Integrating Innovation into Enterprise Architecture Management

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ABSTRACT

The ability of organizations to innovate is acknowledged as an essential capability to compete in a competitive market. This paper proposes to use enterprise architecture management as a systematic approach to innovate the enterprise. The enterprise architecture approach is based on a comprehensive architecture framework which aligns the domains of business -, application - and infrastructure architecture. The framework addresses all dimensions relevant for enterprise innovation like business model, organization, processes, and technology and provides appropriate design techniques.

A comprehensive architecture development process is introduced which integrates innovation as a central element for the enterprise architecture design. The process encompasses all activities from business vision & strategy, architecture design to implementation. In addition, the organization of architecture management and the main stakeholders from the business as well as IT side and their respective role are explained.

Keywords

Enterprise transformation and innovation, enterprise architecture framework, architecture development process, enterprise architecture management, stakeholders

1. INTRODUCTION

The ability of organizations to innovate is acknowledged as an essential capability to compete in a competitive market. There are several dimensions of innovation discussed in literature and practice. Besides technological innovation there can be also an organizational innovation in terms of new processes or channels to communicate with customers and suppliers for instance. Davila for example identify six levers of innovation [15]: value proposition, supply chain, target customer as part of business model innovation and product & services, process technologies and enabling technologies as part of technology innovation.

Innovation has as many definitions as it has contexts; we follow Sørensen in his definition of innovation as a process of creativity, ability to implement and to succeed [43]. Thus, innovation is not only creating ideas but the ability to implement new ideas rapidly, and the ability to succeed in the market place (products & services) or within the organization (services or processes).

In this understanding fostering innovation is not only providing a creative environment but also to provide the ground for implementation and success in the market or the organization. The importance of an innovative culture of the organization and the innovative attitude of individuals is argued extensively and has to be paid high attention [15, 32]. Nevertheless providing creativity and freedom is only one important side of it which should be supplemented by a systematic approach fostering the implementation and success of these innovative ideas.

Here, Enterprise Architecture Management comes into place; it not only addresses all dimensions of enterprise innovation with its architecture design it also provides a systematic approach. This paper argues to leverage this potential for innovation.

Enterprise Architectures are in the scope of interest in the recent years in academia as well as practice [1, 10, 16, 35, 36, 39, 45]. It is recognized as an instrument for business/ IT alignment [5, 7, 24, 30, 31, 47]. Architecture is a commonly used term in the design of information systems. However understanding and structuring of enterprise architecture and their basic elements differs (see the discussion in [151, 11, 17, 18, 48]).

IEEE Standard 1471-2000 defines architecture 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" [25].

Enterprise Architecture comprises the entire business with all its constituents. The alignment of the business and organizational design of the enterprise (business architecture) with the IT architecture is fundamental. The wide range of different domains and scope of enterprise architecture and its high complexity are characteristics of enterprise architectures.

In contrast to information systems architecture, which is widely discussed under the aspect of a single information system being integrated in an organization and aligned with business processes, enterprise architecture takes the entire IT landscape into focus. In comparison architecture is understood as city planning and not only as planning the architecture of a house [12, 21]. It requires the definition of development plans for an entire area and not only the construction plan for a building. The development of the IT landscape in contrast to the information system architecture of a single system is architecture design on a large scale.

To summarize, the extension of architecture design to the business and not only IT architecture focus and the large scale development encompassing the entire enterprise give a new perspective to Enterprise Architecture Management. The intended scope (opposed to the Enterprise Architecture Management practice which is still IT driven, see [10, p. 11f.]) is truly the architecting of the entire enterprise or organization, institution or value network etc. in focus.

The following sketches some objectives to be pursued with Enterprise Architecture Management [4, p. 9f., 34, p. 9f., 35, p. 6f., 49f., 46, p. 6f.]:

- Business/ IT alignment and leverage of IT

- Governance, planning and controlling of I&C program and compliance to regulations & standards

- Implement the I&C landscape in a systematic and efficient manner

- Provide for Scalability, Growth and Adaptability

- Transparency of architecture building blocks and better communication of stakeholders

Enterprise Architecture is a means to support business and IT alignment. Architecture planning is the ground for IS strategy implementation and the development of the IT landscape. At the same time an enterprise architecture approach provides the agility to react fast to market requirements.

However, while strategy and business orientation and the leverage of IT is widely addressed little attention is given to use architecture for a systematic approach towards innovation of the enterprise and its business. Enterprise Architecture constitutes all important building blocks of the enterprise like organization, processes and technology. Thus, it addresses all dimensions of enterprise innovation. Enterprise Architecture Management provides a structured and systematic approach towards the design of the enterprise. Enterprise Architecture Frameworks and supporting methods and tools provide transparency on the building blocks and their interrelationships and ease of communication among the stakeholders.

At present in many companies this potential of Enterprise Architecture Management to leverage innovation is only partly used. A major drawback is that Enterprise Architecture design is often seen as an IT project with focus on technology implementation and not as a business issue to design and innovate the entire enterprise [10, p. 11f.].

This paper proposes to use enterprise architecture management as a systematic approach to innovate the enterprise. It is based on an enterprise architecture framework and corresponding methods which were developed in a number of architecture projects (for details of the framework and its application [38]). The next section gives an outline of the framework and methods in order to show how it can be used for the proposed innovative enterprise architecture development. It is followed by a section which introduces a comprehensive architecture development process designed to integrate innovation into Enterprise Architecture Management. The process encompasses all activities from business vision & strategy, architecture design to implementation. In addition, the organization of architecture management and the main stakeholders from the business as well as IT side and their respective role and usage of the design techniques are explained.

2. FRAMEWORK AND REFERENCE FOR ENTERPRISE ARCHITECTURE DESIGN

2.1 TOGAF and other frameworks

An architecture framework is a foundational structure, or set of structures, which can be used for developing a broad range of different architectures. It should describe a method for designing a target state of the enterprise in terms of a set of building blocks and how these building blocks fit together. In addition, it should contain a set of tools and provide a common vocabulary [46, p. 7].

For an overview on enterprise architecture frameworks see [18, 26, 28, 29, 41, p. 85f., 42]. Examples for frameworks are: The Open Group Architecture framework (TOGAF [46]), Federal Enterprise Architecture Framework (FEAF [19]), Generic Reference Enterprise Architecture Methodology (GERAM [22]), Gartner and META Group Enterprise Architecture Frameworks [20, 35], and Zachman Framework [49, 50]. Regardless which framework will be selected, it is important to base architecture development on a framework. It is an essential means for transparency, communication, and a systematic approach.

The Generic Reference Enterprise Architecture Methodology, as the name implies, aims for a generic approach with a common framework embracing the other frameworks. As a result it remains rather abstract.

The Open Group Architecture framework (TOGAF Version 9 [46]) is widely recognized and plays a prominent role. It provides the methods and tools for assisting in the acceptance, production, use, and maintenance of enterprise architecture. It is based on an iterative process model supported by best practices and a re-usable set of existing architecture assets.

TOGAF has been developed through the collaborative efforts of 300 Architecture Forum member companies and represents best practice in architecture development. Using TOGAF as the architecture framework will allow architectures to be developed that are consistent, reflect the needs of stakeholders, employ best practice, and give due consideration both to current requirements and to the likely future needs [46, p. 7].

It is designed as an open framework which may be used in parts, enhanced with on deployments, and adapted to company specific needs. It serves as a guideline and best practice collection thus leaving freedom and giving a frame in terms of an outline and general descriptions.

The core concepts of TOGAF are [46, literally extracted from p. 9-16.]: The Architecture Development Method (ADM) provides a tested and repeatable process for developing architectures. The ADM includes establishing an architecture framework, developing architecture content, transitioning, and governing the realization of architectures. Architects executing the ADM will produce a number of outputs as a result of their efforts, such as process flows, architectural requirements, project plans, project compliance assessments, etc.

TOGAF includes the concept of the Enterprise Continuum, which sets the broader context for an architect and explains how generic solutions can be leveraged and specialized in order to support the requirements of an individual organization.

Supporting the Enterprise Continuum is the concept of an Architecture Repository which can be used to store different classes of architectural output at different levels of abstraction, created by the ADM. In this way, TOGAF facilitates understanding and co-operation between stakeholders and practitioners at different levels.

By means of the Enterprise Continuum and Architecture Repository, architects are encouraged to leverage all other relevant architectural resources and assets in developing an Organization-Specific Architecture.

In order to carry out architectural activity effectively within an enterprise, it is necessary to put in place an appropriate business capability for architecture, through organization structures, roles, responsibilities, skills, and processes."

The TOGAF framework consists of four architecture domains: The business (or business process) architecture defines the business strategy, governance, organization, and key business processes. The data architecture describes the structure of an organization's logical and physical data assets and data management resources. The applications architecture provides a blueprint for the individual application systems to be deployed. Finally the technology architecture describes the logical software and hardware capabilities that are required to support the deployment of business, data, and application services.

However, since the data architecture is defined as the 'logical and physical data assets of an organization it mixes business requirements with technical implementation.

2.2 The Enterprise Architecture Triangle

In this section a framework is introduced which structures enterprise architecture in key domains and building blocks in order to give a comprehensive view on all relevant aspects of enterprise architecture. The framework and the architecture modeling approach briefly introduced in the next section have been successfully implemented in a number of projects (for details of the framework and its use in architecture projects, see [38]).

In difference to TOGAF the architecture framework introduced in this paper clearly separates the domains of business and IT architecture. This provides for a clear distinction of the business oriented description of the enterprise architecture and the derived technological implementation. Hence, in the proposed framework, in difference to TOGAF, the information architecture is not described as a separate architecture domain but split in a building block of the business architecture in terms of logical information structures and a building block of applications architecture in terms of implementation of data repositories. Furthermore, the framework details the domains in architecture building blocks to give a comprehensive overview of all constituents of enterprise architecture.

The framework is composed of three basic domains each with distinct architecture building blocks.
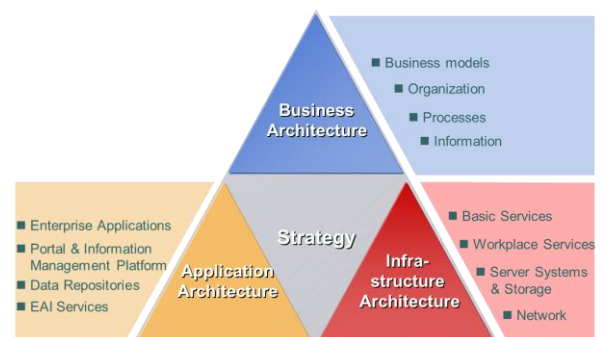

Figure 1: Enterprise Architecture Framework

The business architecture describes the fundamental organization and requirements of the business based on business strategy and objectives. It is composed of the four building blocks business model, organizational architecture, process architecture, and information architecture.

The business model gives a high level view on the nature of the business in terms of products & services offered in the market, the value chain, business partners, market channels utilized, and the combination of resources and information needed for value creation.

The organizational architecture describes the organizational design of the enterprise and the principal cooperation with customers and suppliers.

The process architecture classifies and describes all processes of the business and their respective value creation. It is the core building block of the business architecture. The process architecture can be classified in the core business processes customer relationship management, supply chain management,

product life cycle management and the management and support processes.

The information architecture shows the logical structure of all information entities like products, business partners, logistic information etc.

The application architecture gives an overview on all applications supporting the processes of the business with the building blocks enterprise applications, portal & information management platform, data repositories, and EAI Services.

Enterprise applications are supporting the automation of business processes and can be assigned to the respective process in terms of their functional support.

The portal and information management platform is the universal access to all company information and knowledge. Portals are designed to specific user groups like customer, business partner, and employees.

Data repositories are the physical storage of all relevant company data and provide an integrated view on product -, customer and business partner - , logistic -, or financial data.

Enterprise application integration services provide the integration of applications and data across the company. Integration technology spans from message exchange, data exchange to process integration.

The infrastructure architecture, also referred to as technology architecture, comprises the software, hardware and network infrastructure required for operations of all applications. Infrastructure building blocks are basic services, workplace services, server systems & storage, and the network.

Basic services are essential applications providing a specific functional support which are independent from business processes. Examples are communication services like Email or Telco, directory or search services, and administration services like single sign on or PKI. Web Services are emerging services which transfer the concept of basic service to the internet. Basic services are modules to be used in different applications.

Workplace services provide for presentation and work with information and for productivity support at the work place (office desk, shop floor etc.). They comprise fixed and mobile devices at the client site and include basic office applications and browser.

Server systems support all back end resources like applications, data repositories, integration services etc. Storage provides all memory capacity for running the applications on the server.

Networks provide the communication links in the LAN and WAN, within the company, between companies and in the Internet.

Security is integral part of all architecture building blocks and described in an overlaying structure.

This paper can only give an outline on the domains of the enterprise architecture framework and sketch the main building blocks at a high level. All building blocks of the framework are detailed down to the level of modules, systems and components. The framework gives a comprehensive description of all relevant elements of enterprise architecture providing a principal structure and classification schema used as a reference for architecture development.

2.3 Enterprise Architecture method and artifacts

The projected method for architecture design consolidates the modeling of enterprise architectures to a few essential and ample techniques (for details of the architecture models see [38]). For the design of architecture a "Service Oriented Architecture" (SOA) approach is followed (for SOA principle e.g. [2, 9, 33, 37]. Basically, IT-architecture can be always seen as providing services to the business e.g. an application supporting a business process, office and communication services at the workplace supporting each individual employee. Taking these perspective puts the value adds of IT in the focus. Consequently the building blocks of the architecture framework are structured in service groups, core services, and service modules.

Enterprise Architecture is more than the collection of the constituent architectures. The inter-relationships among these architectures, and their joint properties, are essential to the enterprise architecture. Thus, the architecture domains should not be approached in isolation. Key element of architecture design is to account for interdependencies among the building blocks of architecture. Blueprints are introduced as a means in planning the deployment of architecture on a large scale. Blueprints give a comprehensive view on the building blocks and how the interact. They show the effects of architecture design between business, application, and infrastructure architecture.

In the focus of enterprise architectures is the alignment of business and IT. In other words, the design of the business architecture determines the IT architecture which has to support and enable business. The building blocks of business architecture with the process architecture as the core define the frame for the design of the IT landscape. The dependencies between the different architectures can be described in blueprints.

A blueprint is a plan which describes the deployment of an architecture building block across the enterprise. It pictures the landscape of this building block in a matrix of two business dimensions.

- The application landscape describes for each business process how it is supported by applications. The second dimension shows the deployment in organizational units, like divisions, business segment etc.

- The data repository landscape describes the deployment with databases and how the support defined information clusters of the information architecture. The second dimension shows the deployment of the databases in organizational units.

- The service landscape shows the deployment of infrastructure services and the support of applications. The second dimension shows the deployment in organizational units.

In general, different types of blueprints can be generated depending which dependency of business -, applications -, and IT infrastructure architecture or building block is in focus. Also, the matrix dimensions can be chosen in different level of detail, although the experience in architecture projects shows that a high level is sufficient in order to derive decisions for architecture development. Generating to detailed blueprints involves a lot of resources and time without enriching the decision base in the same degree. The three blueprints introduced above provide a good information base for management decisions. Blue prints are used for presentation of "as is" as well as target architecture.

In addition to blueprints, each enterprise architecture domain can be described by views [13], which look at the architecture, its structure and elements from a specific perspective. Three basic views were identified which are sufficient to describe all relevant aspects of enterprise architectures:

- Component view: The view describes the logical and functional structure of the architecture in scope. All building blocks and their systems and components are described in terms of composition, structure and relationships among one another. The component view allows for different level of detail of the architecture. Components, systems, subsystems, building blocks can be grouped or decomposed. The segmentation of the diagram is in building blocks based on the respective architecture in scope.

- Communication view: The view describes the communication (interaction) between systems and components. The relationship among the systems is decomposed in the interaction of components within a system and to other systems. Different types of communication can be described with distinct notation for communication lines. The segmentation of the diagram is in communication areas based on the respective architecture in scope.

- Distribution view: The view describes the allocation of systems or components in terms of geographical or organizational distribution. The diagram is segmented in organization or location based on the respective architecture in scope.

These three views can be applied to all domains of enterprise architecture. However, the segmentation of the diagram is selected according to the appropriate context of the domain and chosen level of detail. The high complexity of enterprise architectures can be reduced by taking particular views which focus on specific aspects of architecture. The three views facilitate the reduction to core entities and construction principles and the understanding of their behavior.

In a number of projects these core design techniques, the blueprints and three views used for all domains and architecture building blocks, proved to be capable to advance the communication and architecture design of the different parties involved in architecture development [38].

In the following section we show the interrelationship of business and IT architecture and focus on the process for archi-

tecture development. Also, we explain how stakeholders can use the artifacts for innovation of the enterprise.

3. ARCHITECTURE DEVELOPMENT AND ENTERPRISE INNOVATION

3.1 The Innovation Potential

The objectives and success factors for enterprise architecture discussed in the first section show the relevance of architecture management and a defined architecture development process. In particular the transparency of architecture and the communication of objectives and results of all activities and artifacts along the process of architecture development are in the focus. Enterprise architecture is even seen as a change agent [35, p. 8].

The following summarizes the key features of Enterprise Architecture Management explained in the prior sections which bear a high potential to be used for innovation of the business:

- Enterprise Architecture is a comprehensive approach which constitutes all important building blocks of the enterprise like business models, organization, processes and technology.

- It addresses all dimensions of enterprise innovation.

- Enterprise Architecture Frameworks and supporting methods and tools provide
  - transparency on the building blocks and their interrelationships
  - easier communication among the stakeholders.

- Enterprise Architecture Management provides a structured and systematic approach towards the design of the enterprise.

At present in many companies this potential of Enterprise Architecture Management to leverage innovation is only partly used. A major drawback is that Enterprise Architecture design is often seen as an IT project with focus on technology implementation and not as a business issue to design and innovate the entire enterprise [10, p. 11f.]. Hence, based on reported deficiencies, own experience in architecture projects and guidelines for Enterprise Architecture Management, we design and propose an improved architecture development process which integrates innovation in a systematic manner.

3.2 The TOGAF Architecture Development Method (ADM)

At first we take a look what TOGAF recommends for Enterprise Architecture Management, in order to contrast the traditional approach. The TOGAF Architecture Development Method (ADM) provides a tested and repeatable process for developing architectures [46, p. 49f.]. The ADM includes establishing an architecture framework, developing architecture content, transitioning, and governing the realization of architectures. All of these activities are carried out within an iterative cycle of continuous architecture definition and realization that allows organizations to transform their enterprises in a controlled manner in

response to business goals and opportunities. Phases within the ADM are as follows:

The Preliminary Phase describes the preparation and initiation activities required to prepare to meet the business directive for a new enterprise architecture, including the definition of an organization-specific architecture framework and the definition of principles.

Phase A: Architecture Vision describes the initial phase of an architecture development cycle. It includes information about defining the scope, identifying the stakeholders, creating the Architecture Vision, and obtaining approvals.

Phase B: Business Architecture describes the development of a Business Architecture to support an agreed Architecture Vision.

Phase C: Information Systems Architectures describes the development of Information Systems Architectures for an architecture project, including the development of Data and Application Architectures.

Phase D: Technology Architecture describes the development of the Technology Architecture for an architecture project.

Phase E: Opportunities & Solutions conducts initial implementation planning and the identification of deliver y vehicles for the architecture defined in the previous phases.

Phase F: Migration Planning addresses the formulation of a set of detailed sequence of transition architectures with a supporting Implementation and Migration Plan.

Phase G: Implementation Governance provides an architectural oversight of the implementation.

Phase H: Architecture Change Management establishes procedures for managing change to the new architecture.

Requirements Management examines the process of managing architecture requirements throughout the ADM.

Taking a closer look to the activities listed for each of these phases reveals that the scope and focus is on IT architecture design which has to match the business architecture. The design of the business architecture is not given the same attention. Here the potential of Enterprise Architecture Management especially for the innovative architecture design of the business is not used.

Preliminary phase and architecture vision provide the ground for architecture projects in defining the scope and baseline of projects, management buy in, identifying stakeholders etc.

Phase B – D have the focus on analyzing the architecture domains, documenting it and designing a future state.

Phase E – H deal with the implementation of new architecture by governance, portfolio management and project execution.

Thus, the Architecture Development Method (ADM) provides a good ground for EAM activities with IT architecture in its core but needs to be enhanced for innovation and business design issues.

3.3 Enterprise Architecture Development

Based on the potential of enterprise architecture management for innovation we propose and introduce in the following an architecture development process which aims to leverage that potential. Key features of the extended architecture development process are:

- to use enterprise architecture management and the architectural artifacts for a systematic approach towards innovation

- to integrate creative brainstorming and innovative design at well-defined stages into the process

- to use open innovation for the architecture design [14]

Figure 2 gives an overview of the overall structure and steps of the architecture development process. It advances the understanding of architecture management by extending the scope to business design and innovation (compare the architecture process in [35, p. 5, 57f., 46, p. 51f.].

In addition, the following principles guided the design of the process:

- Scope is business engineering not only IT architecture

- Comprehensive process from visioning to implementation covering the entire business

- Balanced involvement of business people and IT

It is proposed to start with an initial "Visionate" phase. It extends the traditional architecture management by an open, informal, and unstructured process to generate new ideas how to set up and run the business. Visionate stands for a combination of vision and innovate. This phase brings together business people who know the market, the own business capabilities in terms of skills, organization, and processes and IT people who know the information systems and I&C technology. Objective is to develop in cooperation business vision and innovation ideas in all dimensions based on a deep understanding of the capabilities and the market.

Ideas should be generated free of restrictions of the current business design. Sources are business capabilities, market & technology trends, and blueprints of architecture. The "visionate team" elaborates on the business model building block, sketches business scenarios and envisions blueprint options for both business architecture and IT architecture. Here, an open innovation is applied, e.g. integrating customers to develop new business model ideas. The results are worked out independent from the current architecture in order to be open minded for innovation and free of any restrictions. However, architecture blueprints can be used as a powerful means to understand the current business.

It is followed by the "Definition of the Business Strategy". Here, the results of the Visionate are matched against the current business architecture and evaluated, resulting in the formulation of a business strategy.

The development of the business strategy is followed by the two phases of architecture design, the "definition of business architecture" and "definition of IT-architecture". Both phases are

closely linked and perform the same activities for their respective domains.

Architecture development is linked to business strategy which is the starting point for the definition of the IT strategy taking environmental and technological trends into account. This strategy alignment is basically the first cycle of business/ IT alignment. The strategy is detailed to features of the enterprise architecture. Here the architecture framework comes into place, which links business -, applications -, and infrastructure architecture and the respective building blocks. This is the kernel of architecture development where techniques like blueprints are applied.

Based on "as is blueprints" of the business and IT landscape "target blueprints" for all architecture building blocks are defined. They are derived from the business and IT strategy. In addition, an adaptability analysis is performed in order to assess how the information systems in place can adapt to a changing environment [23]. The results are used for the definition of target blueprints. In this phase architects collaborate in teams which range from enterprise to the specific domains of business or IT architecture. These activities correspond to phase B - D of TOGAF.

An Enterprise Architecture however, includes not only the three domains for the "as is" architecture (baseline architecture) and the target architecture. It is built on a strategic information base with a clear definition of business objectives and strategy. The strategy is needed for the transitional processes in order to implement new business design and technologies in response to the changing business needs. That means the enterprise architecture management includes also the process to create, update and

manage the evolution of the architecture domains in line with business strategy. These activities correspond to Architecture Change Management and Requirements Management of TOGAF.

In addition to the initial "Visionate" an innovative design of the architecture domains is encouraged based on a clear understanding of business strategy and a transparency on the interrelation of the architecture domains. Here, open innovation is applied again, e.g. integrating I&C technology experts to develop technology options to best support business.
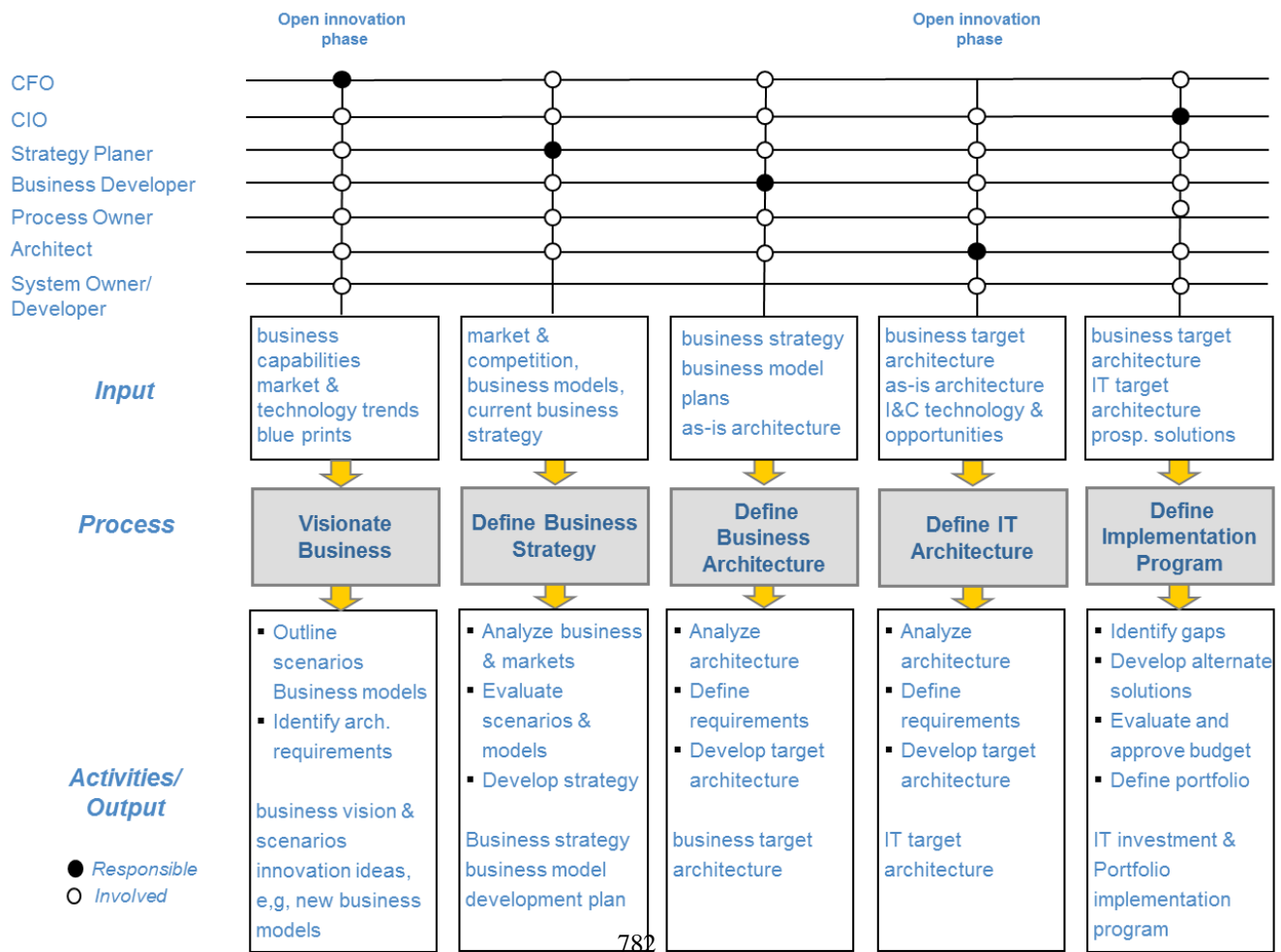
The architecture design phases are followed by the "Definition of an Implementation Program" before hand over to project execution. Architecture blueprints describe the deployment plan to implement IT strategy. From the gap analysis of "as is" and target architecture potential projects are derived.

Figure 2: extended enterprise architecture development process

In an investment & implementation planning the projects are prioritized, migration strategies are worked out and the overall program and portfolio is defined in order to implement the architecture. A business oriented program and portfolio management is of central importance [27, 35, p. 113f.].

The execution of the respective program and the projects finally result in changes to the current architecture and IT service operations. The implementation of the target architecture forms the second cycle of business/ IT alignment. These activities correspond to phase E - H of TOGAF.

In addition to the main focus to drive the architecture development process, architecture management deals with activities

like documentation and maintenance of architecture, communication of architecture benefits, management buy in, and securing compliance to legislation and company standards. All these activities require the involvement of stakeholders from business as well as IT. The following section shows how the architecture development can be supported by an appropriate architecture management organization

3.4 Organization and Stakeholders in Architecture Management

The development of architectures is complex and extensive. It involves a number of participants with different professional background. Many of them have other permanent tasks in addition to architecture design. Thus, it is recommended to set up a project organization for architecture development at high company level, besides a permanent staff within CIO which is responsible for architecture management [16, p. 108f., 35, p. 69f., 46, p. 51f.].

The following proposed project organization is based on Meta Group clients architecture projects experiences and company internal architecture projects experience, [35, p. 69 f., 38].

In practice, for most projects IT is the driver of the architecture development and the business is often not adequately involved [10, p. 11f.]. In consequence the following objectives are important for architecture management success:

- Set up as a business project with clear business goals no technical focus, high level management back up

- High involvement of business people (e.g. resources and management functions)

- Cooperative teams with a good mix of expertise and skills in business and IT

- Awareness building and communication of project scope across the enterprise

- and providing an innovative culture

Figure 3 outlines the overall project organization (compare [35, p. 76]. The core is the architecture team led by an architect at enterprise level. The team is composed of architects of all architecture domains ([35, p. 69f.] recommends not to exceed 8 persons [46] recommends about 5-10 max.). Additional teams are set up for diverse architecture domains. These teams drive the overall process, create and maintain deliverables and oversee all infrastructure projects. They develop an architecture requirements definition and other key artifacts and present it to the steering committee and architecture review board for approval.
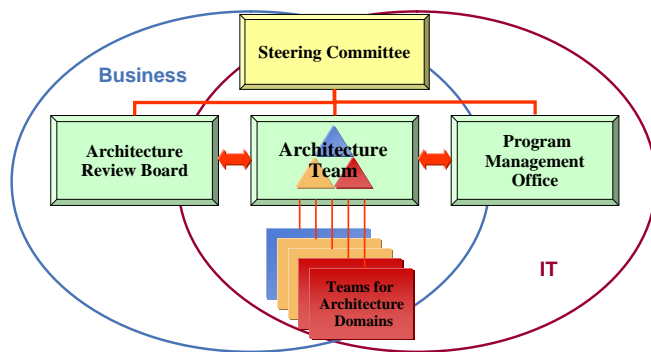

Figure 3: Overall architecture management project organization

A steering committee representing seniority and governance sets the general regulations and gives guidance for the project and the overall architecture development process. The steering committee is set up with business and IT managers. The architecture review board provides input for, reviews, and approves the overall conceptual architecture and standards set. The program management office is responsible for the planning and execution of the entire project. It governs the architecture development from analysis, innovation, and target design to implementation.

The entire project organization should be a good mix of business and IT people. The scope of enterprise architecture and the architecture development process in mind, ranging from visioning to implementation, it is obvious that a number of people coming from different organizational backgrounds and disciplines are involved. The enterprise architecture framework and the design techniques outlined in the sections 2.2 and 2.3 are in the core for architecture design.

The stakeholders like CEO/CFO; CIO, IT strategy planer, and program manager are involved in the business/ IT strategy and decisions for direction, objectives of architecture, and IT program. They merely use methods of business IT alignment, IT impact, portfolio techniques and blueprints. Architecture principle and pattern are partly used.

The central role plays the enterprise architect who leads the architecture development and coordinates all respective activities. He is responsible for as is/ target-architectures and dependencies among architectures. In addition, there are other domain related architects involved. Responsibility of architects can be on diverse domains ranging from system to enterprise architecture. Architects use the entire range of techniques with different levels of detail depending on their respective domain.

It is essential that business and IT architects are involved in the overall enterprise architecture team and in the architecture domain teams. For innovation of the business architecture it is important to involve business development manager and also employees who execute the business processes in order to integrate experience and skills across the enterprise. Furthermore in line with an open innovation consideration should be given to use the potential of external innovation knowledge [14].

We recommend open innovation at two well-defined stages of the process: integration of customers to the Visionate phase and I&C experts for the IT architecture design (see section 3.3 and figure 2). Practice shows that at present it is often limited to analysts for the evaluation of I&C trends.

Process owners focus on blueprints which show how processes are supported by applications and services. Principles and patterns for business architecture are also used.

System owners and system developers use component -, communication - , and distribution diagrams with focus at system level. Defined principles and pattern are basis for their work.

The respective techniques are used differently by the stakeholders depending on the respective scope of work. The alternate ways of architecture description are an important means of com-

munication among the stakeholders involved in the architecture development process.

4. SUMMARY AND OUTLOOK

This paper addressed the management of enterprise architectures. The first section introduced a comprehensive architecture framework which classifies the basic domains and building blocks of enterprise architecture. It is used as reference for the constituents of enterprise architecture development. The framework addresses all dimensions relevant for enterprise innovation like business model, organization, processes, and technology and provides appropriate design techniques. This paper recommends to use enterprise architecture management as a systematic approach to innovate the enterprise.

Based on the projected method for architecture design and experiences in a number of architecture projects the second part outlined the organization of architecture management and the principal architecture development process. An extended architecture development process was introduced which integrates innovation as a central element for the enterprise architecture design. The process encompasses all activities from business vision & strategy, architecture design to implementation. Enterprise architecture needs to integrate business and IT. The main stakeholders from the business as well as IT side and their respective role in the process were explained.

In a next step the proposed extended architecture development process will be applied in a reference project. Based on the project experience, future work will enhance the process with a set of guidelines for architecture management and innovation. This will be added with methods to measure enterprise architecture success and an architecture management maturity model.

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