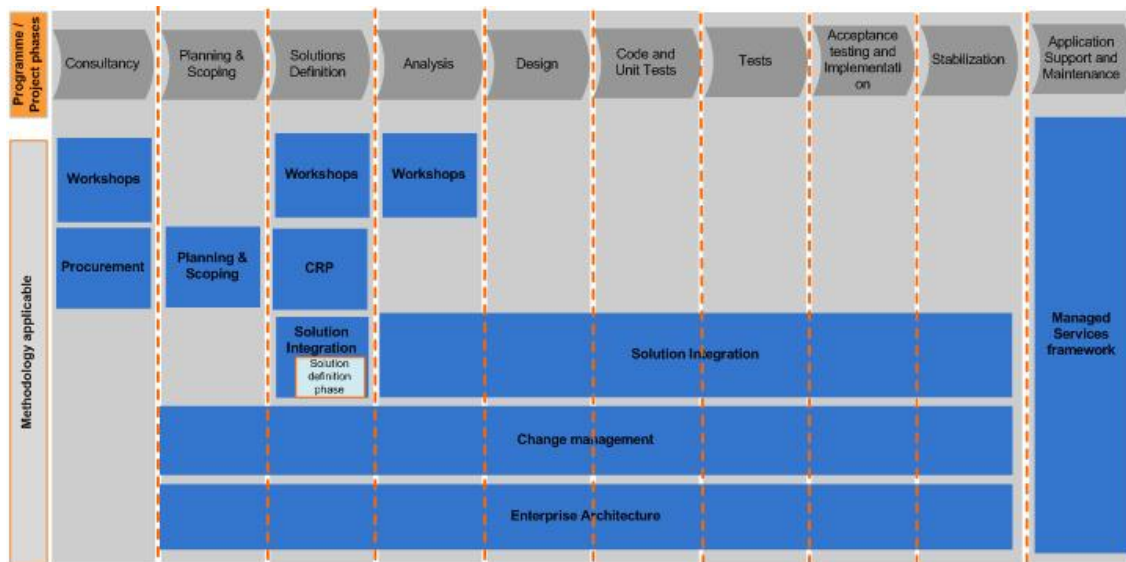


Figure 4.1 - Wipro Retail main methodology divided into its seven sub-methodologies.

At this point, the domains presented are the ones documented, perceived as most critical and only a few that should be considered. Thus, this main methodology is not complete and it is intended to be designed/completed over time.

4.1.1. Enterprise Architecture Methodology

The Enterprise Architecture activities cover business processes and IT infrastructure and their relationship, which will be used to support the organization's business goals.

These activities will occur across several phases in a project's life cycle, from the Planning & Scoping phase to the Stabilization phase. The areas covered by this methodology are:

- Vision & Strategy
- Data Architecture
- Business Processes
- Application Architecture
- Version Control

Each one of these methodologies has an owner that is responsible to define the methodology activities, to conduct methodology analysis, researches and to propose the implementation of initiatives to improve/innovate the methodology, to assure that the critical activities are described and to conduct the needed training to assure the necessary resources to the methodology execution.

Figure 4.2 illustrates the aforementioned Enterprise Architecture methodology, which intends to identify and describe a set of activities that will guarantee the integrity and consistency of the overall solution.

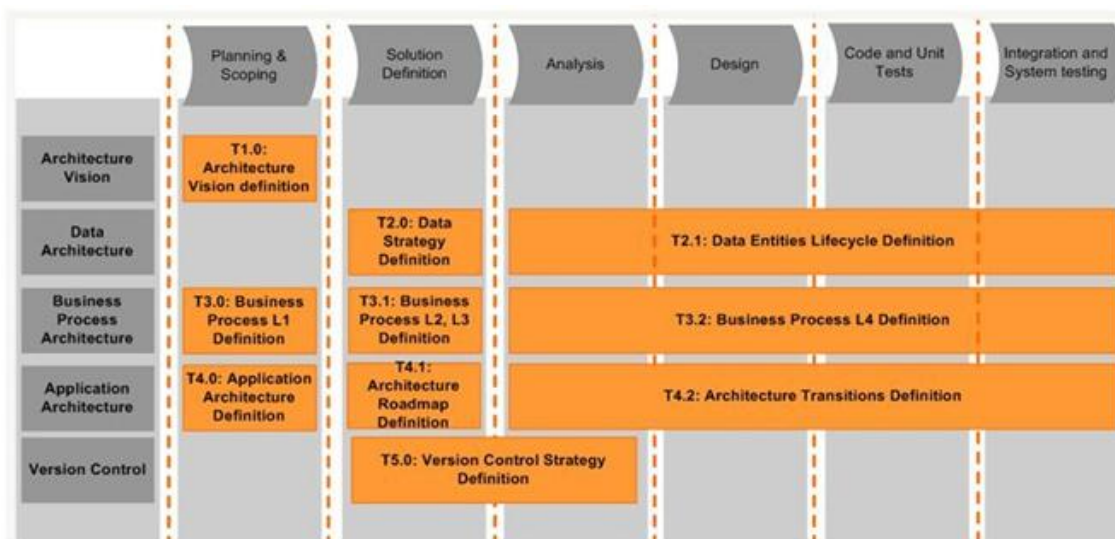


Figure 4.2 - Wipro's Enterprise Architecture Methodology.

These set of activities will occur across several phases in a project's life cycle and will be part of the existing methodologies, namely: Planning & Scoping, Conference Room Pilot and System Integration. These activities can be applied globally or when justified, partially.

4.1.2. Task description

The following topics will explain the task currently documented and its main artifacts and dependencies.

Task 1.0: Architecture Vision Definition

The objective of this activity is to capture and document the Business Vision for the Retail Project.

The Business Architecture Vision is the starting point for any project and works as a compilation of corporate guiding elements that should shape the landscape of the project and help steer its progress.

It is expected that the customer had already performed preparatory work on this topic and may already have a strong understanding of all these guiding elements, in which case, the vision is shared with Wipro, or it may be a collaborative exercise, where Wipro is called upon to participate and bring its experience in building the Vision. Either way, the Business Architecture is one of the most strategic elements of the program, with very high level of seniority from the participants that contribute for the Vision.

The main artifact produced is the Architecture Vision document and the following aspects are addressed:

- Business Drivers (Goals and Objectives)
- Expected Benefits
- Business Constraints and Dependencies
- Business Differentiators
- Key Stakeholders
- Architecture Principles

In Table 4.1, a summary of Business Architecture Vision is presented.

Tasks	Input	Output	Suggested template	Responsibility	Validation Mechanism	Review Checklist
Architecture	Business Discovery	Architecture	Architecture	Architecture	Document	Customer
Vision		Vision	Vision	Team	Review	
Definition	Workshops	Definition				

Table 4.1 Business Architecture Vision summarized.

Task 2.0: Data Strategy Definition

The objective of this activity is to address the Data Strategy topic. The produced content should address the following aspects:

- Scope: data entities and applications;
- Data Principles;
- Stakeholders and Responsibilities;
- Cleansing approach;
- Rationalization approach;
- Conversion approach;
- Data quality approach;
- Auditing mechanisms.

The main input for this task is the Architecture Vision created in the previous task. The Architecture principles statements from the previous documents will be critical to produce the

appropriate strategy to deliver the data requirements aligned with the global Architecture Vision. This activity occurs during Solution Definition phase and is a result of a joint effort between the Architects teams and the customer representatives that look after data. The output document, Data Strategy, is submitted to a review in order to guarantee that all critical topics were correctly addressed. The signing of this document ensures that its contents have been understood and approved by all parties involved in its creation.

Task 2.1: Data Entities Lifecycle Definition

The objective of this activity is to characterize the data entities life cycle. The input for this stage is the output of the previous stage, Data Strategy Document. The content produced in this activity should address the following aspects:

- Life cycle characterization challenges;
- Data entities and applications;
- Life cycle status, actions and conditions.

This activity receives the Architecture Vision and Data Strategy documents as main inputs. The output document, data entity lifecycle, is a result of a joint effort between the Architect team and the client representatives. The production of this document occurs in several iterations between these stakeholders. To promote the discussion and consolidation of the content to be produced, it is advisable to schedule several meetings involving the stakeholders.

In Table 4.2- Data Architecture summarized, a summary of the Data Architecture Phase is presented.

Tasks	Input	Output	Suggested Template	Responsibility	Validation Mechanisms	Review Checklist	Approval Authority
Data Strategy Definition	Architecture Vision	Data Strategy document	Data Strategy	Architecture Team	Review	Document Review	Architects team / Customer's Data
	Application Architecture						
Data Entities Life Cycle	Architecture Vision	Data entities life cycle document	Data Entities Life Cycle	Architecture Team	Review	Document review	Architects team / Customer's Data Architects
	Data Strategy						

Table 4.2- Data Architecture summarized

Task 3.0: Business Processes L1 Definition

The main objective of this activity is to describe the Business Processes Level 1 for the As-Is and To-Be Architectures. The Level 1 design occurs during the Planning and Scoping phase. This task's input is the Architecture Vision document which will reflect the main areas of business that should be addressed in the business process design. The output of this activity is consolidated in two documents, one for the As-Is and other for the To-Be business processes.

These Level 1 documents are submitted to a review in order to guarantee that all the critical topics were addressed.

Task 3.1: Business Processes L2, L3 definition

This task has as main objective the description of the business Processes Level 2 and Level 3 for the As-Is and To-Be processes. This activity is done during the Solutions Definition preparation phase, however, depending on project's needs and manager's decision, it can also be done in the next phase, the Analysis stage. The main input is the Business process Level 1 produced in the previous stage.

Task 3.2: Business Processes L4 Definition

The objective of this activity is to describe the business process level 4 for both As-Is and To-Be architecture. This activity will receive the Business Process Level 3 as main input.

In Table 4.3, a summary of the Business Process Phase is presented.

Tasks	Input	Output	Suggested template	Responsibility	Validation Mechanisms	Preview Checklist	Approval authority
Business Process L1 Definition	Architecture Vision		Business Process As-Is or To-Be	Architect, Process Lead, Process Consultant,	Review	Document Review	Customer
Business Process L2, L3 Definition	Business Process L1		Business Process As-Is or To-Be	Architect, Process Lead, Process Consultant,	Review	Document Review	Customer
Business Process L4 Definition	Business Process L2, L3		Business Process As-Is or To-Be	Architect, Process Lead, Process Consultant,	Review	Document Review	Customer

Table 4.3- Business Architecture summarized.

Task 4.0: Application Architecture Definition

The objective of this task is to identify and characterize the list of applications modules in the current Architecture and to identify the application Architecture which will support the future business operations. The following topics are addressed in this stage:

- Architecture Principles;
- Application modules and its relationship;
- Data & functionalities;
- Business criticality;
- Stakeholders' identification.

As a continuous Architecture evolution exercise, the output for this activity will be both the As-Is and To-Be application architecture documents with the corresponding application modules described. Similarly to previous tasks, the main input for this activity is the Architecture Vision.

Task 4.1: Architecture Roadmap Definition

The objective of this task is to develop the application's Roadmap by prioritizing the delivery of each of the application modules and respective functionalities. To be able to do such prioritization it is fundamental to incorporate the business priorities and benefits in the Roadmap. Thus, the Architecture Vision and the Application Architecture are key inputs for this activity.

Task 4.2: Architecture Transitions Definition

The objective of this task is to detail the Architecture Transitions. The content discussed in this activity focuses on the following topics:

- Business enablement;
- Data requirements;
- Implications on migration, Go-Live and rollout;
- Risks and Mitigation.

In Table 4.4, a summary of the Application Architecture Phase is presented.

Tasks	Input	Output	Suggested template	Responsibility	Validation Mechanism	Review Checklist	Approval Authority
Application Architecture definition	Architecture Vision	Application Architecture As-Is	Application Architecture As-Is or To-Be	Architects team, Customer	Review	Document Review	Architects Team, Customers Applications Architects
Architecture Roadmap Definition	Architecture Strategy	Architecture Roadmap Document	Architecture Roadmap	Architects team, Customer	Review	Document Review	Architects Team,
Architecture Transitions' Definition	Application Roadmap Diagram	Architecture Transition Document	Architecture Transitions	Architects team, Customer	Review	Document Review	Architects Team,

Table 4.4- Application Architecture summarized.

Task 5.0: Version Control Strategy Definition

The main objective of this task is to define the Version Control Strategy and addresses the following:

- Version Control types;
- Repository and Structure;
- Tagging strategy;
- Branching Strategy;
- Merging strategy;
- How to manage several environments.

In Table 4.5, a summary of the Version Control Phase is presented.

Tasks	Input	Output	Suggested template	Responsibility	Validation Mechanism	Review Checklist	Approval authority
Version control strategy definition		Version Control strategy document	Version control strategy	Architects team	Review	Document Review	Architects team, infrastructure,

Table 4.5- Version Control summarized

4.1.3. Wipro's Methodology Mapping

Following Wipro's Enterprise Architecture Methodology analysis, second and third main phases' results of the study process described in the previous chapter are presented together. Instead of mapping Wipro's methodology to the different TOGAF phases and then start over from the beginning of the methodology to present the suggested best practices, each methodology task will be mapped, and suggested the corresponding best practice(s).

Preliminary Phase

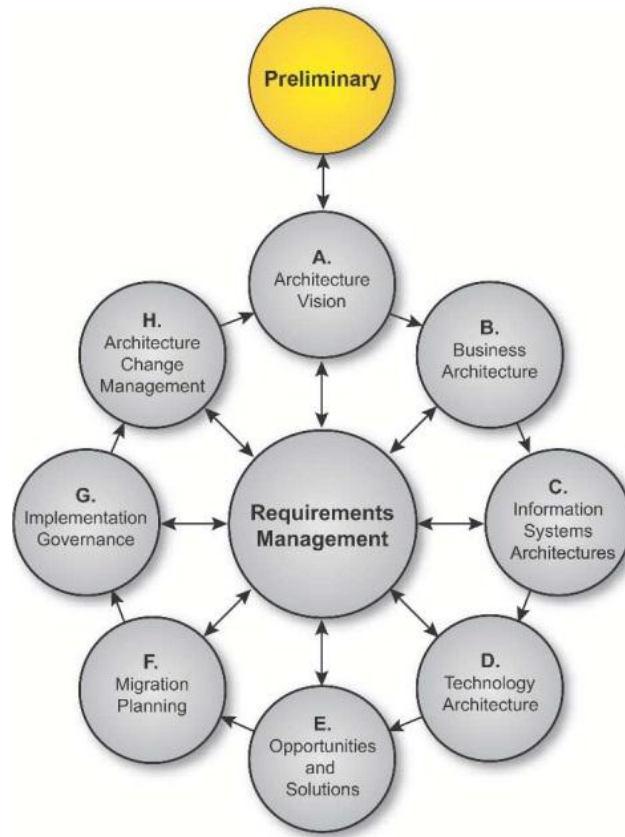


Figure 4.3 - Preliminary Phase.

This phase intends to review the organizational context for conducting the Enterprise Architecture exercise, identify the sponsor's stakeholder(s) and other major stakeholders impacted by the directive to create an Enterprise Architecture and determine their requirements and priorities. Besides, it's critical to ensure that everyone who will be involved is committed to success.

The project team also defines the architecture principles that will form part of the constraints of any architecture work. Also, crucial tasks like identification and EA elements' scoping that are affected by the business directive are performed.

Like the objectives described, many more are proposed in TOGAF's Preliminary Phase, but by porting these best practices to Wipro's reality, quickly becomes clear that many of those practices are executed outside Wipro's EA methodology, in the Conference Room Pilot and Planning and Scoping methodologies. For this reason, it was decided that this first ADM phase is not directly mapped to Wipro's EA methodology, however, it will be accounted for the overall coverage of TOGAF, since it is part of Wipro's main methodology.

Phase A: Architecture Vision

The Architecture Vision is a key tool to sell the benefits of the proposed capability to stakeholders and decision-makers within the enterprise. Architecture Vision describes how the new capabilities will meet the business goals and strategic objectives and address the stakeholder concerns when implemented (Group 2009).

This phase acts as the first set of activities that takes place at Wipro's EA Methodology. As described in "Task 1.0: Architecture Vision Definition" the addressed aspects are:

- Business Drivers (Goals and Objectives)
- Expected Benefits
- Business Constraints and Dependencies
- Business Differentiators
- Key Stakeholders
- Architecture Principles

At this point, considering that the Architecture Vision document is part of TOGAF's core artifacts and undoubtedly the main output of the whole ADM process, it needs double the attention, and as of now, it is incomplete and must be finished and approved as soon as possible.

The second issue to address at this stage reviews both roles and responsibilities for architecture team(s). Here a RACI (Responsible-Accountable-Consulted- Informed roles) matrix definition becomes crucial and thus, a responsible entity in charge of keeping this record updated is required, for example, a Project/Program Management Office (PMO). This full-time requirement is explained through the high rotation level on personnel observed even within project releases/implementations or specific deliverables. With this, each deliverable would have its RACI Matrix. Going even further, it would be advisable to consider a tool to monitor these changes and tie them with document status. This tool could show a document status, and it could only be changed through this tool by the correct owner. With this paradigm, it is possible to have a requirements matrix for each analyzed document, what's missing, and it is possible to do a direct mapping between which requirements, gathered from CRP sessions, originate from a specific technical or functional document.

By this, each document would be associated with a process phase, and quick check could reveal who is responsible, accountable, informed or consulted.

Besides these recommendations, one of the best outcomes of adopting an EA Methodology like TOGAF is using its “reuse” policy. What this means is, there is a way in which an enterprise can store its knowledge from past projects and give it even more usability by reusing it in future projects. This kind of knowledge takes the form of architectural blocks, a reference library and an architecture capability model. This kind of model is called the Architecture Repository. This repository can store different classes of architectural output at different levels of abstraction, created by the ADM process. With this repository implemented, which serves as the central hub for all documentation, architects are encouraged to leverage all other relevant architectural resources and assets available through Wipro’s architecture pool.

At this point, Wipro’s EA methodology lacks a formal description of steps to handle the inputs and reach the correct outputs. Being this approach a tailored one, it is not expected to totally on a set of generic steps, however, there are some recommendations that should be considered at this stage. Such steps are:

- Define the Target Architecture value propositions and Key Performance Indicators;
- Identify the business transformation risks and mitigation activities.

Wipro’s output at this stage is a single Architecture Vision Document, where it lacks business cases and a clear communication plan.

Phase B- Business Architecture

At this stage, the main objectives are to develop a Target Business Architecture, describing the product and/or service strategy, and the organizational, functional, process, information, and geographic aspects of the business environment, based on the business principles, business goals and strategic drivers.

From Wipro’s practice, the activities done at this point are the Business Process Level 1, 2, 3 and 4 definitions.

From a best practice perspective, the main activity, alongside Business Processes’ design, is Baseline description development. The inputs for this artifact may already be available and in use in Phase A, however, in the chance of no such input exists, the required information can be gathered in whatever format comes to hand.

There must be a logical link between the current and the previous phases. This links take the form of business scenarios previously created on the Architecture Vision and therefore, the architecture being created can thus be mapped from the high-level business requirements down to the more detailed ones.

In Phase A, the Architecture Repository was firstly introduced, now as part of Phase B, it is time for the architecture team to step in and assess what useful assets there are and make use of them. For this specific scope, generic business models concerning the retail industry should be taken into account.

Regarding the Enterprise Continuum, these architectures should be stored at the “Industry Architectures” section.

Phase C- Information Systems Architecture

Phase C differs from the other phases due to its two-phase aggregation. The Information Systems Architecture, divided into Data Architecture and Application Architecture, aims to develop Target Architectures covering both sub-architectures. Its focus is on identifying the applications and data considerations that support an enterprise’s Business Architecture.

The question posed at this point is whether to start from Data or Application Architecture. In this field, advocates exist for both sequences. For example, Steven Spewak’s Enterprise Architecture Planning (EAP) recommends a data-driven approach, building from the bottom-up regarding granularity.

On the other hand, major applications systems, such as those for Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), etc., often provide a combination of technology infrastructure and business application logic and some organizations take an application-driven approach, whereby they recognize certain key applications as forming the core underpinning of the mission critical business processes, and take the implementation and integration of those core applications as the primary focus of architecture effort (the integration issues often constituting a major challenge)(Group 2009).

For these reasons, an Application Architecture driven approach was considered and advised as the first Information Systems Architecture focus.

Application Architecture

This phase deals with the necessary applications to support the business. Within Wipro's reality, the list of current architecture's application modules are identified and characterized, and the target application architecture, which will support the future business, is defined. It must be kept in mind that at this stage, the concern is not the application design but the kind of applications needed to manage data.

The first approach to this stage is to consider the inputs. From a TOGAF perspective, there is a complete set of inputs, ranging from architectural inputs like tailored architectural frameworks, constraints on architecture work, maturity and gaps assessment, architectural principles, architecture vision document and reusable building blocks from the Architecture Repository and a set of non-architectural inputs like capability assessment or communication plan. From Wipro's perspective though, the architectural inputs also include architecture principles regarding applications, the relationship between application modules and its functionalities and data. For the non-architectural inputs, Wipro has business criticality assessment and shareholders' identification. For the first task, Task 4.0- Application Architecture definition, the Architecture Vision document is the main input and as a result the As-Is and To-Be application architecture documents are produced with the corresponding application modules described. This task conveys to TOGAF in the form of Baseline Application Architecture Description and Target Application Architecture Description.

Before detailing Wipro's Task 4.1: Architecture Roadmap, which is obviously the next one being done, TOGAF suggests doing a gap analysis before defining the subsequent roadmaps. This gap analysis consists of testing the architecture models produced so far for completeness against functional requirements. Thus, is possible to identify the gaps between the baseline and target artifacts. At this point, it is crucial to analyze what might have been forgotten. For example, there may have been a change at the stakeholder committee, therefore, new concerns might have arisen, thus haven't been addressed in prior architectural work.

The following task, Task 4.1, aims to develop the application roadmap, prioritizing the delivery of each of the application's modules and corresponding functionalities. To achieve said aim, implementation phases, timelines and application dependencies are addressed within this phase. Frequent meetings involving the architects' team and client's representatives are critical to agree in one of the most important phases in the process, since the functionalities required are confronted with the technology that will support it.

The Application Roadmap is the last input of the Application Architecture produced at this phase, but this is just an initial architecture since the complete Application Architecture definition will only be produced and be part of a cross-discipline roadmap at the end of Phase E- Opportunities and Solutions.

The last task, 4.2, performed by Wipro at this phase addresses Architecture Transitions and constitutes one of many specificities to this business area. This Architecture Transitions mainly attend the implications on migration, Go-Live and rollout activities, all with risk and mitigation assessment. At this phase, TOGAF documentation only advises to do a preliminary application migration diagram, exporting the implementation and migration planning to the next phase, Phase D- Technology Architecture, where the physical realization of an architectural solution is defined.

Data Architecture

Having in mind that Wipro in almost every project deals with legacy systems, a Data Migration strategy is crucial at this stage. Therefore, when the need to replace a certain application (putting it simple) appears, there is obviously the need to migrate its data. The activities described below aim to establish a migration and conversion requirements as well as present a cleansing approach for the target data format which meets the requirements.

In Wipro's practice of Data Architecture, beginning with Task 2.0- Data Strategy Definition, the aspects to address are:

- Scope: data entities and applications;
- Data Principles
- Stakeholders and Responsibilities;
- Cleansing approach;
- Rationalization approach;
- Conversion approach;
- Data quality approach;
- Auditing mechanisms.

This task is a joint effort between Wipro's Architects team and customer's data representatives. At this point, regular meetings are held with customer's business and technological analysts. The input/output diagram for this phase is the following Figure 4.4.

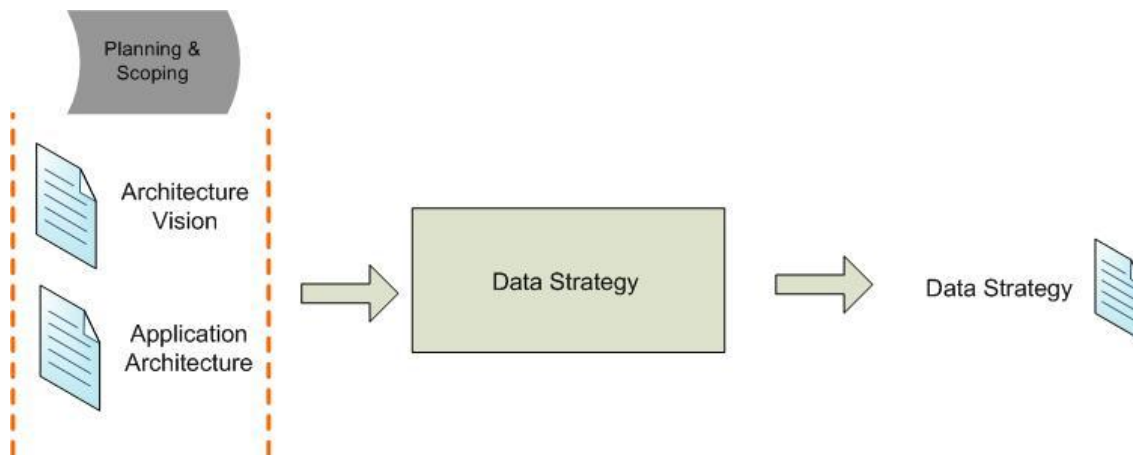


Figure 4.4- Data Architecture artifacts

The second task of Data Architecture, Task 2.1: Data Entities Lifecycle Definition, is a specificity of Wipro, since it is not covered in TOGAF. This task analyzes data entities lifecycle and maps the data used in every application.

Once again, this phase can highly profit from the Architecture Repository's artifacts, such as organization standards and organization-specific reference models. At this stage, there must be a future vision redefinition, meaning that the Baseline Business Architecture and the Target Business Architecture produced in Phase B must be updated after completing this Phase. The objective at this stage is to define the types and sources of data necessary to support the business, in such way that is understandable by stakeholders (Group 2009).

Version Control

Version control constitutes the last phase of Wipro's Enterprise Architecture Methodology. Although it makes sense to include this phase in Data Architecture or Application Architecture, the truth is that it "feeds" a lot more steps than just those two, because Wipro's Version Control task encompasses tagging strategy, branching strategy, merging strategy, rules and principles of usage, stakeholders, repository and structure and communication model. Besides this, the architects' team, release managers and infrastructure teams are involved in this document's production. By being accessed by several teams and competency centers across Wipro, this task stands outside any other task or Architecture development, thus playing a standard company role.

This task, however, is not clearly described in TOGAF and only activities regarding stakeholders and repository and structure definitions are performed, but all separately and with different timings.

4.1.4. High-Level Completeness

To assess the level of completeness of Wipro's methodology opposing to TOGAF, we need to take into account, once again, that only the documented steps/phases are analyzed, leaving hypothetical uncategorized ones aside. Although the analysis reaches its limits specifically at Wipro's Enterprise Architecture methodology, there are some steps within adjacent methodologies that are covered in TOGAF but, within Wipro's practice, are available outside Wipro's EA methodology to serve other Competency Centers.

Wipro's EA Methodology

This section will present which TOGAF phases and support materials are being used within Wipro's EA methodology.

As mentioned in the Literature Review section, the TOGAF Document is composed by six parts, which are:

- Architecture Development Method (ADM);
- ADM Guidelines and Techniques;
- Architecture Content Framework;
- Enterprise Continuum and Tools;
- TOGAF Reference Models;
- Architecture Capability Framework.

From the first part, the ADM process, Wipro's Enterprise Methodology covers four out of ten available. Figure 4.5 presents Wipro's EA methodology coverage.

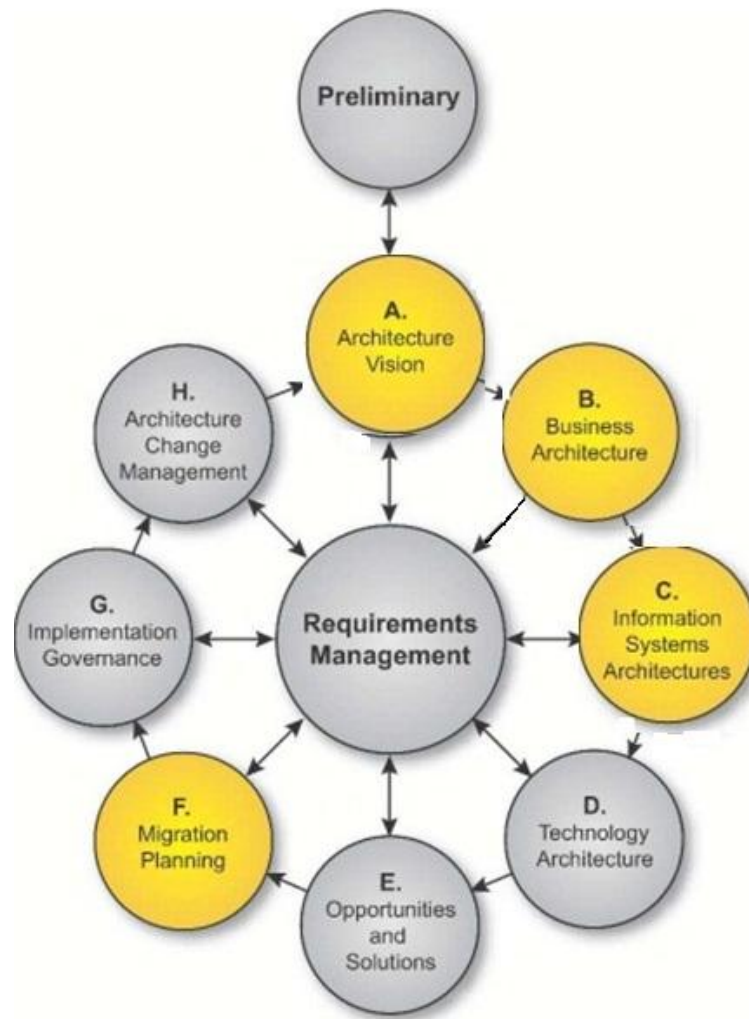


Figure 4.5 – TOGAF's ADM Method

As you can see in Figure 4.5, Wipro's EA methodology covers 40% of TOGAF's ADM. But if we consider that most of the activities outside Wipro's EA methodology should be within it and map those activities to TOGAF's ADM process, the percentage rises up to 70%. For this percentage contributes such tasks as Change Management (covered in Phase H with the same name), Consultancy CRP and Procurement phases (which cover ADM's Preliminary Phase) and Solution Integration which covers Wipro's business in terms of Technology Architecture, Phase D.

Regarding the second part of TOGAF's document, ADM Guidelines and Techniques, Enterprise Architecture principles and Business Process Guidelines are available. Also, templates for Phase A (Architecture Vision), Phase B (Business Architecture) and Phase C (Information Systems Architecture- Data Architecture) are available.

Apart from these two components of the TOGAF Document, none of the following are covered as of today: Enterprise Continuum and Tools, Architecture Capability framework, Reference Tools and Architecture Content Framework.

To obtain a round value for the level of TOGAF coverage by Wipro, a points system was used. So, considering that the ADM process is the core of TOGAF, it counts for 30%. Then 20% was given to ADM Guidelines and Techniques, without which, the process couldn't be well applied and shaped to each enterprise's business. Also with a 20% importance appears the Enterprise Continuum and Tools which make for TOGAF's technology foundations. The remaining 30% are equality distributed by Architecture Content Framework, TOGAF Reference Models and Architecture Capability Framework, which serve as a support for the previous parts.

If we consider Wipro's practice, we have seven out of ten ADM phases documented, 60% of the required (to cover each documented phase) Guidelines and Techniques, and none of the remaining TOGAF Document parts addressed, which results in 33% coverage by Wipro.

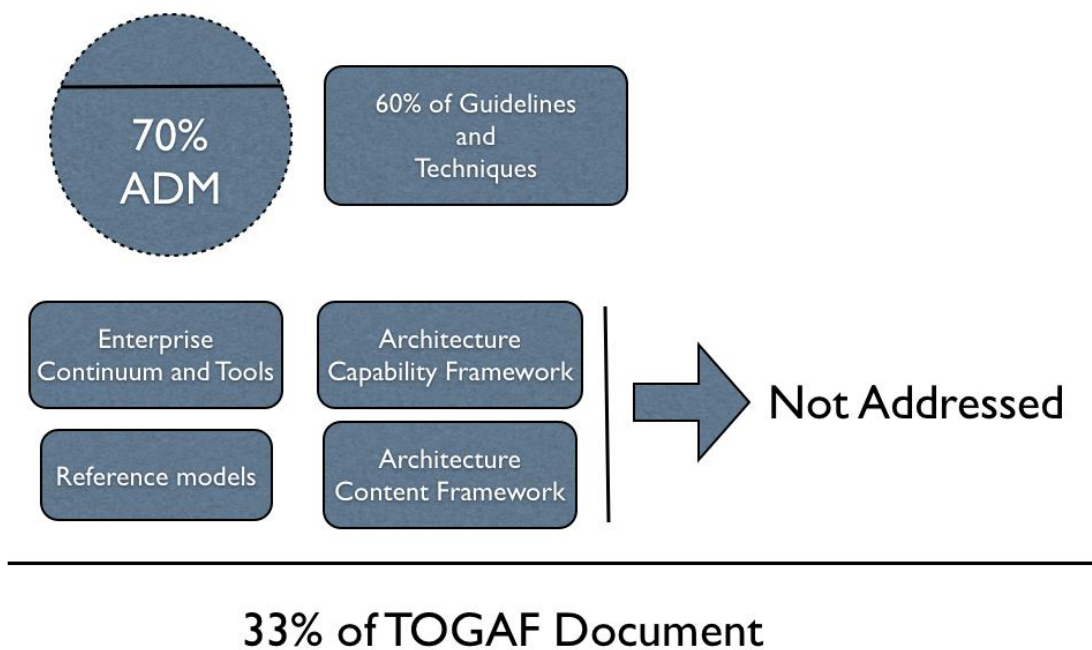


Figure 4.6 - Wipro's TOGAF Document coverage.

4.2. Survey Results- Methodology wise

One of the objectives of the survey, and the one presented in this section, was to debrief the questioned architects about their field experience, methodologically wise. The questions given below take into account the fact that Wipro's EA Methodology is applied whenever the customer does not impose a proprietary methodology or when a customized approach deemed necessary to fulfill specific project needs.

Survey's Question five: "Regarding previous retail projects, what was the main methodological approach?"

The choices were:

- Only Wipro's customers methodologies were used.
- Only Wipro's methodologies were used.
- In most projects, Wipro's methodologies were integrated alongside with customer's methodologies.

The following chart is only a part of the result since this question, like some of the others, has an open field to add comments, which was the case. Architects gave extra help in a question made with a few words, leaving room for ambiguity and forcing them to add their personal experience.

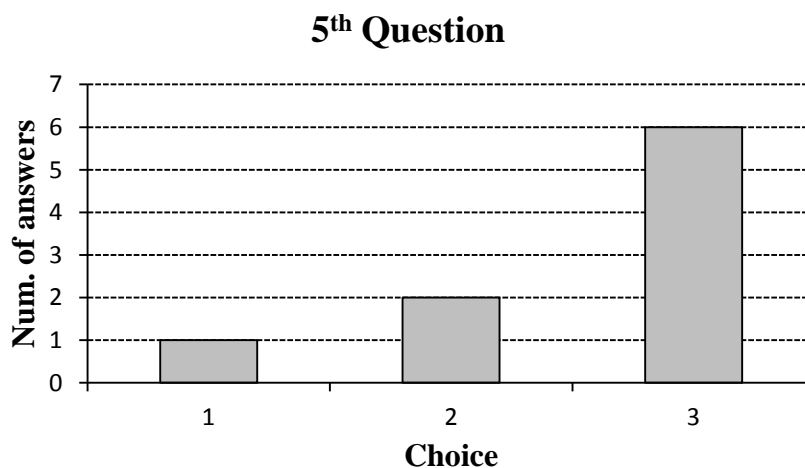


Chart 4.1 - Survey's Question 5- Adopted methodologies.

As stated before, some architects contributed a little more to this question by adding their personal experience. The first comment regarding the methodological choice was that it varies from one client to another depending on the client's maturity level. Another inquired architect stated that Wipro's methodology was defined in such way that it could be implemented on its

own or tailored to include customer's methodologies. He stated that his/her experience showed that projects are evolving towards a tailored methodology that provides more "comfort" to the customer, strongly impacting the necessary deliverables. This input was given by an architect who was involved in more than twenty three retail related projects.

The following question aimed to assess which of the approaches stated in the previous question were more successful, knowing before-hand that methodology choice is not the only variable, but by far one of the most relevant ones considering projects of this size and required effort.

Survey's Question six: In your opinion and with the projects you've worked on in mind, what projects do you think went smoother and were more successful?"

The choices were:

- The ones where the customer had architecture and methodologies already in use and Wipro's team was "absorbed".
- Standalone projects in which an architect's role exist on Wipro's behalf, but not necessarily on customer's side.
- Those in which Wipro applies a customized approach.

The following chart shows the answers' distribution for question six.

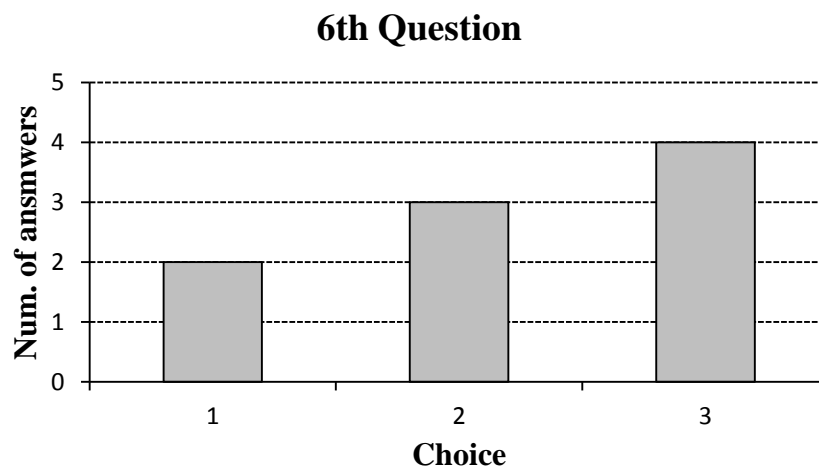


Chart 4.2 – Survey's question six, project's success

This chart demonstrates a lower accordance between the inquired architects, however following the same input as Question five, some additions to this question were made by the architects and can be a valuable asset to this results presentation.

One of the inquired architects states that Wipro's customized approach typically resulted in faster implementations with less management overheads. However, this does not mean that from a customer's perspective, this would be the method that would provide the best value to this customer's clients. Other opinion was, as stated at this question's presentation, the success of implementation is not directly linked with structure even though it is a variable that heavily impacts success. With that being said, in this architect point of view, both the customer and Wipro's structure should be similar in order to have the customer committed to the overall solution (in what relates to solutions architect). It is mandatory to have a Solutions Architect in the structure to make sure the solutions and impacts are looked at and have another part of the structure dedicated on execution.

The next question is not confined to a specific topic and therefore, the answers presented below will only have methodological related concerns and advices.

Question seven was: "What would you change, if you could, during past projects' course?"

The first methodological related answer circled around RACI matrixes, where the architect states that the existence of a formal architecture governance process must be ensured from projects' beginning with clear RACI matrixes, ways of working and roles and responsibilities defined.

The second topic concerned sponsorship, which is seen as having considerable relevance and was not seen quite often as expected in previous projects. Communication was also highlighted as core to projects' success and thus, a more straightforward communication at the right level is essential, typically related to upper management.

The third and last answer states that Wipro needs to be able to react quickly to enterprise level changes on the customer side without compromising architects' positioning, for example, C-level executives' changes may drive a re-definition of strategy. In this scenario, it is important to ensure the alignment with the new teams and engage in working towards the new strategies that are defined, ensuring that the ones followed in the past do not look like Wipro's faults.

Since the hot topic on the open questions was proven to be communication and strategic alignment, question eight was added to the survey to discuss these issues, with the results presented below.

Question eight was: "In a project scope, how do you assure or think should be assured that everyone is aligned, strategically and technically wise?"

The first answer focused on the communication topic, suggesting more periodic meetings, both internal and with the customer, and more granular deliveries by doing smaller deliveries instead of a single huge delivery.

The second answer is a bit similar to the first answer of the previous question, focusing on RACI matrixes and defending existence of a formal architecture governance process from the start of the projects with clear RACI definition, ways of working and defined roles and responsibilities, which will put in place the relevant communication mechanisms and information sharing across all projects and release levels.

The third answer argues that top-down communication is essential to strategy broadcast. Sponsorship is also mandatory so everyone is aware that the leadership is committed with the change. Change Management should be included in all project activities, which can manage the proper level of communication and message.

A fourth answer was given saying that the key strategic goals should be shared with different teams, through frequent meetings or other communication methods. Status meetings are important to share updates between teams. While evaluating new situations, processes and concerns, all streams should be involved in order to contribute to the discussion and ultimately, solution sign-off and then present it to the customer.

4.3. Roles definition

The first few meetings with the architects allocated to different projects, posed a few challenges. The first one was to understand that even having professionals from the same corporation, just the fact that they have worked in such different environments, gives them a very distinct view and opinion about their role's boundaries and interpretation.

Beginning with the experience from a top UK retailer, the roles implemented at this level were the Enterprise Architect, Solutions Architect and Domain Architect for each area of expertise. The Solutions Architect role is specifically requested by their customers, due to its wider knowledge regarding project phases, components, what will interact and affect those components and a huge factor to request this role, to concentrate that broader knowledge and apply it to the switch from legacy systems. The customers do not want a *big-bang* like model, there is just too much data sensitivity. This specific architectural role has to know every step

within Oracle Retail, and know the mapping of which modules must be installed in order to fulfill the established requisites.

At this UK retailer, the Solutions Architect is involved right from the beginning, by designing the solution's roadmap. This roadmap acknowledges which set of requirements will be addressed with the functionality available from that specific module and a pooling document is generated to gather the scope and the roadmap of the next release.

This pooling document is very detail-centric, whereas at this UK retailer exists a document with a higher level of abstraction, let's call it Alpha Document. This Alpha Document was created for the Enterprise Architect to interact with the stakeholders, because it's a summarized version. However, if more details are requested, it must be jointly analyzed with the pooling document and the blueprint document, like the name suggests, the lower level architectural document.

4.3.1 Survey Results- Role Definition

In the Study Description section, more precisely in the role definition subsection, the need for an internal survey was presented, result of a multiplicity of knowledge associated with distinct work experiences. In this section, the questions and results regarding the architect's role will be presented.

The survey was sent to fourteen architects from the architecture pool, having answered half of the surveyed, seven.

The first question of the survey regarding architectural roles and its activity was: "How would you define the Solution and Enterprise Architect role?"

The choices were:

- 1- A solutions architect is often, but not always, focused on technical architecture and the meeting of non-functional requirements, often in the context of deploying specific applications.
- 2- The Solutions Architect is deeply involved during the first phases such as consultancy, Planning & Scoping and Solution Definition but his/her involvement decreases until, ideally, it reaches zero at the system's development, having a quality assurance role only.

- 3- A solutions architect acts as a domain architect in a project scope. Depending on the size of the project, we will have, for example, a Business Solution Architect, a Technology Solution Architect and a Data Solution Architect.
- 4- A solutions architect acts as the accountable entity for the several architectures developed under the several domain architects guidance.
- 5- A solutions architect steps in when an application becomes so vast and complex that dealing with the overall technical vision and planning, and translating business needs into technical requirements becomes a full-time job.
- 6- An Enterprise Architect is a planning role that is responsible for identifying the future state of an organization's IT environment and engages wherever and whoever necessary to help guide project teams to deliver towards it.
- 7- The Solution Architect is a member of the Enterprise Architecture team but becomes at a later stage also a member of the Development team. His role is mixed; he is the bridge between concepts and implementation. However, the Solution Architect does not operate at the Strategic Architecture level (at Enterprise level).

The results were very conclusive, as follows:

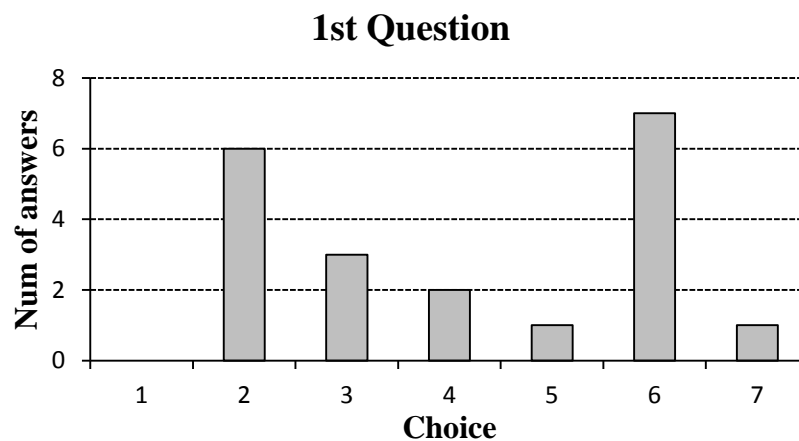


Chart 4.3 - Survey Results, Question one.

This first question, with a multiple choice nature, addressed the circumstances of the Solutions Architect role, the possible overlap between this role and the Subject-Matter-Expert (SME), here mentioned as a domain architect, and the Enterprise Architect role.

The following question is going to be used in other section, since its nature lets the inquired architects to give their opinion on several topics. In this section though, only architect's role related answers will be presented.

Question seven asks: “What would you change, if you could, during past projects course?”

The first answer stands for the case that during CRP phase, a solution architect must be present, so that he/she can start designing the solution from the project’s beginning. Other topic approached by a second answer was the proximity there was between Wipro’s and customer’s teams, in which is stated that customer’s resources should be involved earlier and tighter in the process, ideally from the beginning.

The third answer suggested that in previous projects, the solution architect role should have been included on the overall view design of the projects, strategically and technically.

Going in the same “open” direction as question seven, question eight focuses on how every team should be aligned.

Question eight was asked as follows: “In a project scope, how do you assure or think should be assured that everyone is aligned, strategically and technically wise?”

The first answer focused on the communication between the stream leader and the solution architect, stating that, in order to assure that all teams are aligned, each stream leader needs to be always in touch with the architect.

The second answer said that the solution architect role must have the overall view of the project, strategically and technically, and should be responsible to align with project’s main stakeholders.

In Annex 1, a full record of the survey’s results is available.

CONCLUSIONS

After applying the methodology described in 1.2, the support from the architecture teams, the pool manager and especially from Wipro's supervisor, were crucial to help understand the results. Mostly because of the debrief that was made in some questions, were the inquired were urged to give their personal experience, thus presenting situations or decisions that are not very clear or easy to understand when the person analyzing them does not have that kind of experience. The indication of the cases that underwent this kind of analysis will be made when deemed appropriate.

Regarding Wipro's methodology, at the beginning, the expected result was a set of activities directly drawn from projects' expertise, but that was not entirely the case. A set of steps and a small number of templates or rules were present because the Architecture pool is quite in the beginning and was created ad-hoc, since none of the professionals had specific training for the Solutions Architect role. Instead, the pool had already documented the initial stages, mainly phases A to C of the ADM process, and created the architectural artifacts to support those activities. But the documentation presented in the Enterprise Architecture Methodology section of the results, proved that the in charge architects made a terrific job adapting the ADM suggested steps to Wipro's reality, by erasing the unnecessary steps and designing the methodology workflows presented in Figure 4.2.

The Solutions Architect role definition was one of biggest challenges, right from the beginning where the reality of such different perspectives on the subject, whether resulting from previous projects or simply different literature interpretations, led to the need of elaborating a survey to gather all of those points of view, so that the following interviews and research path could be properly conducted and taken the right way. Another constraint of this activity of role definition was the fact that this specific domain is no older than 2005, so its definition is a very strong ongoing debate with variables being tossed into the arena every day.

Regarding the methodology mapping, the task of selecting a framework to which the comparison would be made was significantly reduced, since Wipro had already started the first analysis and the architects were informed shortly before this dissertation process begun. Nonetheless, the architecture process was quite in its beginning steps so, a great deal of discussion could still be made, namely regarding the Version Control's position and influence and Data and Application Architecture sequence.

This dissertation process starts by addressing two objectives proposed by Wipro Retail, more specifically the Solutions Architecture Competency Center. The first objective was to try to define an organization wide definition for the Solutions Architect's role and second one was to map Wipro's Enterprise Methodology with industry's frameworks and gather a set of best practices. The challenge was to support a new pool of assets, the Architecture pool, created to attend the recently identified needs from Wipro's customers and in reaction to a new consultancy profile that has been requested by the growing market itself.

Until this pool's creation, all professionals were SME's, but just like mentioned in the previous paragraph, Wipro started to work with larger customers, with growing needs and mainly, the requests for standards and certified methodologies were perceived as essential to compete at said level. Thus, the creation of the Solutions Architect role, as well as the other now called "domain architects" was mandatory, not only to distinguish the professional's field of expertise, but to create a role that once applied to a selected said professional, he or she could know the methodology's phases, component hierarchy, what affects those components, legacy systems migration, etc. At this level, the worst word to throw at a customer is "Big-Bang". There is simply too much sensitivity in that data to use a method like that. Instead, the Solutions Architect, must know all the methodology steps regarding Oracle Retail, which modules must be installed and which modules answer the requirements' needs, in order to have an end-to-end perspective.

One role instance that was supported by every architect was the project involvement, where it should always be a descendant curve with a strong influence at early stages such as project design, and should not be involved in the system's development, but have a quality assurance responsibility instead, as shown in Figure 5.1.

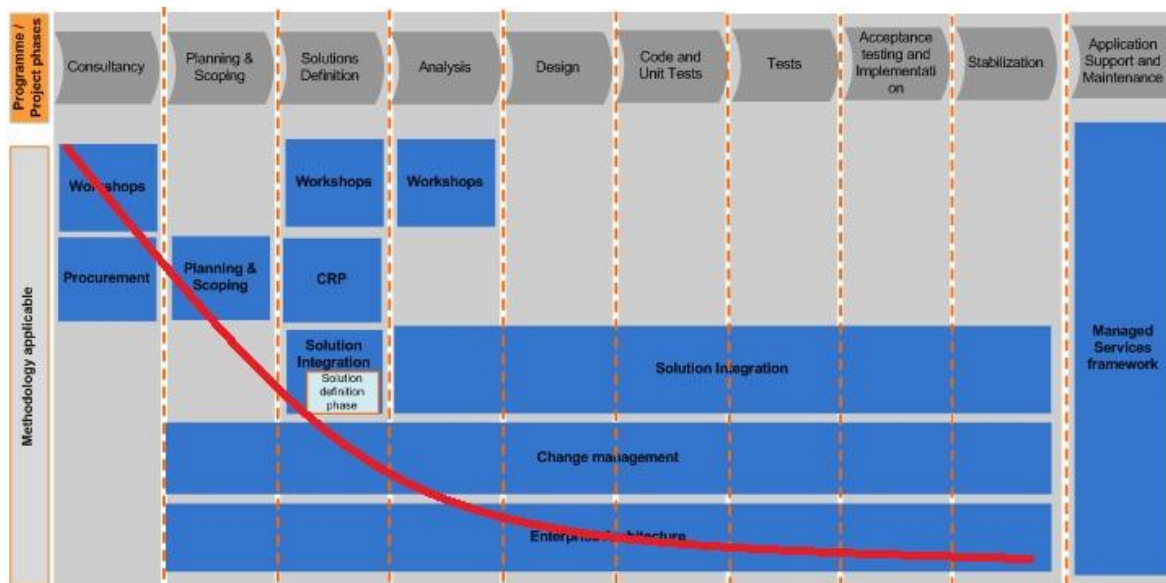


Figure 5.1- Solutions Architect project involvement in Wipro’s practice.

Within this first stage of a project, it is clear that in the CRP sessions, the architect shouldn’t be present, which is in most of the cases right now. Instead, it is the SME that must be present because the discussions circle around a certain business area and since the architect already described how to implement the several modules, the SME should pick up those blueprints and build those CRP sessions and make the requests directly to the customer at those meetings. Until now, the Solutions Architect ended up playing the role of a SME, when they should be separate roles.

Since the boundaries of the Enterprise and Solution Architect’s roles are often a blurry area, the first conclusion that can be drawn is that the Enterprise Architect is the person who sees the end-to-end of a project, but does not know the details, instead, this architect knows exactly who is responsible by a certain domain and redirects the attention to the accountable person. It is a senior role, who went through several business areas before, and knows exactly how a company runs without having an integrator or other technology related person to help him/her. On the other hand, a Solutions Architect is responsible for the end-to-end within a release and the integrity assurance cross-release, and in this specific context, he or she coordinates other domain architects to do so. Figure 5.2 shows a retail implementation project summarizing the hierarchy that is typically adopted, where several domain architects work within each Oracle Retail module and the solution is coordinated for each release by the Solution Integrity Team, where among others, is a Solutions Architect. The Enterprise

Architect has a supervising and business oriented role, having the said quality assurance role also.

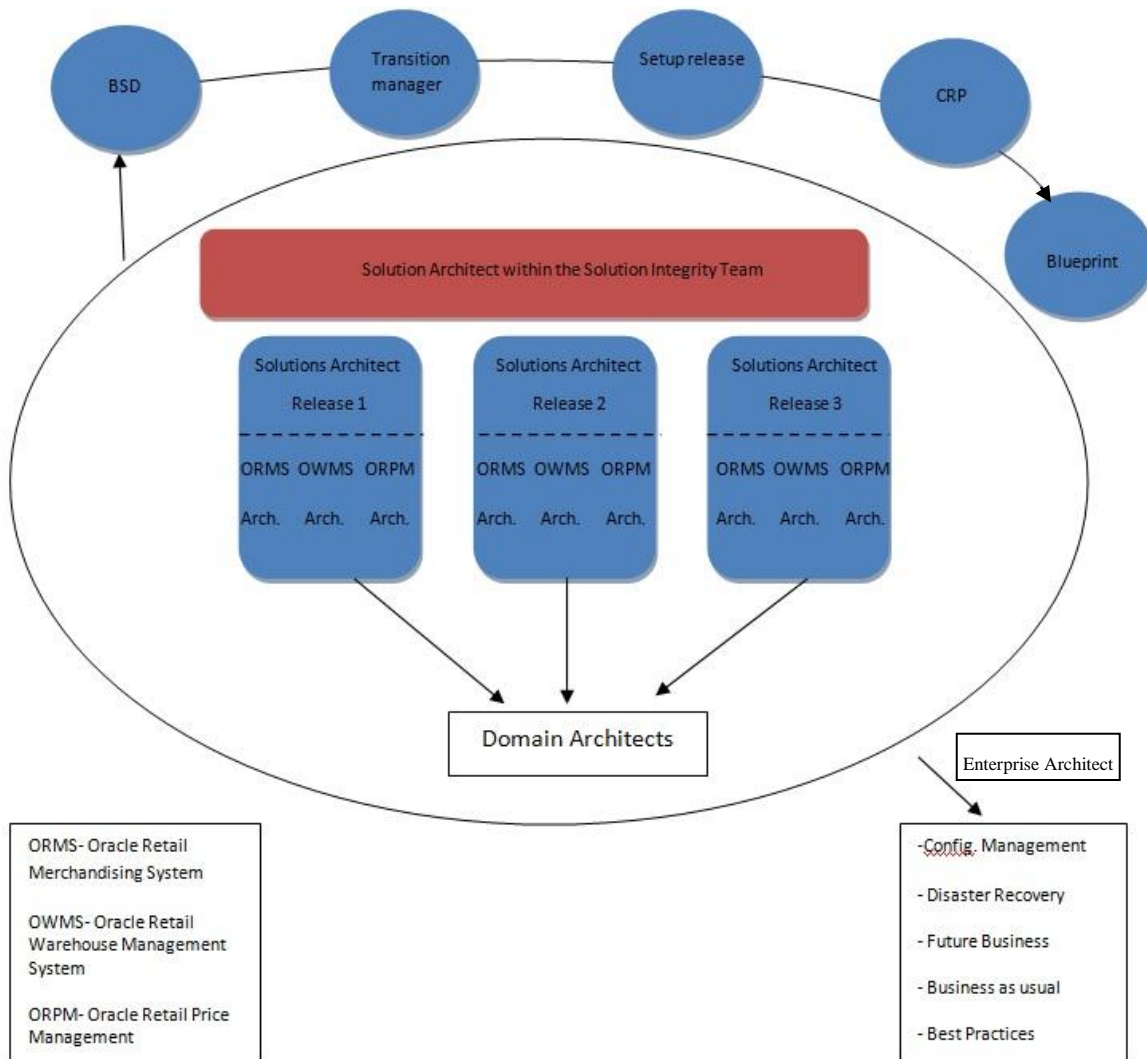


Figure 5.2- Enterprise and Solutions Architect role depth within a standard project.

Methodology wise, the main conclusions that were drawn out both by the survey and the architecture meetings were that the key element to influence the methodology when a new project starts, is the customer’s maturity level. It is important to remember that Wipro’s customers vary in dimension and the biggest European retailers are in this group. Most of the times, Wipro’s methodologies are tailored to include customer’s own methodologies and that is the trend to follow, since it gives comfort to the customer by having his own artifacts and processes, normally in the core business processes. The second most observed reality is that the customer has its own methodology. This case occurs more often when dealing with a retail leader.

Regarding Wipro’s practice, with the methodologies presented in Figure 4.1, it is clear that before the Enterprise Architecture effort, some attempts to formalize a methodology were made, since the Enterprise Architecture block does not encapsulate blocks like Solution Integration, Planning & Scoping or CRP sessions. Thus, and since the main methodology’s design and definition activities are still in the beginning, a study should be conducted to discuss the rearrange of this practice, by organizing these methodologies inside Enterprise Architecture Methodology.

When considering other sensitive areas than methodology, the most important factor to consider is the role hierarchy and the communication chain. It became clear that in some projects, a RACI matrix did not exist and the teams were always questioning each other about architecture governance and since the project roles and assignments change several times within each release, the correct activity tracking was not done. Whenever a co-worker needed, for example, some explanations regarding an artifact produced in the previous release or when the customer made some requests that affected a previously made decision, important amounts of time were wasted on trying to obtain the correct sequence to identify the involved professionals. Figure 5.3 presents an example of a RACI matrix and its implications and different shareholders.

	Enterprise Architect	Project Solution Architect	IV&V
SAF Templates	R,A	C	C
SAF Checklist	R,A	C	C
Solution Architecture Development	C	R,A	I
Solution Architecture Verification	I	I	R,A

Key: C = Consulted R= Responsible A = Accountable I = Informed

Figure 5.3- RACI Matrix example regarding Solution Architecture Framework artifacts’ governance

Communication, at the same level as methodology choice, was highlighted as vital to project’s success, and many concerns about this topic were made relating upper management and their support. Typically, in projects with this dimension, various C-Level executives are involved, from both the customer and Wipro’s side, and since these projects register a high rotation level, it is crucial that executive decisions pass on from one C-Level to another C-

level executive and the sponsorship of the project ensures the alignment with the new teams and in this case, protect Wipro whenever approved strategies and implementation are subject to modification by the customer's new leadership, ensuring that the previous decisions do not look like Wipro's fault.

5.1. Future Work

This topic of future work must be dissected into two different analyses. The first one comprehends Wipro's next steps towards standards compliance. TOGAF methodology's foundation relies on three main architectural tools, Architecture Repository, Enterprise Continuum, Architecture and Solutions Continuum. These tools are critical to accomplish each phase output correctly and to create a solid architectural background. Thus, the first architectural concern should be the Architecture Repository to gather previous projects' architectural outputs so that the next projects can reuse those potential building blocks and benefit from their experience. The second concern resides on the addition of architectural base stones to Oracle Retail Practice which are not mapped yet, like Infrastructure architecture (networking, server configuration, etc.) alongside with Technical architecture and Security Architecture. These are the immediate concerns methodology wise.

The second analysis of future work must encompass the general industry of Enterprise and specifically Solutions Architecture, within the research work developed. As EA becomes a standard and mandatory in such environments like the United States Government, the discussion of its scope and the boundaries of its sub-architectures becomes more unified. Regarding this research work, there is a set of details that should be improved for the forthcoming researches. In the first place, the survey sample should obviously have encompassed more projects with different sizes and maturity levels and should itself be wider than the fourteen surveyed. Then, the analysis made and the suggested practices must be tested and Wipro must do at least one ADM iteration to correctly populate the several repositories before applying at a larger scale.

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REFERENCES

- Alison, D. (2007). What does a Solutions Architect really do?, *The Server Side*: 2.
- Banerjee, U. (2011) Defining Requirements- The TOGAF Way. Technology Trend Analysis 2
- Berg, M. v. d. and M. v. Steenbergen (2006). Building an Enterprise Architecture Practice, Springer.
- Bittler, R. and G. Kreizman (2005) Gartner Enterprise Architecture process: Evolution 2005. The Gartner Group 12
- Bogue, R. (2005). "Anatomy of a Software Development Role: Solution Architect." Cracking the Code: Breaking Down the Software Development Roles. from <http://www.developer.com/mgmt/article.php/3504496>.
- Boucharas, V., M. v. Steenbergen, et al. (2010). The Contribution of Enterprise Architecture to the Achievement of Organizational Goals: Establishing the Enterprise Architecture Benefits Framework. Department of Information and Computing Sciences. Utrecht, Utrecht University. **UU-CS-2010-014**: 169.
- Bredemeyer, D. (1999) James Madison and the Role of the Architect.
- Bredemeyer, D. and R. Malan (2009). The Role of the Architect. Architecture Resources for Enterprise Advantage. Boston, Bredemeyer Consulting. **1**: 9.
- Bucher, T., R. Fisher, et al. (2006). Enterprise architecture analysis and application: An exploratory study. Hong Kong, EDOC Workshop TEAR.
- Campbell, A. (2007). "Defining Solution Architecture." Retrieved 15th February, 2011, 2011, from <http://ingenia.wordpress.com/2007/11/21/defining-solution-architecture/>.
- Capgemini (2009). Why do we need solution architect?: 2.

Churbanau, D. (2010). A Conceptual Framework for Specification of Network-Centric System Architectures. Faculty of the Virginia Polytechnic Institute and State University. Blacksburg, Virginia. **Master of Science: 95.**

Council, C. (2001). A Practical Guide to Federal Enterprise Architecture. C. I. O. Council. **1.0: 112.**

Dictionary, A. H. (2006). The American Heritage Dictionary of the English Language. Forth Edition. Framework. Boston, MA, Houghton Mifflin Company.

Dictionary, A. H. (2006). The American Heritage Dictionary of the English Language. Forth Edition. Taxonomy. Boston, MA, Houghton Mifflin Company.

Glass, R. L. (2002). Sorting out Software Complexity. Communications of the ACM. **45(11): pp.19-21.**

Greenslade, C. (2002). The Open Group Architecture Framework (TOGAF)- The Continuing Story, Frietuna Computer Consultants Limited: 102.

Group, T. O. (2009). TOGAF Version 9. The Open Group Architecture Framework. **G091.**

Group, T. O. (2010). Introduction to Building Blocks. TOGAF 9- Enterprise Edition.

Herbsleb, J. D. (2007). The future of Socio-technical Coordination. Global Software Engineering: Future of Software Engineering FOSE'07 IEEE- Compute rScience: 37.

Hoogervorst, J. (2004). "Enterprise Architecture: Enabling Integration, Agility and Change." International Journal of Cooperative Information Systems **13: 213-234.**

IEEE (2000). IEEE Std 1471-2000: IEEE Recommended Practice for Architectural Description of Software-Intensive Systems: i-23.

IEEE (2004). Software engineering body of knowledge, IEEE.

IIBA (2006). Business Analysis Body of Knowledge, International Institute of Business Analysis.

Integration, O. o. S. (2010). Enterprise Architectue Office- OSI Solutions Architecture Framework Toolkit. . O. o. S. I. Health and Human Services Agency. California: 16.

ISO/IEC, I. O. f. S.-. (2007). Systems and software engineering — Recommended practice for architectural description of software-intensive systems. **42010:2007**.

Jhal, R. S. B. (2001). Wipro Ltd PAT up 129% to Rs.1,077 million(\$ 24 / UKP 16 million) in Q1 2000-2001 PBIT of Wipro Technologies up 146% in quarter ended June 2000. Quaterly Business News- Wipro. Bangalore.

Johnson, P., M. Ekstedt, et al. (2004). Using enterprise architecture for CIO Decision-Making: On the importance of theory. 2nd Annual Conference on Systems Engineering Research.

Josey, A. (2009). TOGAF™ Version 9 Enterprise Edition- An Introduction, The Open Group: 11.

Langston, M. (1999). Federal Enterprise Architecture Framework. T. C. I. Council. Washington, U.S. Governement. **2**: 80.

Lankhorst, M. (2005). Enterprise Architecture at Work: Modeling, Communication and Analysis., Springer.

Lapkin, A. (2005). "Gartner's Enterprise Architecture Process and Framework Help meet 21st Century Challenges." Gartner group(G00133132).

Lewis, R. (1998). Architect? A Candid Guide to the Profession. The MIT Press: 304.

Lindstrom, A., P. Johnson, et al. (2006). "A survey on CIO concerns-do enterprise architecture frameworks support them?" Information Systems Frontiers **8**(2): 10.

Linthicum, D. (2000). Enterprise Application Integration. New Jersey, Addison-Wesley Information Technology Series.

McGovern, J., S. Ambler, et al. (2003). A Practical Guide to Enterprise Architecture. Upper Saddle River, New Jersey, Prentice Hall.

McSweeney, A. (2010). Enterprise Architecture and TOGAF (The Open Group Architecture Framework). Dublin.

Morgan, G. (2007). "Enterprise Architect vs Solutions Architect." MSDN Blogs Enterprise. from http://blogs.msdn.com/b/gabriel_morgan/archive/2007/09/02/enterprise-architect-vs-solution-architect.aspx.

O'Rourke, C., N. Fishman, et al. (2003). Enterprise Architecture Using the Zachman Framework. Boston, MA, Course Technology.

Office of Systems Integration, O. (2008). OSI Solutions Architecture Framework. California, California Health and Human Services. **1.0**: 23.

OMB, F. E. A. P. M. O.-. (2007). "Value to the Mission"- FEA Practice Guidance. U. S. O. o. M. a. Budget. Washington, D.C.: 63.

PMI (2008). Project Management Body of Knowledge, Project Management Institute

Raadt, B. v. d., R. Slot, et al. (2007). Experience report: assessing a global financial services company on its enterprise architecture effectiveness using NAOMI. 40th Annual Hawaii International Conference on System Sciences (HICSS'07).

Ross, J. W., P. Weill, et al. (2006). "Enterprise Architecture as Strategy." Harvard Business School Press.

Seliger, R. A. (1997). "An Approach to Architecting Enterprise solutions." HP Journal(11): 11.

Services, C. f. M. a. M. (2011). Federal Enterprise Architecture Framework. U. S. D. o. H. H. Services. Washington, D.C.: 1.

Sessions, R. (2007) Comparison of the Top four Enterprise Architecture Methodologies. ObjectWatch White Pappers **13**, 44

Slot, R. G. (2010). A method for valuing Architecture-Based Business Transformation and Measuring the value of Solutions Architecture. Economics and Business. Amsterdam, University of Amsterdam. **Doctoral**: 213.

Sowa, J. F. and J. A. Zachman (1992). "Extending and formalizing the framework for information systems architecture." IBM Systems Journal **31**: 590-616.

Spewak, S. H. (1993). Enterprise Architecture Planning: Developing a Blueprint for Data, Applications, and Technology John Wiley & Sons.

Standish (2004). CHAOS REPORT. Q. R. Reports, The Standish Group.

Tang, A., P. Chen, et al. (2004). A comparative Analysis of Architecture Frameworks. Asia Pacific Software Engineering Conference, Asia Pacific, IEEE.

Teeuwen, P. and R. Slot (2010). The Proven Value of solution Architecture: Six Sigma for Projects. Enterprise Architecture Advisory Service- Executive Update, Cutter Consortium. **13**: 4.

TOGAF (2004). The Open Group Architecture Framework, Version 8.1 Enterprise Edition sl. TOGAF.

Vernadat, F. (1996). Enterprise Modeling and Integration, Kluwer Academic Publishers.

Wagter, R., M. v. d. Berg, et al. (2005). Dynamic Enterprise Architecture: how to make it work. Hoboken: 39.

Wagter, R., M. v. d. Berg, et al. (2005). Dynamic Enterprise Architecture: How to make it work, John Wiley & Sons.

Weel, A. v. and W. Wiersema (2009). Why do we need a solution architect? Technology Blog, Capgemini: 2.

Weiss, D. (2006). Enterprise Architecture. Battleground of the EA Frameworks. TeleConference, Gartner Group: 20.

Wikidot (2011). "Gartner EA Framework." Enterprise Architecture from Strategy to Execution
from <http://iea.wikidot.com/>.

Winter, R. and R. Fischer (2006). Essential layers, artifacts and dependencies of enterprise architecture. 10th IEEE International Enterprise Distributed Object Computing Conference Workshops (EDOCW'06): 12.

YouSigma (2010) Enterprise Architecture Methodology and Comparisons. Technology and Architecture 4

Zachman, J. A. (1987). "A Framework for Information Systems Architecture." IBM Systems Journal **26**(3): 276-292.

Zachman, J. A. (1996). Concepts of the framework for enterprise architecture. Los Angeles, CA.

Zachman, J. A. (1998). Life is a Series of Trade-Offs and Change is Accelerating. La Cañada, Ca, Zachman Internacional: 7.

Zachman, J. A. (2006). "Enterprise Architecture- A State (R. Sessions-Interviewer)." Perspectives of the International Association of Software Architects: 17.

Zachman, J. P. (2009) The Zachman Framework™ Evolution. EA Articles

ANNEXES and APPENDIXES

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ANNEXES

Annex 1

Survey sent to the Architecture Pool, available at: <http://goo.gl/rfLRO>



Enterprise and Solution Architecture survey

This survey aims to aggregate and discuss the different understandings that Enterprise and Solution Architecture have on IT professionals and assess the critical success factors of a retail project. By answering this quick survey, you will be contributing to Wipro's general project's performance and supporting documentation. Besides, you will be helping me with my Master's Thesis, for which I am very thankful for.

Pedro Magalhães

* Required

Disclaimer: Your personal identity is unknown at all time and the information given is confidential.

1- How would you define the Solution Architect and Enterprise Architect's role? *

Select those that you see fit and/or suggest a definition in the 'other' section.

- A solutions architect is often, but not always, focused on technical architecture and the meeting of non-functional requirements, often in the context of deploying specific applications.
- The Solutions Architect is deeply involved during the first phases such as consultancy, Planning & Scoping and Solution Definition but his/her involvement decreases until, ideally, it reaches zero at the system's development, having a quality assurance role only.
- A solutions architect acts as a domain architect in a project scope. Depending on the size of the project, we will have, for example, a Business Solution Architect, a Technology Solution Architect and a Data Solution Architect.
- A solutions architect acts as the accountable entity for the several architectures developed under the several domain architects guidance.
- A solutions architect steps in when an application becomes so vast and complex that dealing with the overall technical vision and planning, and translating business needs into technical requirements becomes a full-time job.
- An Enterprise Architect is a planning role that is responsible for identifying the future state of an organization's IT environment and engages wherever and whomever necessary to help guide project teams to deliver towards it.
- The Solution Architect is a member of the Enterprise Architecture team but becomes at a later stage also a member of the Development team. His role is mixed; he is the bridge between concepts and implementation. However, the Solution Architect does not operate at the Strategic Architecture level (at Enterprise level).

Other/ additional information

If it's the case of additional information for one of the previous definitions, please state for which option is it.

2- In you previous projects, which of the following activities were adopted? *

- Define the problem, the voice of the customer, and the project goals, specifically.
- Improve or optimize the current process based upon data analysis using techniques such as design of experiments, poka yoke or mistake proofing, and standard work to create a new, future state process. Set up pilot runs to establish process capability.
- Control the future state process to ensure that any deviations from target are corrected before they result in defects. Implement control systems such as statistical process control, production boards, and visual workplaces, and continuously monitor the process.
- Define design goals that are consistent with customer demands and the enterprise strategy.
- Measure and identify CTQs (characteristics that are Critical To Quality), product capabilities, and risks.
- Design details, optimize the design, and plan for design verification. This activity may require simulations.
- Verify the design, set up pilot runs, implement the production process and hand it over to the process owner(s).
- Ensure alignment within the business area and identify the business service (or services) being addressed.

3- Does the retail business have specific definitions/needs/issues that affect solution architecture's development in a different way? Besides specific business processes. *

Please state them

4- In how many retail projects have you been involved in? *

Absolute value

5- Regarding your previous retail projects, what was the main methodological approach? *

- Only Wipro's clients methodologies were used
- Only Wipro's methodologies were used
- In most projects, Wipro's methodologies were integrated alongside with client's methodologies.

Other / complementary

State other experiences or add information to the existing ones

6- In your opinion, and with the projects you've worked on in mind, what projects do you think went smoother and were more successful? *

You can choose more than one option

- The ones where the customer had an architecture and methodologies already in use and Wipro's team was "absorbed".
- Standalone projects in which an architect's role exist on Wipro's behalf, but not necessarily on customer's side.
- Those in which Wipro applies a customized approach.

Other / additional information

If it's the case of additional information for one of the previous definitions, please state for which option is it.

7- What would you change, if you could, during past project's course? *

Strategic, operational and other variables apply.

8- In a project scope, how do you assure or think should be assured that everyone is aligned, strategically and technically wise? *

Thank you for your cooperation! Please click 'Submit'.

Your effort is highly appreciated!

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Annex 2

Brief meeting notes taken with the architects, Resource Manager and Supervisor. This serves as an example, not contemplating the full extent of the recorded artifacts.

Reunião 9/03/2011- Supervisora Wipro

- Follow-up meetings, sextas-feiras- 14.30 as 15h
- BAS- Ver o que há de Arquitectura e Metodologias
- Portal Enabler

TO DO:

- Best Practices analysis
- BAS work
- Explorar TOGAF

Reunião 18/03/2011- Supervisora Wipro

- EAI.pps – frameworks, ainda se usam estas?? R: São demasiado focadas na tecnologia
- Financial value- Revenue or savings created which originates from the use of enterprise or solution architecture
- Determine the value of solution architecture
- Business value of EA
- Determinar o que é success rate of projects.
- Best Practices: focar em ITIL, ISO 27000, SDLC, Six Sigma
- Problemas da confidencialidade?
- What about SOA?
- Usaram alguma metodologia do cliente? Existem 7 metodologias mas que só são usadas quando o cliente não impõe a sua própria.
- Docs de compilação?? R: segunda-feira
- Qual é o teu (Supervisora Wipro) take nas SolutionsArchitecture e a relação com as outras arquitecturas (Data, Business...)? R: depende muito de pessoa para pessoa, sugestão: fazer um survey

- BAS- pouca informação, muito técnica do género “Application updates...”
- Solution integration, que sentido de investigação?
- No .doc EA há a mistura entre Enterprise e Solutionarchitect
- Sugerir principles para cada Domain architecture
- Value of business transformation para arquitecturas- CBAM- Mas nenhum método contabiliza incertezas.
- Solution (project-level) Architecture

Reunião Follow-up 25/03/11

- Papel do arquitecto quase completo
- Desenvolvimento do survey
- Tema de tese, “...como agilizar...”??
- Projectos de SA de outras áreas -> Saúde, government, security...
- Preciso de analisar o peso do arquitecto em cada projecto
- Os destinatários do survey estiveram em +/- quantos projectos? Sugerir melhoria.

Reunião Marta- 04/04/2011

- Dividir as respostas dos survey
- passar algumas questões de resposta aberta para escolha múltipla (colocar definições e secção ‘other’)
- Se foi utilizada alguma coisa do mercado e também coisas que são feitas mas que não estão no mercado mas que devem ser repetidas;
- uma pessoa pode estar a usar uma best practice e não sabe que está a usar uma bestpractice
- ver metodologias com a Resource Manager
- Ver que alguma coisa resulta bem num projecto e instituir como bestpractice.
- Tenho que recolher o que há no mercado de bestpractices e recomendações e até de coisas que não há no mercado mas que devem continuar a fazer e por isso devem trazer isso para a realidade da wipro e instanciar no dia-a-dia do trabalho de projecto, não quero saber o que é o mercado lá fora. O meu trabalho acaba na realidade da wipro, não vou estar exclusivamente no campo teórico.

Reunião Pool Manager e Solutions Architect de um cliente europeu- 21/IV/2011

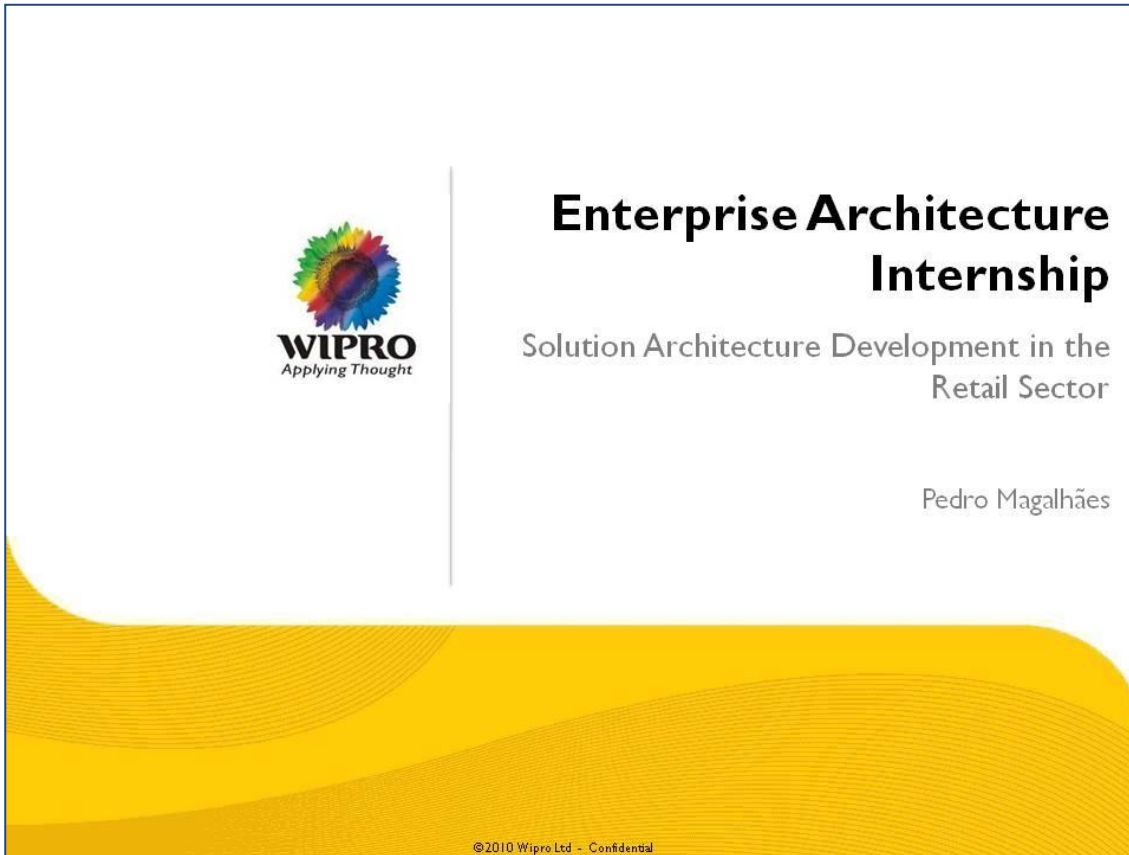
- Em relação aos artefactos todos que tenho, apesar de serem muito diferentes, o objectivo de cada é praticamente o mesmo.
- No Middle-East usaram as metodologias de CRP, systems integration.
- Qual a compatibilidade disto que estão a propor com o TOGAF e afim. Tipicamente, o sponsor do cliente pergunta quantas pessoas são certificadas.
- Tenho que fazer a minha definição de arquiteto de soluções.
- Está a ser construída a architecture vision
- O tópico é a prática é de SolutionsArchitecture, mas a ideia é construir uma Framework/metodologia única ao arquitecto da Wiproretail, independentemente de ser enterprise ou solutions.
- Não me “fechar” na SA.
- Ver conjuntamente Zachman e Gartner...
- Wipro fala de um SA como Integration ou application ou business architect
- EA; SA; SME
- ValueAssessment: Ver metodologia de gestão de projectos- ver measures
- Quais as maiores lacunas da arquitetura da wipro em relação às do mercado. O que podemos melhorar (redes, servidores...)


- RECOMENDAÇÃO: Fazer uma matriz em que tivesse as bestpractices do mercado, TOGAF e diferentes fases da arquitectura, aEnterprisearchitecture da Wipro e como é quea está a praticar hoje. Nem que seja por cores para ver em que nível de maturidade está a Wipro hoje e ver depois o que está a falhar para se perceber como estamos. A parte da tecnologia é importante e Enterprise architecture repository, Reference model, como construir e o processo de alimentar e estrutura do repositório. Informação das ferramentas para fazer o ciclo de vida da arquitectura (ver o que há no mercado), ver se a wipro tem licenças do rational rose ou ver o que a Oracle tem. Passar do projeto para o suporte- fase que tem sido descuidada,é melhor ver na arquitectura o que se pode fazer. Service Management no TOGAF. A parte dos testes também, a Wipro tem uma mas ver qual a ponte entre o arquiteto e as equipas de testes. Ver se o tipo, modo e sequencia dos testes vão de encontro à arquitectura.
- A parte do business process está iniciada, a Oracle já lançou software para o reference model. Como guideline ver: BPA BPM tools, pode ter que se fazer algum refresh em termos da metodologia.
- O que foi dito nos pontos anteriores são as fronteiras!

APPENDIXES

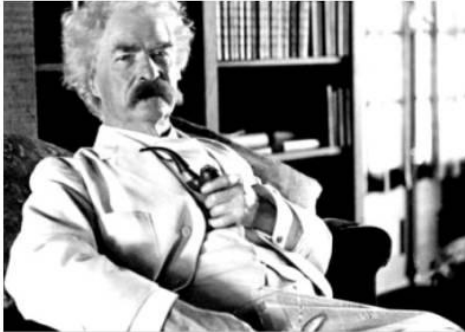
Appendix 1

Presentation made at Wipro for the Architecture Pool on May 30th, 2011






WIPRO
Applying Thought



"I didn't have time to write a short letter, so I wrote a long one instead."

- Mark Twain (1835-1910)

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WIPRO
Applying Thought

Agenda


- Challenge
- Solutions Architecture
- Enterprise Architecture
- Wipro's Practice
- SA's role definition
- Survey
- EA Framework Selection
- TOGAF
- TOGAF/Wipro's Practice Mapping
- Prioritized Artifacts

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Challenge

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Challenge

1. **Customers' request for a new IT specialist role;**
 - More than a product specialist – business process master
 - Literature is lacking a standard role definition
2. **Internal misalignment (survey assessed);**
 - New discipline
 - Different projects
 - Define Solutions Architect role
3. **New methodological requests, both internal and external;**
4. **Gap analysis between Wipro's architecture pool methodology and industry's architectures.**


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Solutions Architecture

6

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Solutions Architecture


- **Not a consensus...**
 - Some say:
 - Includes the same views of EA but with a different, smaller scope;
 - Right below EA's job description;

- **Goal: Define the Solutions Architect role, thus adding more perspective to the mix.**

7

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Solutions Architecture



- Way of working with two main aspects:
 1. Projects incorporate Enterprise Architecture-based standards, guidelines, etc. Solution Architecture describes the structure of the solution, main interfaces and the interaction with the environment, adjacent projects and existing application portfolio;
 2. Architecture governance processes to control the progress of the projects, regarding implementation of standards, guidelines, etc.

Just an element of the Enterprise Architecture discipline.

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Enterprise Architecture

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Enterprise Architecture



- A multitude of definitions
- Over twenty years of existence
- Establishes the organization-wide roadmap to achieve an organization's mission through optimal performance of its core business processes.
- Growing need
 - Information systems' ever-growing complexity management
 - Usability challenges recurring from first problem.
- Composed by a set of systems and environment diagrammatic descriptions
- Organized in Business, Application, Data and Technology Architectures.
- Several frameworks available.

10

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Enterprise Architecture



"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"

Lunkhorst's IEEE1471 practice


"Enterprise architecture is the practice of applying a standard approach for and describing in a standard way the current and/or future structure and behavior for an organization's processes, personnel and organizational information systems and technical infrastructure."

Raymond Slot, 2010

- No distinction between Business and IT architecture...

11

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Wipro's Practice

VelociQ

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Wipro's Practice



Programme / Project phases	Consultancy	Planning & Scoping	Solutions Definition	Analysis	Design	Code and Unit Tests	Tests	Acceptance testing and Implementation	Stabilization	Application Support and Maintenance
Methodology applicable	Workshops		Workshops	Workshops						
	Procurement	Planning & Scoping	CRP							
			Solution Integration <small>Solution definition phase</small>	Solution Integration						
				Change management						
			Enterprise Architecture							
										Managed Services framework

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SA's role definition

Wipro's Practice

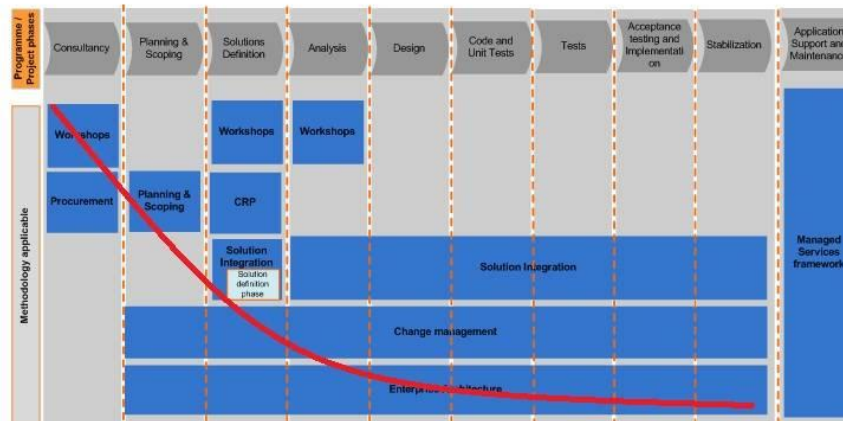
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SA's role definition



- Based on the existing literature, instantiate to Wipro's reality;



- Involved since project's beginning;
- Needs to know the business model and targets;
- Quality assurance role towards the end.

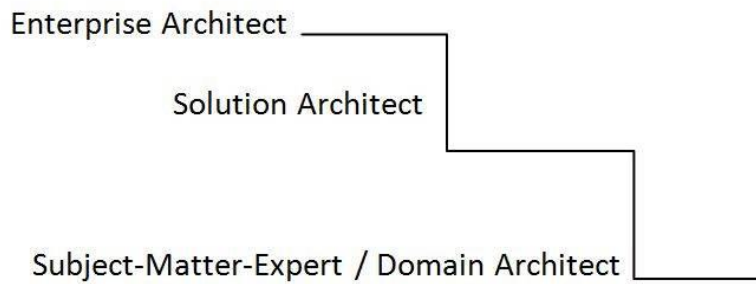
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SA's role definition



- The enterprise architect accountable for the end-to-end (cross domain);
- EA needs to articulate with domain architects;
- SA is responsible for that articulation and mapping.



- The SA should be replaced by the domain architect at CRP sessions.

16

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Survey

Available at: <http://goo.gl/rfLRO>

17

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Survey's Objectives



- Aimed to aggregate and discuss the different understandings that Enterprise and Solution Architecture have on IT professionals;
- Assess the critical success factors of a retail project;
- Field concerns' debriefing;
- Set a baseline for then upcoming interviews.

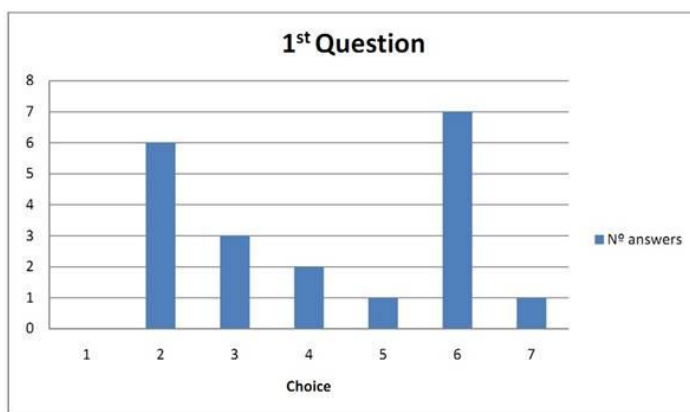
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Results



Q: How would you define the Solutions and Enterprise Architect's role?



- 1- Solution Architect (SA) focused on technical architecture and the meeting of non-functional requirements.
- 2- SA deeply involved in the first phases until decreasing, ideally to zero, during system's development, having a quality assurance role.
- 3- SA acts as domain architect. Depending on the project's size, we'll have a Business, Technology and Data architect.

- 4- SA acts as the accountable entity for several architectures develop under several domain architects guidance.
- 5- SA steps in when an application becomes so vast and complex that overall technical vision and planning and business needs translation becomes a full-time job.
- 6- Enterprise Architect is a planning role responsible for organization's IT future state and engages whomever necessary to help guide project teams to deliver towards it.
- 7- SA is a member of E. Architecture Team but later joins the development team. Mixed role but not a strategic one.

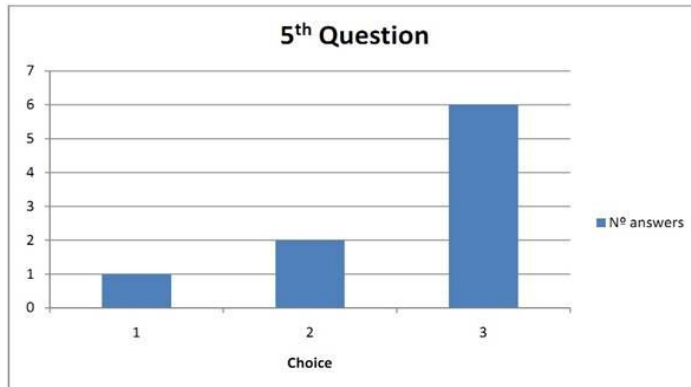
19

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Results



Q: Regarding previous retail projects, what was the main methodological approach?



1 - Only Wipro's clients methodologies were used.

2 - Only Wipro's methodologies were used.

3 - In most projects, Wipro's methodologies were integrated alongside with client's methodologies.

20

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Conclusions



- 1st Question- No agreement on Solutions Architect and Subject Matter Expert' role distinction- Personal experience?
- 5th Question- Depends on the project's nature and size, Wipro's methodological approach seldom travels alone;
- **Future state with modularity priorities?**
- 6th Question- Not the only variable to achieve success;
- **Generally means less overheads, faster implementations. From a client's perspective, this could not provide the best value for the customer.**

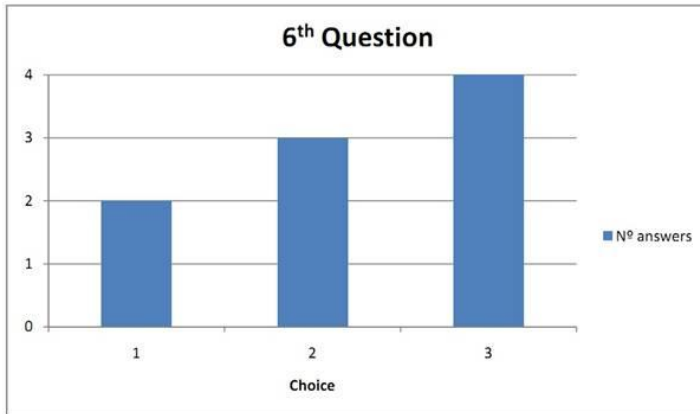
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Results



Q: In your opinion, and with the projects you've worked on in mind, what projects do you think went smoother and were more successful?



- 1- The ones where the customer had an architecture and methodologies already in use and Wipro's team was "absorbed".
- 2- Standalone projects in which an architect's role exist on Wipro's behalf, but not necessarily on customer's side.
- 3- Those in which Wipro applied a customized approach.



EA Framework Selection

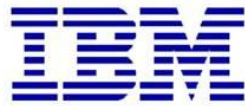
EA Framework Selection



- 90% of multinational corporations use one of the following:
 - Zachman Framework
 - TOGAF
 - Federal Enterprise Architecture Framework
 - Gartner Framework

Roger Sessions, CTO Object Watch

- 80% of the Forbes Global Top 50 companies uses TOGAF



- Wipro's methodology (early stage) is based on TOGAF.

24

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An effective enterprise architecture is critical to business survival and success and is the indispensable means to achieving competitive advantage through IT.

[The Open Group Business Executive's Guide](#)

TOGAF

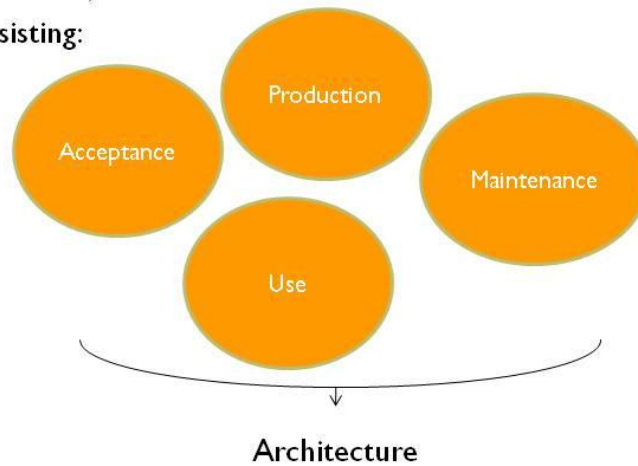
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Overview



- An architecture framework;
- Provides tools for assisting:



7

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TOGAF Document



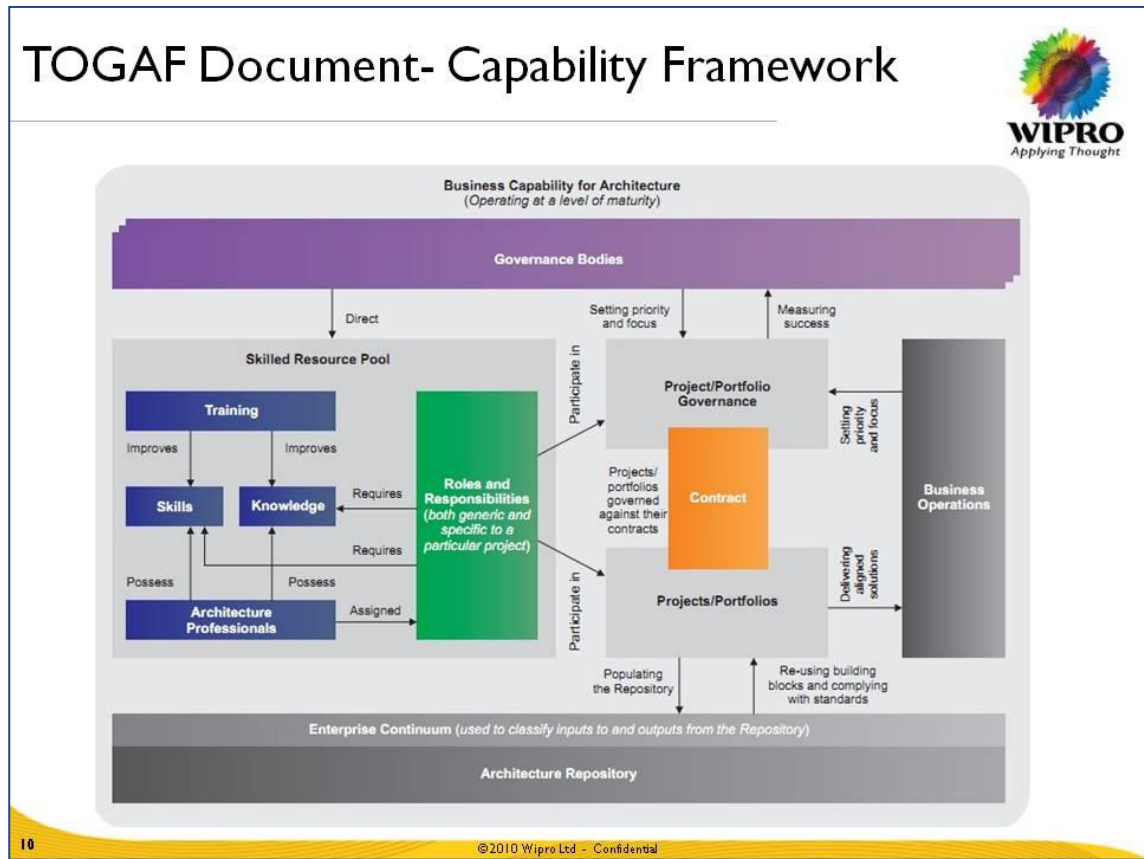
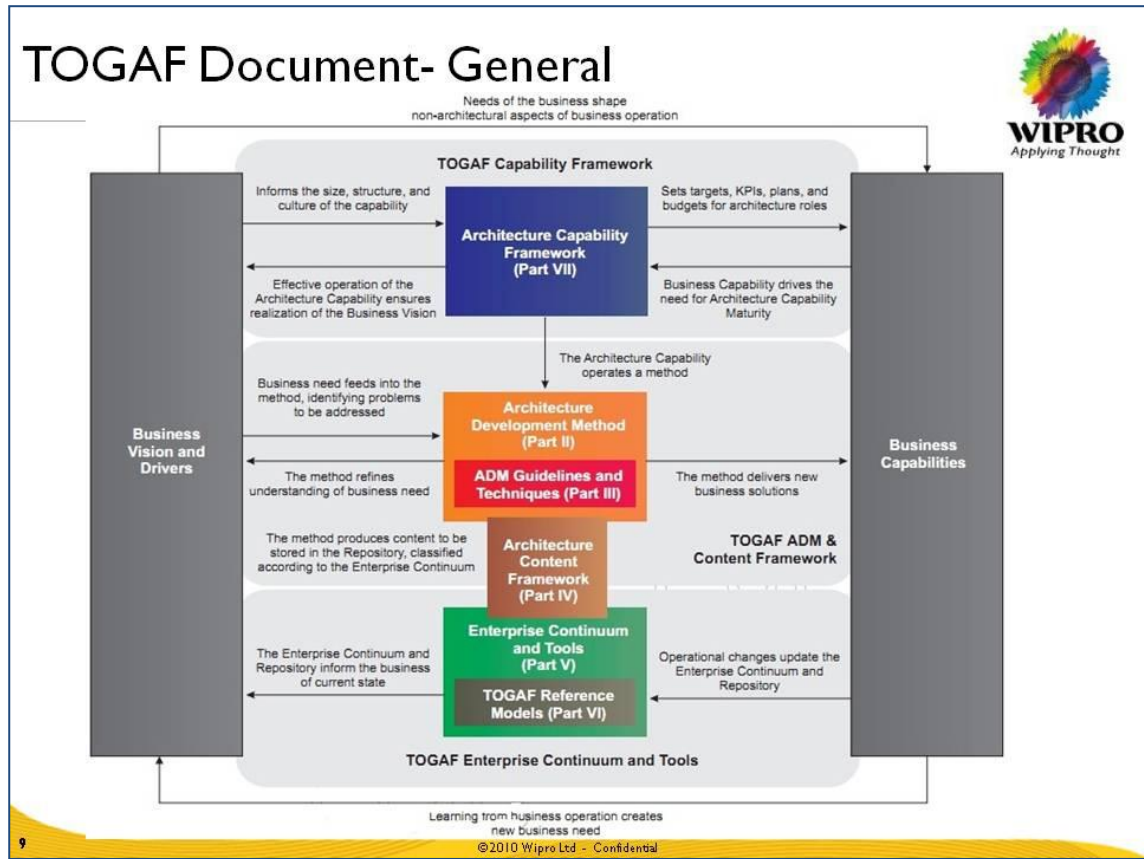
- Architecture Development Method (ADM)
- ADM Guidelines and Techniques
- Architecture Content Framework
- Enterprise Continuum and Tools
- TOGAF Reference Models
- Architecture Capability Framework

How come?

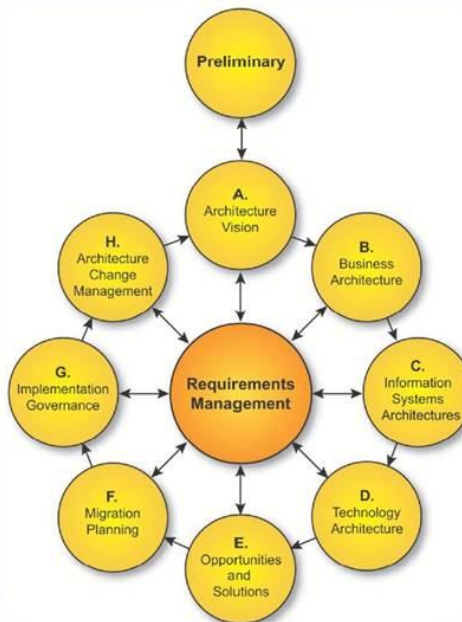
Areas of Specialization ———> detail-centric ———> addressed in isolation

26

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Architectural Development Cycle (ADM)



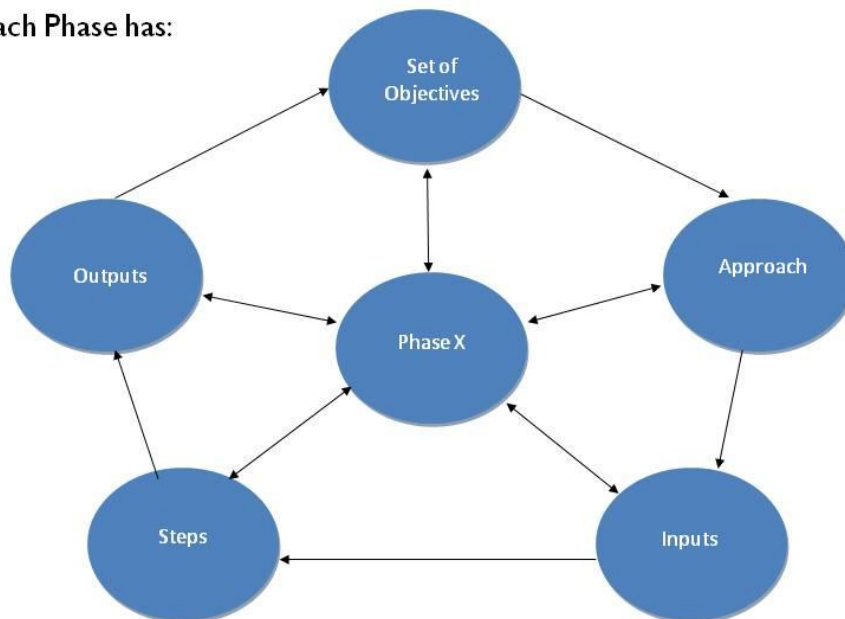
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Architectural Development Cycle (ADM)



- Each Phase has:



28

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Architectural Development Cycle (ADM)



- I- Architecture Development Method (ADM)
- II- ADM Guidelines and Techniques
- III- Architecture Content Framework (Architecture Repository)
- IV- Enterprise Continuum and Tools
- V- TOGAF Reference Models
- VI- Architecture Capability Framework

VI operates I → I is supported by II → Output stored in III

→ classified according to IV → which is initially populated with V.

14

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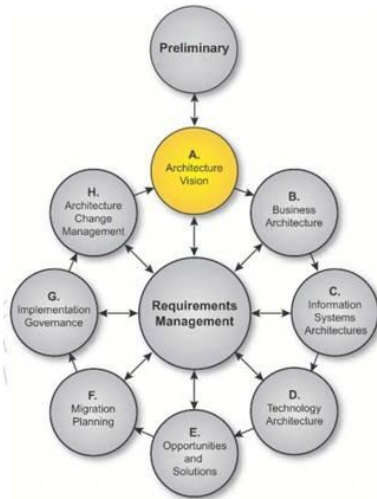


TOGAF/ Wipro's practice mapping

29

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Phase A- Architecture Vision



Wipro's take:

- Business Drivers (Goals and Objectives)
- Expected Benefits
- Business Constraints and Dependencies
- Business Differentiators
- Key Stakeholders
- Architecture Principles

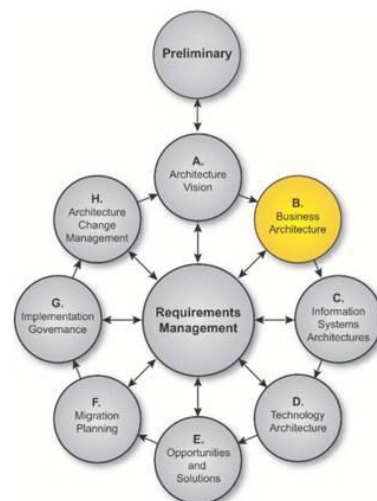
Best Practices/ Work in progress

- Architecture Vision is the main output of the whole process (incomplete)
- RACI Matrix Draft
- Architecture Repository Setting/analysis

30

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Phase B- Business Architecture



Wipro's take:

- Business Process L1 , L2, L3 and L4 definition;

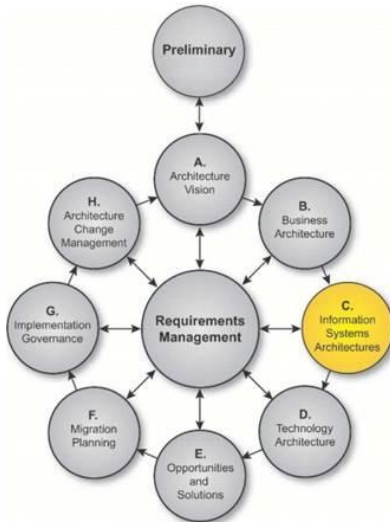
Best Practices/ Work in progress

- Baseline description- Wipro must perform this.
- Activity Models
- Use-case Models
- Information Workflow

31

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Phase C- Information Systems Architecture- Application Architecture



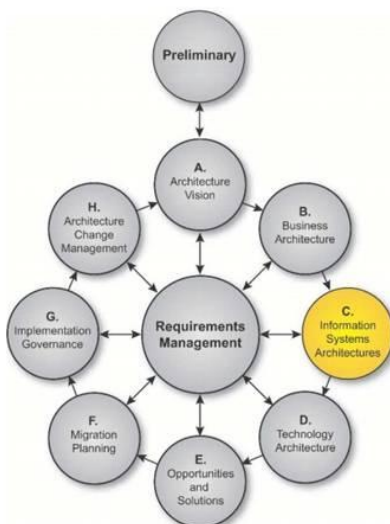
Wipro's take:

- Architecture Principles;
- Application modules and its relationship;
- Data & functionalities;
- Business criticality;
- Stakeholders' identification;
- Major output: Architecture Roadmap.

Best Practice/Work in Progress

- Architecture roadmap from baseline and target architectures and gap analysis.

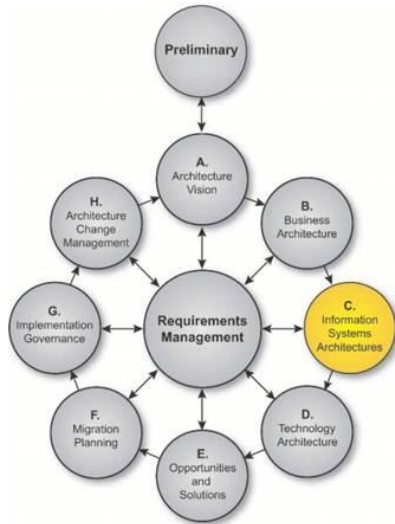
Phase C- Information Systems Architecture- Data Architecture



Wipro's take:

- Scope: data entities and applications
- Data Principles
- Stakeholders and Responsibilities
- Cleansing approach - Phase F
- Rationalization approach - Phase F
- Conversion approach - Phase F
- Data quality approach
- Auditing mechanisms - Phase F

Phase C- Information Systems Architecture-Version Control



Wipro's take:

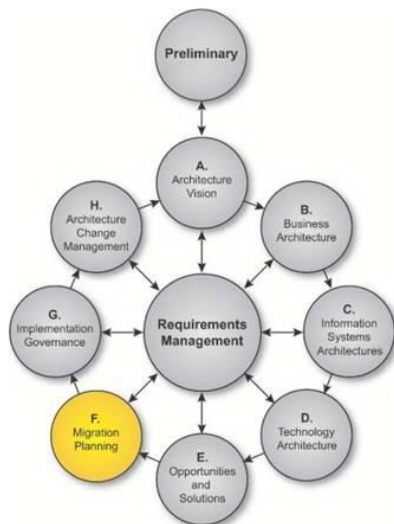
- Version control types
- Repository and Structure
- Tagging strategy
- Branching Strategy
- Merging strategy
- How to manage several environments
- Naming conventions
- Rules and Principles of usage
- Stakeholders
- Communication model

Version control is currently outside Phase C, but should be done before Data and Application Architectures.

34

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Phase F- Migration Planning

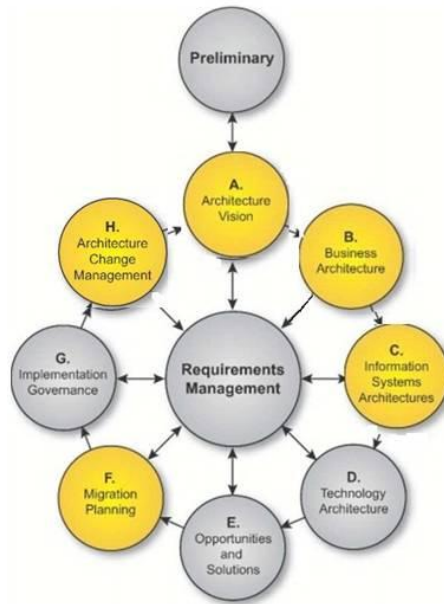


- Architecture transitions task is on Application Architecture, Phase C, but is expressed in Migration Planning Phase.
- One of the objectives is to confirm the Transition Architectures defined in Phase E with relevant stakeholders.

35

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Summary



36

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Summary



1. ≈ 40% of ADM process- EA Methodology only- 70% considering the whole Oracle Retail practice;
2. ADM Guidelines and Techniques;
3. TOGAF Architecture Document completeness.
 - Need for reference Models;
 - Need for architectural references.

23

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Summary



- I. \approx 40% of the ADM process (EA only)
 - Considering documented-only on EA Methodology;
 - Solution Integration methodology is a small part of Phase D- Technology Architecture- and it's outside of EA Methodology;
 - Lacks Phase E- Opportunities & Solutions- Main objectives:
 - Review target business objectives and capabilities, consolidate the gaps from phase B to D, and then organize groups of building-blocks to address these capabilities;
 - Review and confirm enterprise's current parameters for the ability to absorb change, and derive a series of transition architectures that deliver continuous business value;
 - Generate and gain consensus on an outline implementation and migration strategy.
 - Lacks Phase G- Implementation Governance
 - Main objective- To ensure that the program of solutions is deployed successfully and to ensure conformance of the deployed solution with the Target Architecture.

24

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Summary



- I. \approx 40% of the ADM process (EA only); (cont.)
 - Lacks Requirements Management- The core of ADM Process
 - Main objective- To define a process whereby requirements for enterprise architecture are identified, stored, and fed into and out of the relevant ADM phases.
2. **ADM Guidelines and Techniques**
 - Enterprise Architecture Principles and Business Processes Guidelines- Enterprise Architecture Methodology;
 - Templates for Phases A (Architecture Vision), B(Business Architecture) and C(Information Systems architecture- Data Architecture)

25

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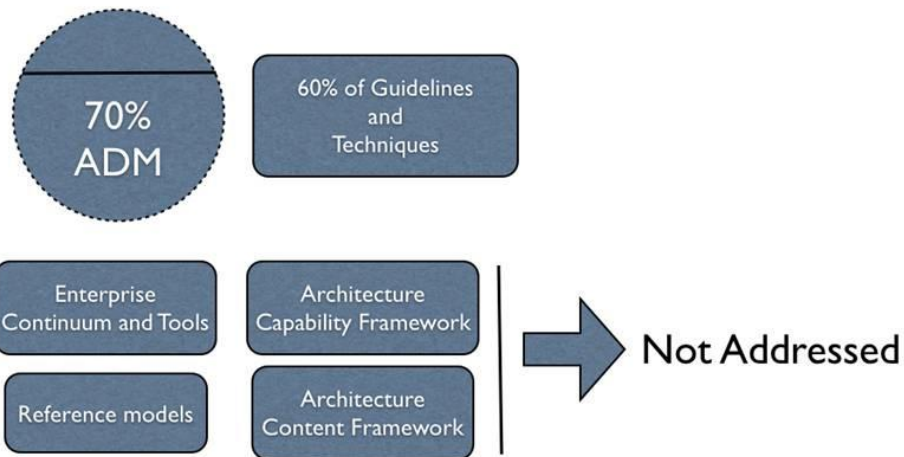
Summary




3. TOGAF Architecture Document completeness.

- ≈ 33% of TOGAF documented;
 - Detailed 7 out of 10 ADM Phases;
 - 60% of Guidelines and Techniques;
 - Architecture Content Framework, Enterprise Continuum and Tools, TOGAF Reference Models, Architecture Capability Framework not addressed.

Summary




33% of TOGAF Document



WIPRO
Applying Thought

Prioritized Artifacts

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WIPRO
Applying Thought

Starting Recommendations

- **Foundation Architecture** that governs all systems.
- **Common Systems Architectures** that governs major shared systems — such as the networking system or management system.
- **Industry-specific architectures** that govern the way systems must behave within retail industry.

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Main Propellers



The methodology foundation relies on:

- Architecture Repository
- Enterprise Continuum
- Architecture and Solutions Continuum

These tools are critical to accomplish each phase's output correctly and to create a solid architecture background

40

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Architectures to address



Architectural base stones to add to Oracle Retail Practice:

- Infrastructure (networking, server, etc...);
- Technical, jointly with Infrastructure;
- Security.

41

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