Management for Professionals

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Strategic Enterprise Architecture Management

Challenges, Best Practices, and Future Developments

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Introduction

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Management summary

Enterprise Architecture Management (EAM) emerged as a way to deal with organisational complexity and change in an increasingly turbulent business environment. EAM's history dates back to the 1980s when information systems engineers strove to take a holistic, organisation-wide perspective on IS design. At this stage, IS engineers realised that they could only design suitable software components if they understood how the organisation works as defined by its processes, organisational structure and goals. Over time, the concept matured and has become a discipline that provides a philosophy, methodologies and tools to develop, realise and operate competitive enterprise architectures. EAM assists organisations in maintaining the flexibility, cost-efficiency and transparency of their technical infrastructure, information systems, business processes and organisational structures in line with their business goals. EAM therefore ensures that corporate change can be implemented swiftly and easily.

In this chapter, we present EAM as a management discipline that helps to systematically design and develop an organisation according to its strategic objectives and vision. For this purpose, models are used to guide EA's structured development. We identify as-is models describing the current state and to-be models describing the future EA state (target architecture). Models can cover one or several layers of the EA: the business, organisation and processes, information systems, and infrastructure. Based on this understanding, we define EAM as a management practice that establishes, maintains and uses a coherent set of guidelines, architecture principles and governance regimes that provide direction and practical help in the design and development of an enterprise's architecture to achieve its vision and strategy.

The findings and insights presented in this book are the result of comprehensive qualitative research involving a team of 13 researchers and professionals. We investigated eight case companies and identified factors and practices for a successful EAM. The research design consisted of the following five subsequent phases: preparation, data collection, data compilation, and review by the case companies and data analysis.

1.1 The need for enterprise architecture management (EAM)

Background: The turbulent and complex business environment

Adaptation to the changing environment is a competitive factor

Companies operate in an ever-changing marketplace characterised by variable customer demand patterns, fast-paced technology innovation, the shortening of product life cycles, and increasing specialisation and competition in global value chains. While so much is in flux, one certainty stands out: The urgent necessity to adapt to the changing environment to stay ahead of the competition. Change has become the norm. Change affects all elements of an enterprise's value creation: products and services, corporate capabilities and assets, alliances, partners, suppliers, and customers. Enterprises respond to the ever-changing market environment by adapting their core competencies and strengthening their customer and supplier relationships, by redesigning their organisational structures and processes for being efficient and effective, and by leveraging information systems and information technology for digitising their business. They thereby continuously change their fundamental structure, which is the enterprise architecture. Although the changes are intended to strengthen an organisation's competitiveness, they frequently have severe and unintended side effects. If change initiatives are launched independently, with little or no coordination across the enterprise, they result in a plethora of heterogeneous, incompatible and costly changes to information technology, information systems, business processes and organisational structures. Even worse, additional investments in organisational redesign and/or information technology might not pay off because they might produce uncontrollable architectural complexity, instead of improving business performance. Investments might thereby generate risks that might even paralyse the business. The downsides of architectural complexity are manifold; these include:

Poorly coordinated changes generate risks and paralyse business

Complex enterprise architecture increases costs and decreases flexibility and transparency

Loss of transparency. With increasing complexity, managers might lose their organisational overview and, therefore, might lack fundamental information necessary for decision-making. They simply have to invest more effort in collecting information about the current situation in order to determine the implications of change.

Increased complexity costs. A complex structure is mostly more expensive to manage than a reasonably simple, well-defined architecture. The following example illustrates that complexity is a cost driver: If different technologies are used in different parts of the organisation, IT investments will most likely be relatively high. If there is greater unity in the technology, the organisation can negotiate a better price by bundling purchasing volumes and buying one type of technology. Furthermore, it is much easier to develop the necessary skills and competencies to manage technology within the organisation when only one type of technology is used.

Complexity costs may also result from using diverging business processes in different subsidiaries. If each process is run independently, using its own resources, potential synergies across subsidiaries are likely to be neglected. Unless individual processes lead to a competitive advantage, diverging business processes therefore also result in unduly costly structures.

Increased risks. Highly complex enterprise architectures also increase operational risks and hamper risk management. A large number of architectural components with sprawling interfaces, media breaks, diverging business rules and procedure make it almost impossible to identify all business-critical risks and approach them accordingly.

Inability to consistently implement strategic directions across the organisation. The more complex an enterprise's architecture is, the more difficult it is to restructure or redesign it, and the more problematic it is to implement strategic changes in the organisation. In its worst form, an organisation might remain in its current state because change is no longer possible.

Distraction from core business problems. Complex enterprise architectures tend to tie down highly skilled and competent professionals. Instead of maintaining competitiveness, they are distracted by having to manage complexity and, ironically, end up preserving the current state, which keeps the organisation in a state of stagnation.

Many organisations lack transparency due to the number and frequency of their organisational changes and suffer from overly complex enterprise architecture. Some of the questions they cannot answer are:

How can we successfully integrate new firms after an acquisition?
Can we introduce new products and services, using the existing business processes and the underlying applications?
Which business units and users will be affected by an application's migration?
What applications and infrastructure technologies do we require to run new or redesigned business processes?

EAM as used by a global car manufacturer

We looked at a car manufacturer that makes use of EAM to manage a large, global corporation. This car manufacturer comprises a group of various brands. Each brand operates independently, and has a global market presence. The group has more than 50,000 employees and operates production plants in several countries, with a majority of these sites situated in Europe.

A sophisticated strategy is needed to manage such a large, global corporation. For example, if new production facilities are established – as is currently being done in Russia, India, and the US – it is vital to set them up in a standardised way. Therefore, the manufacturer uses a global template. This toolbox contains IT modules that implement an out-of-the-box process model. The model covers all standard business processes, including production planning, logistics, maintenance and assurance, as well as finance, accounting and HR. IT modules and processes are bundled together in a central EAM toolset, ready for decentralised introduction in new subsidiaries. When processes are improved and redesigned, which happened, for example, with the logistic processes in the US factory, these changes are approved as the current version of the standard and are then incorporated into the centrally managed toolbox. This approach enables a cost-efficient and swift set-up of up-to-date processes that can be customised to local requirements, if necessary.

At the same time, the car producer closely monitors its IT budget. The organisation spends less than 1% of its revenues on IT and claims to have the lowest IT cost per car in the industry. External contractors are responsible for many developments. With EAM, the company reduces the complexity and operating costs of its IT systems and keeps the budget under control. To realise these objectives, architects are very involved in the approval process of software architectures and the standardisation of IT components.

Obviously, the firms struggling to answer these questions have lost the information base that they need to achieve their business goals. Managers might no longer have a holistic perspective on the organisation, the business model and operating principles, the organisational structure (such as business units and regions), business processes and their distribution, applications, databases, and the underlying technical infrastructure. Only if they know how these

components are interrelated, can changes be coordinated and aligned with the mid-term to long-term company objectives. Transparency is a prerequisite to reduce organisational complexity step by step and regain flexibility.

The idea of enterprise architecture management

EAM aims to maintain the flexibility, cost-efficiency and transparency of the enterprise architecture

EAM seeks to maintain the flexibility, cost-efficiency and transparency in the enterprise architecture. It emphasises the interplay between business (such as business models, organisational structures and business processes) and technology (including information systems, data and the technological infrastructure). EAM helps to systematically develop the organisation according to its strategic objectives and vision.

EAM is similar to city planning

The EAM concept is aligned with the idea that planning an enterprise's architecture is similar to planning a city. City planning includes the design of the city's development, which covers the land use, streets, utilities and waste disposal. The design is multi-faceted, complex and inter-disciplinary, since it has to fulfil several – sometimes conflicting – design objectives, as pointed out in Table 1.1. City planning must ensure that the inhabitants have access to key resources and a high quality of life, and must respect the environmental conditions, available budgets and long-term requirements, notably sustainability. If these objectives are not achieved, a number of problems may result, such as traffic jams, indirections, supply shortfalls, environmental pollution, noise, social ghettos, crime, movement of labour and emigration.

Good city planning is characterised by a number of attributes. To achieve this, the city planner must:

anticipate future demands and requirements,
make plans and develop the city accordingly,
bring the different stakeholders together and discuss their interests,
serve the city as a whole and not local interests, and
have a holistic, multi-perspective view on the city (socially, economically and logistically).

The same is true for good EAM. Instead of buildings, streets and utilities, enterprise architecture consists of components that make up the fundamental structure of an organisation: business processes, organisational structures, information systems and technological infrastructure. Enterprise architecture management includes developing, implementing and controlling these different components.

Table 1.1: Analogy between city planning and EAM

Objective	City planning	EAM
Effectiveness	Develop the city to satisfy the requirements of its population	Develop an organisation to satisfy business goals
Efficiency	Develop the city so that logistics and supply of any kind can be realised efficiently	Develop an enterprise architecture that supports a firm's efficient operation
Economic feasibility	Develop the city within the available budgets	Develop an enterprise architecture within the available budgets
Flexibility	Be ready for future developments, such as additional suburbs and their requirements	Develop an enterprise architecture that can be quickly and inexpensively adapted to future strategic objectives
Safety and security	Enable a safe life in the city	Allow a firm's secure operation and necessary management controls; minimise operational risks
Sustainability	Develop the city in a sustainable, environmentally friendly way	Develop an enterprise architecture that is sustainable and complies with regulatory standards, or goes beyond those standards, by developing long-term solutions
Robustness / scalability	Develop the city so that it can handle peaks and growth in logistics and supply without major problems	Develop a flexible enterprise architecture that can handle business activity peaks
Quality of life	Provide a high quality life for the citizens	Develop an enterprise architecture that allows job fulfilment and motivation
Wealth	Allow the community to develop and prosper	Develop an enterprise architecture that supports profitability

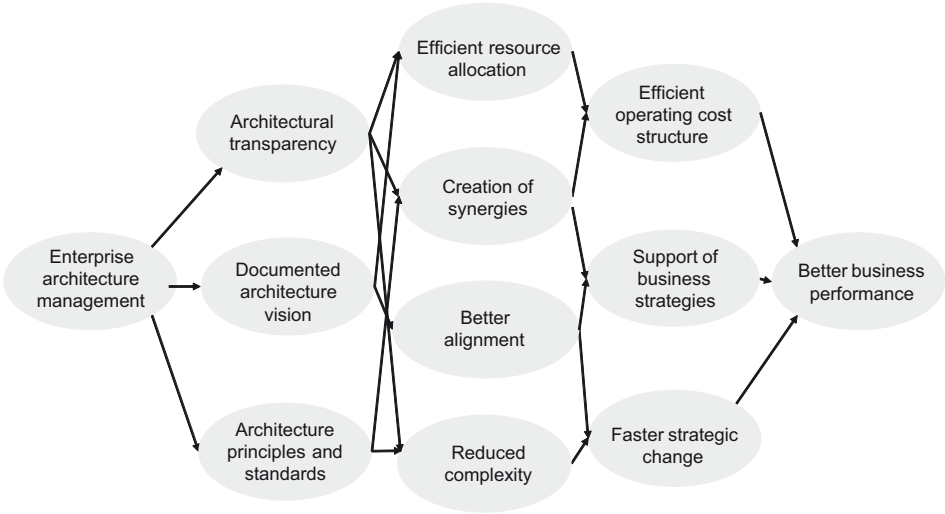

Figure 1.1: EAM effects

EAM can help to improve an enterprise's performance, as shown in Figure 1.1:

The beneficial effects of EAM result from increased transparency, documented architecture vision and clear architecture principles and guidelines

1. **Architecture transparency.** EAM establishes transparency by documenting the main enterprise architecture components and their interrelationships. The enterprise architecture model is often complemented by additional pieces of management-relevant information that relate to security, costs, benefits, compliance and risks. EAM thus creates a valuable information basis that is indispensable for actively managing an organisation: Transparency is a prerequisite for identifying synergies and allocating resources efficiently; it supports strategic decision-making, strategy implementation and operational management.
2. **Documented architecture vision**. Based on a transparent view of the enterprise architecture, management can decide on how to develop the organisation or parts of the organisation. A documented architecture vision represents multiple stakeholders' 'shared view' and enables a better alignment of the different architectural layers and components. For example, the better information systems align with business processes, the higher the business process performance will be. When alignment is weak, there is an increase in manual work, multiple systems are needed for one task, data quality is low and reporting capabilities are poor. However, alignment is not limited to information systems and business processes. The interaction between infrastructure

technology and information systems might also suffer from poor alignment if a network topology does not match an application's requirements. This mismatch would result in low network speed and application performance.

3. **Architecture principles and guidelines.** To guide the purposeful development of an organisation, management must define architecture principles and guidelines.
   Modularisation is a very powerful concept. Modules are accessible via clearly defined standardised interfaces, which increases the chance of re-use. Many advantages emerge with modularisation, such as scalability and cost reduction. Furthermore, the modularisation of an enterprise architecture increases its strategic flexibility, because enterprise architecture components may be recombined when they are needed in new business models or business processes. Moreover, modularisation allows for outsourcing or re-configuration of the value chain.
   Today, many managers adopt modularisation – or service-orientation – as an architecture paradigm to regain flexibility on all layers of an enterprise's architecture. For example, software functionality may be modularised by means of service-oriented architectures, and technological infrastructures may be modularised by cloud, grid and virtualisation techniques. Modularisation can also be applied at the organisational level. For example, an organisation can introduce shared services or modular process patterns, which might ultimately allow for the dynamic re-combination of core competencies in a virtual organisation [1].

Not all enterprises will receive all these benefits from the outset. In most cases, specific business needs and urgencies will influence the targeted benefits. It is therefore important to have a clear understanding of EAM's primary objectives. More detailed information on how EAM actually generates benefits for an enterprise can be found in Chapter 3.

1.2 What is enterprise architecture management?

History of enterprise architecture management

As a management discipline, EAM has evolved over the last 25 years. It has its roots in the 1980s and developed in three phases, as outlined in Figure 1.2.

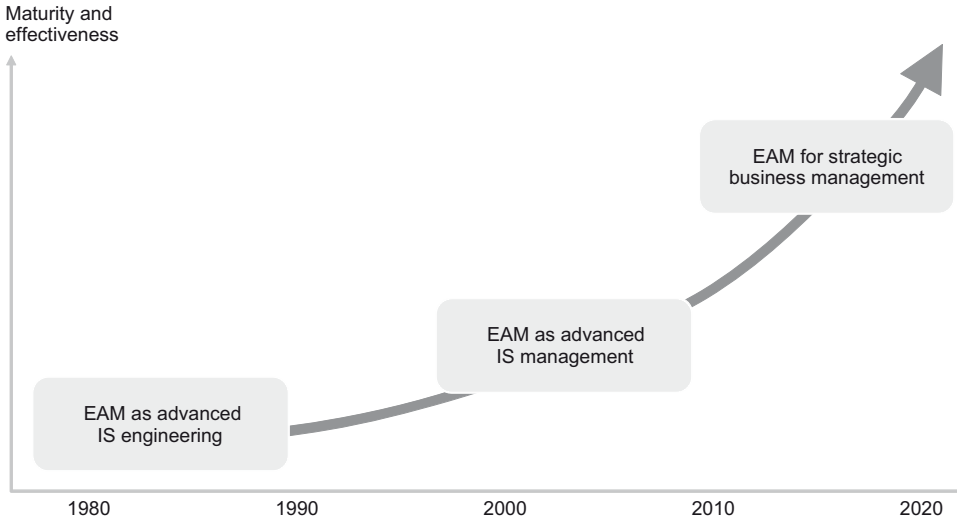

Figure 1.2: EAM development phases

Phase 1: 'Take the big picture' – EAM for information systems engineering

EAM is rooted in Zachman's framework for the holistic engineering of information system

EAM's formation phase was in the beginning of the 1980s, with IBM's 'business systems planning' concept [2] and the subsequent development of the Zachman framework [3]. At this time, Zachman observed that the term 'architecture' was widely used by information system professionals, but often had different meanings. Zachman's framework provided the means for a great leap forward. He introduced the conceptualisation of architectures from multiple perspectives (e.g., objectives/scope, enterprise model, system model and technical model), using different architectural descriptions (e.g.,

data, function and network). The framework is described as a matrix (with 30 cells) and suggests specification documents for each cell (e.g., using entity relationship models to describe data, or using functional flow diagrams to describe processes). Although EAM has subsequently developed significantly, Zachman's ideas still inspire many EAM professionals, and almost all frameworks are based on the principles he formulated. Our contemporaries should especially acknowledge his holistic approach to viewing enterprises formally and in a highly structured way, as well as from a technology and business perspectives. Zachman's idea of a multi-perspective and multi-layered enterprise modelling approach became state-of-the-art in the beginning of the 1990s, influencing many other frameworks. Among them are FEA (Federal Enterprise Architecture) [4], ARIS (Architecture of Integrated information Systems) [5], Business Engineering [6] and SOM (Semantic Object Modelling) [7].

Phase 2: 'Adapt Your Management Processes' – EAM for IS management

Advanced EAM frameworks integrate planning, implementation and controlling processes for IT/IS landscapes

During the 1990s and 2000s, EAM professionals felt that a pure modelling approach was not enough. Owing to technological advances and the dissemination of desktop computing, local area networks and increased business process digitisation, IT/IS landscapes became increasingly complex. This also meant that more stakeholders were involved and IT/IS spending increased. In many organisations, IT/IS implementation decisions were driven by business managers. These business managers provided the funding and had little interest in slowing down the implementation through additional cross-company coordination. Consequently, there were many cases of local optimisation, isolated silo systems, shadow IT organisations, redundancies, misguided investments and IT/IS project failures. To remedy these ills, people began to focus on planning, implementing, and controlling processes to ensure transparent decision-making and to regain control of the IT/IS landscape. IT management processes and governance mechanisms became more relevant. EAM was taken to the next level by:

defining role models,
planning, implementing and controlling the processes for IT/IS landscapes (not only single applications), and
defining decision rights and accountabilities.

Advanced EAM frameworks emerged. These frameworks not only provided architectural artefacts and models, but also contained guidelines for EAM planning, implementation and controlling. One

of the most prominent examples is The Open Group Architecture Framework (TOGAF™) [8], which includes the Architecture Development Method (ADM), a cyclical process model. For further information on such advanced frameworks, please refer to Chapter 8.

Phase 3: 'Make it Strategic' – EAM for strategic business management

EAM becomes a strategic function attached to a board member

Today, we know that architecture management can only achieve its full potential if it is closely linked to the business strategy. Consequently, EAM must align with the organisation's strategy planning and strategy implementation processes. Professionals recognise that architecture management can help organisations to remain flexible and to implement strategic change swiftly and cost-effectively. Consequently, EAM is no longer understood as just an IT department job, but as a strategic function. EAM plays an important role in organisational transformation and development, and is executed by a board member at top management level. EAM is sometimes merged with the programme management office or the business development department, which underlines the strategic importance of developing an enterprise's architecture. Why is this so? The reasons are manifold, including:

IS/IT as a means of strategic and organisational transformation. Companies realise that their IT investments have no value unless they are used to improve organisational effectiveness and efficiency, increase employee productivity and implement new strategies. Hence, the planning of the IS landscape needs to be closely linked to the strategic and organisational directions.

Increased outsourcing. Some organisations concentrate on their core competencies and outsource the other parts of the value chain. When important parts of the value chain are outsourced, thorough monitoring of the external service providers is crucial. EAM may provide the information for such monitoring activities. Furthermore, EAM can evaluate the nature and quality of the interfaces to external service providers and supervise their service provision.

IT/IS as a commodity. Owing to technological trends, including standardisation, virtualisation, grid and cloud computing, as well as software as a service (SaaS), IT/IS services have become a commodity [9]. Consequently, the focus has shifted from managing technology to applying technology to support the business. This emphasises EAM's business relevance.

Business-IT alignment. Many organisations have made great progress in sourcing, making and delivering IT/IS services. Service management standards – for example, the IT Infrastructure

Library (ITIL) – or the trend towards shared service organisations are indicators of this tendency. However, it is still crucial for businesses to align their IT/IS services with their business needs. EAM is a great tool for establishing this alignment.

Integrating EAM into the strategy development and strategy implementation processes results in strong synergies, improved decision-making and faster strategic change. Strategic decision-making is based on enterprise architecture information, and takes enterprise architecture-specific objectives and policies into account. Many leading organisations already follow this broader understanding of EAM and involve highly skilled EAM specialists in these processes.

A working definition of enterprise architecture

What is enterprise architecture?

Generally speaking, architecture is defined as the 'fundamental organisation of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design' [10]. Enterprise architecture (EA) is therefore understood as the fundamental organisation of an enterprise as a socio-technical system, along with the principles governing its design and development. An EA includes all relevant components for describing an enterprise, including its business and operating model, organisational structure, business processes, data, applications and technology. EA's design rules provide stipulations for the development and structuring of the components, as well as a means to ensure consistency in the use of components and in their relationships.

As in city planning, we distinguish between the actual EA (the real-world enterprise as we observe it) and an EA model (documented by means of plans or models) (Figure 1.3):

In the course of documenting the actual EA (from here on: EA), an EA model (**as-is model or baseline**) is created. The EA model is mostly documented by means of a semi-formal modelling language. It is usually stored in a specific database (repository), but can also take the form of a drawing on paper.

Models are developed to capture a desired target EA state (**to-be model or target EA**). The to-be model can be used to guide an EA's development. Thereby, the present architecture is transformed into the to-be-architecture.

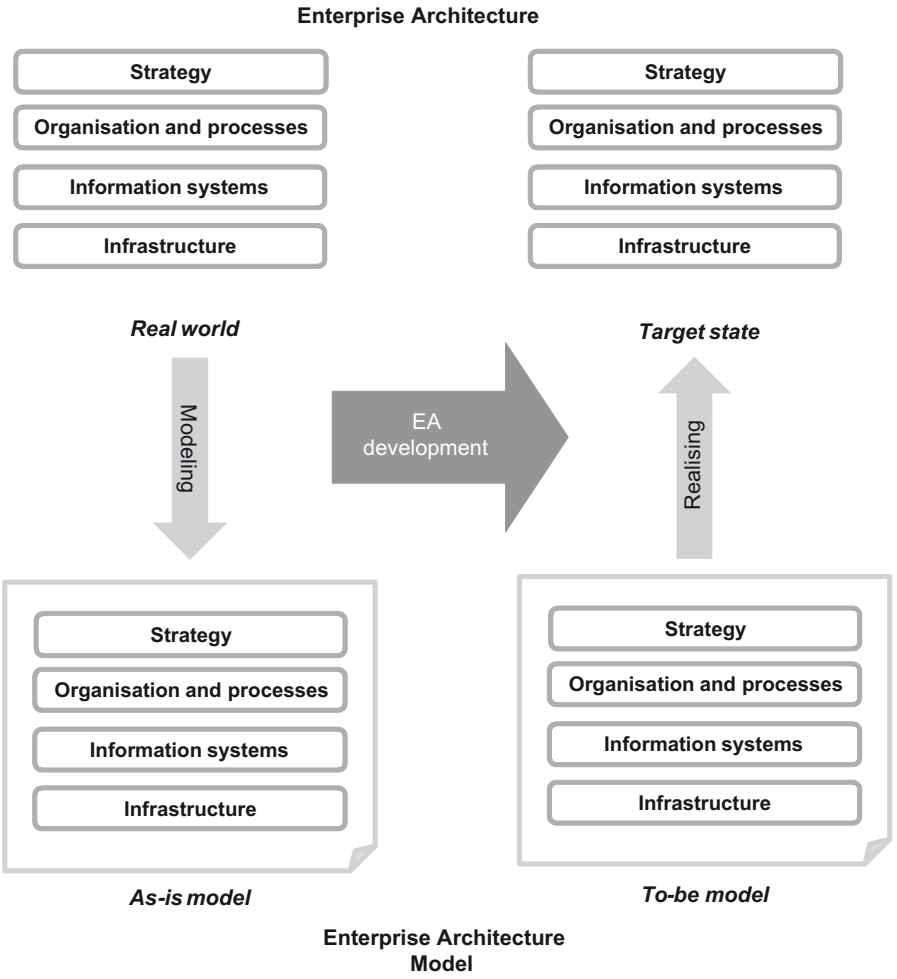

Figure 1.3: Terminology

Enterprise architecture models and their layers

EA models usually have layers that cover the business, processes, information systems and infrastructure

In order to describe an organisation's fundamental structure, EA models often comprise a huge number of components. The EA is most inclusive of all the main components if it is presented from different perspectives at different layers of abstraction. Unfortunately, and despite the long history of EA modelling, there is no consensus on the layers or the components that should be included in the EA. In the context of this book and as depicted in Figure 1.4, we consider the following components and layers as essential:

The **strategy layer** describes the positioning of an enterprise (or its business units) at a high level of abstraction and is developed once the business strategy is defined. Typical artefacts represented on this layer are: the value networks, customers and market segments, the product, talent and service portfolio, business goals, and related KPIs. Some EA frameworks do not include this layer, while others refer to it as the firm's business or operating model. The Target Operating Model (TOM) documents the key decisions regarding how the company will operate in future, thereby representing a cornerstone of the development of an enterprise's architecture.

The **organisation and process layer** specifies a firm's organisational structure and its process organisation. It comprises static (structural) aspects, for example, departments and other organisational units and roles, as well as dynamic (flow) aspects, for example, business processes and tasks. Some frameworks, for example, ARIS or the business engineering framework, emphasise this layer, thus focusing on IS as an enabler of organisational change and business process redesign.

The **information systems layer** describes how information is processed and shared electronically within and across organisations. This layer can be further broken down into an application layer, a data layer, and an integration layer.

- The **application layer** describes the main software components that implement the business logic in order to support business processes. Typical artefacts include application components and services.
- The **data layer** describes how key business information (such as product, customer or supplier data) is represented and implemented in databases. Typical artefacts are data models and data bases.
- The **integration layer** describes how applications share, or could share, data and functions with other applications and databases. This layer comprises interfaces, protocols and integration components.

The **technology or infrastructure layer** contains the computing services that form the enterprise's technical infrastructure. The technical infrastructure is realised by computer and communication devices, as well as by system software, which is this layer's key artefacts.

Finally, the **people and competencies** layer represents the people and competencies required to develop and operate an enterprise architecture consisting of the aforementioned layers.

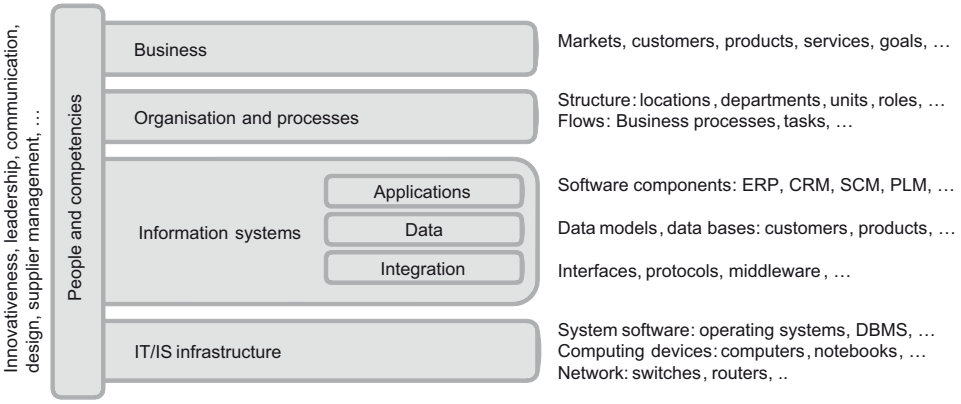

Figure 1.4: EA layers

These layers build up hierarchically and relate to each other

While structuring the EA in layers helps to separate concerns, aligning them can be challenging. Alignment might be complicated due to the different lengths of the change cycles underlying the layers. For example, strategic changes such as the introduction of new product lines and distribution channels are likely to occur annually, but the redesign of an organisation to implement these strategic changes may take up to two years. Information systems are built to last at least 10 years, so the existing IS architecture might not be able to deal with the organisation's constant changes in the business environment [11]. Consequently, it has become very popular for companies to investigate measures for aligning business and IT, and for increasing its agility. However, companies are also aware that monolithic applications impose restrictions, and are concerned about decoupling business processes and their implementation. In this regard, service-oriented architectures are regarded as an enabler of more flexible IS architectures, and standardisation and modularisation are recognised as architecture principles that will decrease heterogeneity.

Managing the enterprise architecture

EAM is becoming a real management discipline

While early EA initiatives focused on EA modelling and documentation, our case studies demonstrate that EAM has become a real management discipline closely linked to strategy planning and implementation. EAM builds on the transparency provided by EA models and documentation of the as-is and to-be situations, but

includes the continuous process of developing, realising and operating the EA. We define EAM as follows:

> EAM is a management practice that establishes, maintains and uses a coherent set of guidelines, architecture principles and governance regimes that provide direction for and practical help with the design and the development of an enterprise's architecture in order to achieve its vision and strategy.

To understand the characteristics of EAM as a management discipline, it is also helpful to clearly delineate what EAM is *not*:

Most importantly, **EAM is not a tool**. Although EAM introduction is often accompanied by an extensive debate on tool support, a tool alone will not yield any impact. A tool just helps the practitioner to capture EAM documentation and store it in one place.

EAM is not just the modelling of the enterprise architecture. While modelling may support EAM, our case studies have shown that modelling is one of the subordinate aspects of EAM.

EAM is not an IT function, although historically it first emerged in IT departments. The successful management of IS landscapes requires more than just technical expertise in applications and infrastructure, as well as some business know-how. EAM is most effective when it is directly linked to the board or the CEO.

EAM is not a new management process. EA includes a set of new management practices, but it does not produce new processes. Instead, it merely changes the way existing processes are run. Strategy planning and strategy implementation are, for instance, complemented by EAM if EAM provides them with additional information and new methods for managing complex real-world organisations.

EAM is not strategy development. EAM practices are merely used in strategy development. They contribute valuable information, such as assessments of the strategic options and their feasibility, taking the firm's capabilities and resources into account, which is useful for strategy development.

To summarize, EAM *is*:

What is EAM?

a holistic way to understand, plan, develop and control an organisation's architecture (**EAM as a management philosophy**),

a support function to enable and improve existing strategy planning and strategy implementation processes (**EAM as an organisational function**),

a set of management practices that helps to improve the quality of decision-making (**EAM as a methodology**), and
an open approach to reach consensus among managers on the basis of their shared vision of establishing a global optimum for the firm, free of local and personal egoism and opportunism (**EAM as a culture**).

Chapter 2 contains more information regarding the building blocks of EAM.

1.3 Objectives of this book

This book is targeted at IT professionals, executives and top management

This book is based on the notion that EAM serves the business *and* the IT/IS function. This means that EAM must be understood by architects, IT/IS professionals, business-side executives and decision-makers, and the firm's top management. Whereas the majority of books on EAM address the first target group, we address C-level managers and decision-makers who:

want to learn what EAM is about. We provide an overview of the most important EAM building blocks (Chapter 2), and discuss these building blocks in subsequent chapters (Chapters 3 to 9).
want to enable other people to initiate EAM. We provide an EAM management agenda for top executives (Chapter 3) and a process model for introducing EAM (Chapter 9).
are responsible for introducing EAM. We provide explicit advice on how EAM can best be introduced into organisations (Chapter 9), and explain what successful EAM looks like (Chapters 4 to 8).
want to improve their EAM and profit from insights on the topic. Throughout the book we present proven best practices, which we gained from leading organisations. We also describe current and future EAM trends (Chapter 10).

To serve these different purposes, the book is:

management-oriented. We avoid unnecessary methodological details and concentrate on the essence of EAM. Our focus is on those aspects that determine EAM success. Therefore, we don't discuss conceptual details in the form of document templates, frameworks, modelling techniques, or meta-models.
business-oriented. We avoid a technological perspective on EAM. Instead, we discuss how EAM can help organisations to strengthen their competitiveness. Technological approaches such as service-oriented architectures may be mentioned, but they are not the crux of our discussions.
innovative. The book goes beyond what the majority of organisations already do. It presents new approaches to organising, governing and practicing EAM, as well as forecasting how EAM might develop in future.

practice-oriented. We only include advice and best practices that have been proven to be effective and can be implemented directly.
research-based. Our insights are based on thorough case study research (see the next section) and extensive consulting experience.

1.4 Methodology

This book is based on qualitative research. We gathered our findings from 8 case studies in different industries, allowing us to thoroughly investigate and analyse the challenges and success factors of EAM.

What is qualitative research?

This book is based on qualitative case-study-oriented research results

Most people have at least a basic understanding of quantitative survey-based research, which provides questionnaires to large samples of respondents. This type of research ultimately leads to statistical procedures for analysing the data, in order to draw general conclusions about the population. We chose a qualitative research approach because our objective was not to describe organisations by means of statistical measures. Instead, we wanted to explore the core of successful EAM in the sense of the required preconditions, success factors and outcomes. We also wanted to elaborate on crucial EAM best practices and trends. These goals could only be achieved through qualitative research, especially in the light of the limited prior knowledge.

Qualitative research differs from quantitative research. It is based on small samples, consisting of cases. Qualitative research uses complex and eclectic data collection procedures, such as open interviews, documents, observations and secondary data. Statistical procedures may be applied but mostly play a minor role. Instead, researchers use the wealth of data to obtain a thorough and in-depth understanding of the cases' inherent logic, which allows them to explore the causal relationships between events. Researchers may also derive success factors and best practices; they may even seek to forecast future developments.

With qualitative research, researchers often analyse cases that are different in nature. This approach allows them to compare different approaches and practices, as well as their antecedents and outcomes. The advantage of differing data sources is that the same phenomenon can be viewed from various angles, allowing for conclusions with a higher degree of validity. Properly done, qualitative research may yield results that have a high degree of internal validity (the internal consistency and correctness of the conclusions) and a reasonable level of external validity (generalisability).

What cases were analysed?

We analysed dissimilar organisations from diverse industries that have different approaches to EAM. Table 1.2 provides an overview of the cases and their characteristics.

Table 1.2: Analysed Companies

Industry	Number of employees	Key figures	EAM characteristics
Banking	More than 50,000	balance sheet total > 700 billion EUR	Decentralised domain architecture with focus on the business side and the management of clustered application portfolios. High degree of maturity in domain-oriented landscape planning and the step-wise introduction of EAM by producing and sharing success stories.
Public administration	About 40,000 (civil servants)		The purpose is to rationalise resource use and adopt best practices for information and communication technology governance. EAM advises decentralised IS and business departments.
Tool manufacturing	About 20,000	Turnover in 2009: approx. 3 billion EUR	The strategy is to further improve IT governance by installing an architecture management. Architecture management is developed with project portfolio management as a starting point. Strong strategic orientation.
Logistics	More than 4,500	Revenue in 2009: 2,9 billion EUR	The company uses EAM for the comprehensive development of master plans, as well as the pragmatic utilisation of standardisation and commonly defined goals by incorporating these into existing governance processes. Strong strategic orientation.
Retail	More than 250,000	Sales in 2010: More than 65 billion EUR	In this group, EAM is understood as enterprise-focused management to control the business-IT alignment. Strong adaptation to the group's business model, which consists of several business lines. EAM processes apply enterprise-wide standardised tools and workflows for the development of core IT systems.

Table 1.2: *continues*

Reinsurance	More than 45,000	Turnover in 2010: Approximately 45 billion EUR	EAM as an approach to steer the organisational development by following certain principles and goals: It is guided by the strategy and has a long-term focus, is aimed at increasing profitability, and takes costs and benefits into consideration by supporting the business with information.
Food	Significant six digit number	Sales in 2010: Approximately 85 billion EUR	Worldwide standardization of the process and application landscape by means of EAM. Very high degree of maturity in terms of global governance and process management.
Automotive	Significant six digit number	One of the world's leading companies	Very complex, distributed organisational environment and several distinct but coordinated EAM initiatives on different EA layers: Long-term application landscape planning, standardisation of IT infrastructure and modularisation/service-oriented architectures. Very advanced decentralised governance structures.

The cases analysed describe the use of EAM by leading companies in different sectors

The cases differ in many ways. The companies used different approaches to introduce EAM, they have different core EAM processes, different governance regimes and diverging degrees of centralisation. By investigating and comparing these cases, we could see what works and what does not. As researchers, we call these 'natural controls': We can observe what happens when a certain practice or environmental factor is observable and when it is not observable. This helps us to distinguish between important factors and less important factors, as well as between best practices and ordinary practices.

How we did our research

Our research was a team effort by 13 researchers and consultants between the spring of 2009 and the autumn of 2010. In these two years, we passed through five phases, as outlined in Figure 1.5 and described in the subsequent sections.

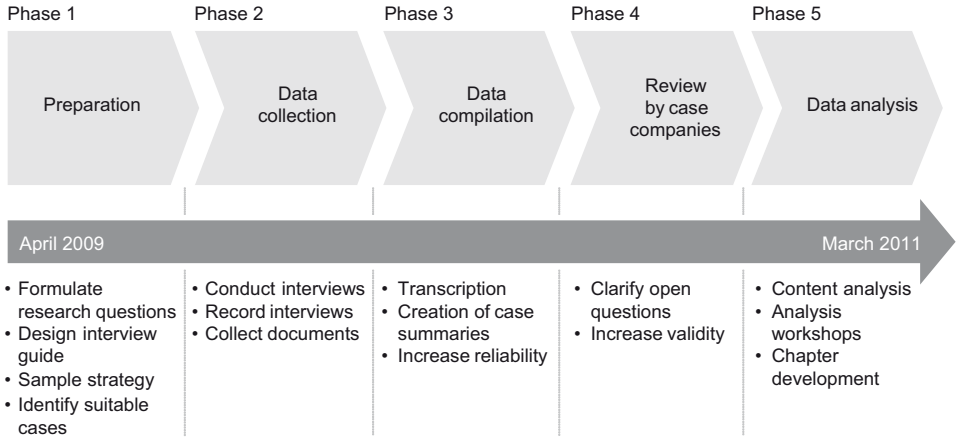

Figure 1.5: Research process

Rigorous research methods were used to generate the insights that underlie this book

Phase 1: Preparation

During Phase 1, we prepared for the research project. We collected topics and themes of interest, and formulated the research questions. We then developed an analysis framework that guided our case work. We also designed an interview guide for discussions with case representatives. One of the most crucial tasks in this phase was the specification of a sample strategy and the identification of suitable cases, which eventually led to the acquisition of the case partners.

Phase 2: Data collection

In Phase 2, we conducted interviews with EAM stakeholders from the case organisations. The interview sessions lasted between 60 and 180 minutes and were conducted by two interviewers – one consultant and one researcher. Several interviews were conducted per case in an attempt to gather data about the most important EAM roles, namely top executives, enterprise architects, portfolio managers and project managers. We recorded each interview and collected additional EAM-related documents, such as reports, EAM manuals, process maps and project plans.

Phase 3: Data compilation

After data collection, we transcribed the interviews. Thereafter we condensed the additional documents and added them to the case write-ups. Case write-ups are complete and consolidated descriptions of the cases, and contain all relevant information in respect of the themes and topics that were relevant in Phase 1. Several rounds of quality assurance improved the validity and reliability of the case

write-up. During quality assurance, experienced researchers and consultants read the material, provided feedback and helped to develop the write-ups.

Phase 4: Review by case companies
Completed case write-ups were sent to the case companies for verification. The interviewees checked the correctness of our statements and conclusions, and provided feedback, where necessary. During Phase 4, we also provided more complete and clear answers to some of the questions. These corrections and additions led to the final state of the case write-ups.

Phase 5: Data analysis
During the data analysis phase, we looked for best practices, recurring patterns and success factors in the cases (within-case analysis) and across cases (cross-case analysis). The data analysis was either done in a workshop with all researchers and consultants, or by means of thorough content analysis. We obtained the findings and recommendations presented in this book and, to structure them, we developed the navigator presented in the next chapter.

Writing of the book
The writing of the book was a joint effort by the whole project team. In order to increase our work's clarity, conclusiveness, and relevance, the team participated in a number of workshops to develop and reconcile the chapter contents.

1.5 How you can read the book

What is in the book?

This book has a simple, easy-to-understand structure. In the next chapter, we introduce a conceptual model that outlines the most important EAM building blocks, and serves as a navigator throughout the book. We then present an EAM agenda for top executives. In the subsequent chapters (Chapters 3 to 9), we discuss the important building blocks and outline successful EAM. In Chapter 10, we forecast how EAM might develop over the next decade.

How can you read it?

We made it as simple as possible for you to access and apply the contents of this book. To allow for an easy orientation, we added a number of concepts and graphical elements that allow you to find contents quickly, grasp the bottom line of what is being said, and find more detailed and related information, when required. The concepts we use for this purpose are:

Navigator. The structure of the book follows an easy-to-understand framework that is called 'navigator' (see Chapter 2). Once you understand the navigator, you can access the book contents without reference to the table of contents.

Separate chapters. Each chapter of the book can be read independently. You don't have to read previous chapters, and you don't need prior knowledge. Every chapter is self-contained and includes cross-references, where required.

Chapter abstracts. The contents of each chapter are summarised in the form of a management summary right at the beginning. If you are in a hurry, or want to know if a specific chapter is relevant to you, just use this summary.

Tables and figures. Instead of writing lengthy texts, we use tables and figures whenever possible. The tables and figures are self-explanatory, but are also referenced and explained in the text.

Margin notes. We use margin notes to summarise sections and paragraphs. In addition to headings and sub-headings, these notes help you to orient yourself and find contents quickly.

Case examples. Case examples are clearly identifiable as such; they are in grey-shaded boxes. Case examples have a twofold purpose: Firstly, they illustrate abstract ideas and concepts; secondly, they may inspire you to improve your EAM.

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An EAM navigator

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Management summary

Enterprise Architecture Management (EAM) is a comprehensive, interdisciplinary management approach that builds on techniques and practices from computer science, organisational engineering and change management, as well as business process management and other fields. Owing to its complexity, focussing on just one aspect of EAM – such as modelling or tools – will not yield results. Our research revealed seven important building blocks of successful EAM initiatives:

Top management awareness and support (a CxO agenda).
EAM governance and organisation.
Embedding EAM into strategic planning.
Embedding EAM into the project life cycle.
Embedding EAM into operations and monitoring.
EA frameworks, modelling and tools.
People, adoption and EAM introduction.

We consider each of these building blocks as crucial to any EAM initiative and will explain why you should consider them. Our empirical work shows that companies that (a) have a thorough understanding of these building blocks and (b) include these building blocks in their EAM initiative are more likely to succeed than others. We have compiled these building blocks in the form of a navigator that will guide you through the book. The navigator will also help you to identify the content relevant to you.

2.1 Introduction and motivation

EAM as a multi-dimensional decision domain

Enterprise Architecture Management (EAM) is an instrument to address a multi-dimensional fields of action and decision. A pure modelling approach, a followed by many organisations with limited EAM maturity, is inappropriate. Equally, focussing exclusively on EA implementation processes or governance will not yield sustainable results. The opposite is true: Our field experience and case analysis clearly indicate that many different facets, including EAM integration in existing processes, organisational structures and governance regimes as well as specific cultural aspects determine EAM's success. This is not surprising. After all, EAM is not an end in itself. It is a means to ensure realistic strategic decision-making, to set clear and focussed project scopes and monitor the firm's development. EAM is a social phenomenon, it needs to be integrated into existing processes and affects numerous elements of an organisation. For example:

EAM requires a proper institutionalisation with people who have the power to make decisions and enforce their implementation. **EAM is an organisation and governance issue**.

EAM requires integration into existing processes, such as strategy development, project prioritisation, budgeting and project implementation, because these are influenced by EAM practices. **EAM is a process issue**.

EAM introduces specific management methods for the modelling, analysis and design of the enterprise architecture. **EAM is a methodological issue**.

EAM requires executives to rethink the (architectural) consequences of their decisions and to create a shared vision. It affects the way people perceive their enterprise and perform joint decision-making. **EAM is a cultural issue**.

One-sided EAM initiatives are likely to fail

Although one would think that this expansive notion of EAM is the norm, many organisations focus on modelling or planning activities but lack the power, skills, or enthusiasm to face the real-world problems of developing and optimising their enterprise architecture. Our case research shows that many organisations also don't get it right the first time: Several attempts are needed to establish EAM before it becomes a living management practice.

In an attempt to tackle challenges of deploying EAM in your organisation, this chapter has a twofold objective: Firstly, we want to help you to understand what is important when you implement EAM. Secondly, we want to give you an overview of the structure of this book. We do so by:

Objectives of this chapter: Present the success factors and offer a guide through the book

- presenting important building blocks of successful EAM,
- relating the building blocks to one another in the form of a navigator, and
- explaining how the navigator guides you through the book.

In the next section, we will introduce the navigator, then discuss its building blocks. In Section 3, we will elaborate on how the navigator may be used to design an EAM initiative, as well as to describe how to assess this initiative for viability and completeness.

2.2 Building blocks of successful EAM

During our case research, top executives and enterprise architects repeatedly raised certain issues regarding successful EAM. We found that there is a uniform set of challenges that must be addressed when an organisation decides to implement EAM. From our cases, we also learned that ignoring these issues will significantly decrease the likelihood of EAM success and will ultimately lead to EAM project failure or to EAM having a low impact on an enterprise's performance.

The navigator as an aggregation of EAM success factors

As these practical success factors are very relevant, we collected them, transformed them into separate fields of action and compiled them into a compact and easy-to-understand frame of reference for successful EAM. To avoid confusion, we refrain from using the term 'framework', since there are many EA frameworks available, each with a different purpose (see Chapter 8). Instead, we decided to use the term 'navigator' for this frame of reference, because it has been designed to guide you through this book as well as to guide your EAM initiative.

Despite its orientation towards success, the navigator (see its building blocks in Figure 2.1) does not describe an ideal EAM scenario. We believe that EAM implementations depend on situational factors, and there is no 'one size fits all' solution. Nevertheless, the navigator may draw your attention to those constituents of EAM that make a difference.

Seven building blocks that influence EAM success

The navigator consists of seven building blocks. Properly implemented, these building blocks strongly influence EAM success. In the following section, we will describe the navigator's building blocks by (1) explaining what they are, (2) motivating their importance, and (3) outlining their relationships and interdependencies. Additional information can be found in the rest of the book: Each building block is described in a separate chapter.

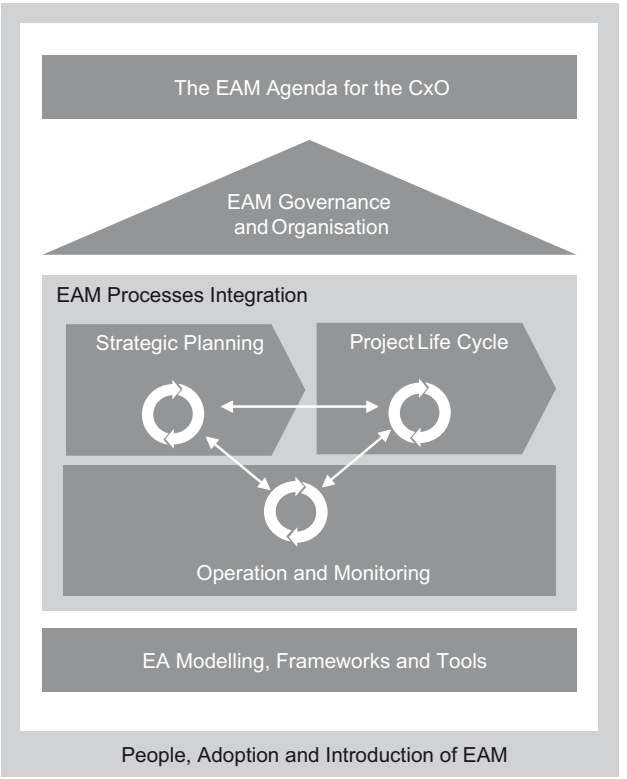

Figure 2.1: EAM building blocks

The EAM agenda for the chief executive officer

EAM objectives are always enterprise-specific

What is this?

If organisations are not convinced that EAM will yield benefits, they certainly will not invest money in it. Firms need to believe that EAM can help them to stay competitive in an ever-changing global market space. But even if there are typical EAM-related benefits, for example, better alignment or increased flexibility, most companies need an 'urgent pain': A business case and a project sponsor to start an EAM initiative or extend an existing one. Top-level executives (CxOs) must invest time, money and resources in EAM. They therefore need to understand what EAM is and how it helps to improve enterprise performance. Based on this understanding, CxOs can define clear EAM-related objectives and create an environment in which EAM can achieve its full potential. Such objectives and the

environment necessary to reach them are always enterprise-specific and depend on the EAM context.

Why is this important?

Senior executives are crucial

For successful EAM, top management needs to be involved; it needs to define the EAM objectives and create a corresponding environment with the help of a management agenda. Only senior management can provide the budget and resources necessary to make EAM successful. Furthermore, senior management members need to be available when problems require escalation, because their power can help to overcome conflicts and resistance that may emerge when people have to change their behaviour or – in some cases – lose some of their power.

What gets measured gets done

There is some truth in the statement 'what gets measured gets done'. It is hard to plan and control an initiative without clear objectives. Both the project sponsor and the EAM team need objectives, because they help to set priorities when it is simply impossible to achieve everything at once. Because EAM is a broad field of action, staggered achievements and benefits can be expected. Objectives also help to direct staff, measure success and define corrective actions, when necessary. Furthermore, clear objectives may allow the stakeholders to better grasp the concept and logic of EAM and to identify with EAM.

How is it related to other building blocks?

Think about organisation and governance first

We consider a clear top management agenda for EAM an important precondition for an effective EAM. Furthermore, EAM initiatives are best driven by top management. For these reasons, we place this building block at the top of our navigator. The best way to initiate EAM is top-down. Besides defining high-level objectives, one of the first things top executives should think about is how to empower the EAM team. For this reason, this building block is closely linked to the next one: EAM governance and organisation. Top management must ensure that the organisational setting and the governance mechanisms in place really enable and serve the EAM team.

More information on EAM objectives and the CxO agenda can be found in Chapter 3.

EAM governance and organisation

What is it?

Decision rights are crucial

EAM governance and organisation deal with the manner in which EAM is institutionalised in an organisation. In this context, manage-

ment must define the organisational components, roles, and committees to perform EAM-related tasks. Therefore, these organisational elements, as well as their tasks, responsibilities and decision rights must be specified. Especially the latter are important, since there is a close relationship between staff members' EAM decision rights and an EAM initiative's effectiveness. In decentralised and distributed organisations, the institutionalisation of EAM is a particular challenge, since management must choose an appropriate EAM organisation and governance model that balances local autonomy and global coordination.

Why is it important?

EAM is about decision-making in the interest of the organisation as a whole. One must ensure that the right people are empowered to make EA-relevant decisions, and that the implementation of these decisions is not hindered by an adverse organisational structure. A clear accountability framework along with transparent escalation processes and well-documented decisions can significantly leverage EAM's effectiveness. These factors are of particular relevance for larger organisations, which frequently struggle to align local interests and global strategic objectives.

How is it related to other building blocks?

Organisation and processes are two sides of the same coin

An effective organisation and governance structure is a necessary precondition for functioning strategic planning and strategy implementation processes. In fact, they are closely linked to each other, since the organisation and governance structure defines who carries out what tasks during a process, whereas the process defines how all these different tasks are carried out in a logical and temporal sequence to achieve the desired outcome. These processes are described in Chapters 5 and 6.

More information on EAM organisation and governance can be found in Chapter 4.

Embedding EAM into strategic planning

What is this?

Strategic initiatives almost always affect the EA

The development of an enterprise's architecture is mostly a long-term and incremental activity. It requires investments in technology and reorganisation projects. Conversely, most projects carried out in an organisation either directly alter, or are at least affected by, the

enterprise architecture. Consequently, EAM is closely linked to the following strategic planning activities (Figure 2.2):

situation analysis,
elaborate strategic options,
develop an architecture vision,
roadmapping and migration planning,
project portfolio planning, and
evaluating the architecture evolution.

These planning activities link to EAM in two ways: Firstly, strategic planning can bring about dedicated architecture initiatives for the EA's structured development. Secondly, all other strategic initiatives must be documented in the EA model and analysed in terms of their impact on the EA. As a result, the EA team may initiate EA-related objectives and investments, and may also review and assess all the other objectives and investments with regard to their EA impact. The existing strategic planning processes therefore need to be complemented by EAM practices, such as EA analysis or EA documentation, so that a long-term EA development can be ensured (see Figure 2.2).

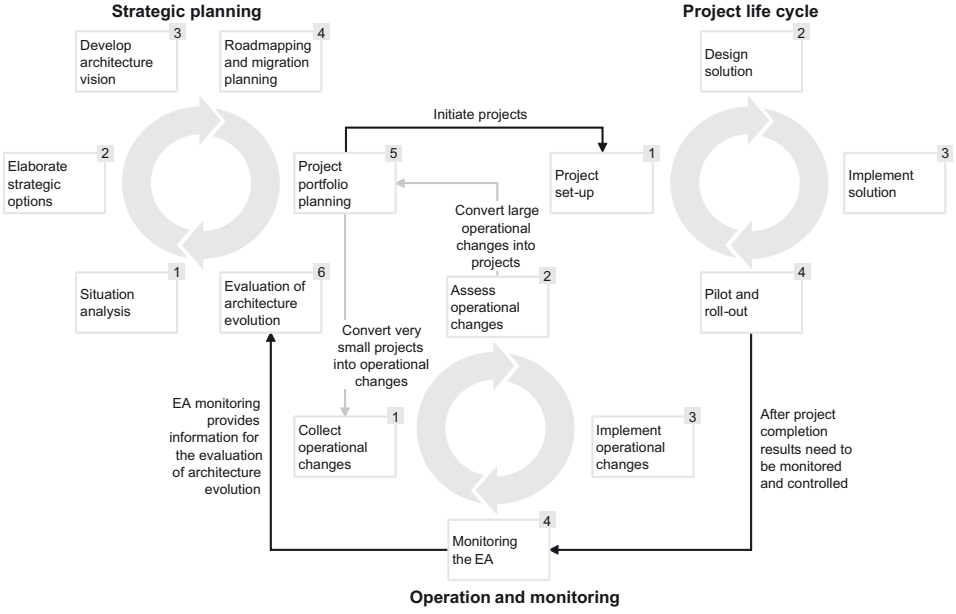

Figure 2.2: EAM process integration

Strategic EA planning prevents a chaotic and arbitrary EA development

Why is this important?
First of all, EAM is a powerful management approach that improves strategic decision-making and the organisation's structured development. It not only assists in mastering real-world complexity by analysing the existing capabilities, but also in defining smart and feasible strategies and migration paths. Secondly, if strategic initiatives that guide an organisation's future development do not align with the architecture vision and principles, they jeopardise long-term strategic EA objectives by creating facts. In such cases, EAM will barely have an impact, because the development of the architecture will remain arbitrary and chaotic. Thirdly, by creating a shared understanding of complex, multi-dimensional dependencies, EAM can also become a communication tool to spread strategic visions and goals in the organisation.

How is this building block related to other building blocks?
Strategic planning naturally precedes the project life cycle, as outlined in the navigator (Figure 2.2). EA operation and monitoring result in secondary relationships when the strategic objectives not implemented in the form of projects are realised as small(er) operational changes, or are simply translated into targets for the organisation (departmental targets).

More information on the embedding of EAM into strategic planning can be found in Chapter 5.

Embedding EAM into the project life cycle

Projects are the instrument for implementing EA change

What is this?
Strategic objectives are mostly realised in the form of projects and project programmes. Organisations normally choose to implement architectural change in project form because projects are temporary endeavours with a clear target and dedicated resources. Therefore, they allow for an efficient development of architectural components, such as infrastructure, information systems and business processes. From an EAM perspective, the project life cycle may be subdivided into the following subsequent phases (as outlined in Figure 2.2):

project set-up,
design solution,
implement solution, and
piloting and roll-out.

Why is this important?

Projects almost always influence the EA in unintended ways

In most cases, projects do not go as planned. Environmental changes can never be anticipated fully and a project's course can never be predicted precisely. Furthermore, the project team often only has a rough understanding of the project results, which makes it even harder to plan every project execution detail. Requirements volatility is another major challenge for contemporary projects: During project execution, project sponsors sometimes change their minds about project objectives. If a project's scope changes, its impact on the EA will probably also change. If there is no constant monitoring of projects and EA-relevant decision-making during project execution, the project's outcome might not align with the intended target architecture.

How is this building block related to other building blocks?

Strategic planning initiates the above-mentioned projects. Beyond this, sub-processes of EA operation and monitoring (see next section) may support project execution by providing relevant data about the EA components of interest, such as service requests and key performance indicators (KPIs).

More information on embedding EAM into the project life cycle can be found in Chapter 6.

Embedding EAM into operations and monitoring

What is this?

Small changes have risks too

Sometimes, projects are the vehicle for large EA changes, but most changes are small. Owing to their minor impact, these operational changes do not require large projects for their implementation. Organisations often have several dozen projects in their portfolio, but several thousand potential change requests in their incident or change request management system. These changes are handled during routine EA operation. There is always the risk that small changes might affect the functionality of applications, the topology of the network infrastructure, or the control flow of a business process. Although mostly useful, these changes might be implemented in ways that conflict with EA guidelines or cause unforeseen side effects. Furthermore, they may not be documented properly, and future decision-making might therefore not be based upon complete information. Operations and monitoring need to establish pragmatic procedures for the efficient handling of smaller changes in the EA in order to counter these risks (as outlined in Figure 2.2):

collect demands and changes,
assess changes,
implement changes, and
monitor the EA.

KPIs are required to systematically control the EA's development

The structured development of an EA consisting of hundreds or even thousands of components, including infrastructure components, applications and business processes, is impossible with only EA models. Organisations can use metrics and KPIs to measure certain EA characteristics, for example, cost efficiency, service quality, alignment and risk. Optimally, such measurement is a continuous monitoring process.

Why is this important?

Uncontrolled changes may jeopardise your EA

Without proper operation and monitoring processes, an organisation will soon lose control over its EA. Uncontrolled modifications of EA components have the potential to derail any EA plans. Furthermore, an EA's structured development requires an up-to-date information base and the timely provision of information to relevant stakeholders. EA operation processes ensure that those changes which impact the EA are systematically tracked and that EA information is up to date. Monitoring processes also provide a good and concise overview of the EA as a basis for early warning and escalation processes.

How is this building block related to other building blocks?

As noted, the processes of EA operation and monitoring deliver valuable information for strategic EA planning and implementation. Metrics and KPIs provide the means to assess the EA and derive strategic objectives; they can also be used to measure whether or not targets are being reached.

More information on embedding EAM into operations and monitoring can be found in Chapter 7.

EA frameworks, modelling and tools

What is this?

A large body of EA frameworks, modelling techniques, and tools is available today (e.g., Zachman's framework). These are useful for defining and developing the detailed description of the architecture, the principles governing its development and the standards applied during the architecture's development. Frameworks comprise guidelines, procedural models and methodologies for the EA's structured

development. Software tools have the potential to lift these activities to a new productivity level.

Why is this important?

At best, you can accelerate your project and reduce the risk of failure

The underlying idea of developing all these frameworks, modelling techniques and tools is simple: Organisations can adopt best practices to accelerate EAM implementation, reduce the risk of EAM failure and make EAM more efficient and effective. However, every approach has strengths and weaknesses. Practitioners must be aware of these to make informed decisions when choosing the frameworks, modelling techniques and tools to fit their organisation.

How is this building block related to other building blocks?

Frameworks, modelling techniques and tools play an important role in all EA-related processes. They serve as a toolbox from which architects can choose in order to do their EAM work. Therefore, there is a close relationship between the strategic planning, the project life cycle, operations and monitoring.

More information on EA frameworks, modelling and tools can be found in Chapter 8.

People, adoption and introduction of EAM

What is this?

Do not underestimate the EAM social dimension

EA publications are dominated by 'hard methodologies' based on EA frameworks, tools and modelling techniques. These components undoubtedly influence EAM success. Despite the undeniable relevance of such 'hard methodologies', many practitioners feel that EAM's impact is also heavily influenced by 'soft factors' resulting from the social sphere in which EAM is applied. Individual resistance, incentives and supportive stakeholders therefore all play an important role.

Why is this important?

Enemies of EAM: Individual interests, fear of transparency and habits

EAM requires many stakeholders to change their behaviour. Firstly, it is simply not enough to make a strong business case for EAM only at the enterprise level. Stakeholders will maximise their individual benefits, although they probably won't admit doing so. Secondly, EAM leads to a high degree of transparency about EA-related decision-making and work practices. This results in fear that past management mistakes might come to light and that managers will be criticised for inefficient behaviour and work patterns. Thirdly, people tend to have habits they do not want to change. The introduc-

tion of EAM can therefore be a challenging endeavour and might result in resistance. Proactive management of the social dimension can significantly reduce the risk of failure and increase all involved parties' satisfaction.

How is this building block related to other building blocks?
Social factors play an important role with regard to all the navigator's building blocks. For this reason, this building block surrounds all the other components.

More information on people, adoption and EAM introduction can be found in Chapter 9.

2.3 Using the navigator to check your EAM initiative

How can the navigator help me to develop EAM?

The navigator presented in the previous section can be used to check EAM initiatives for viability and completeness. At best, an EAM strategy should include concepts that relate to each of the navigator's building blocks. Nevertheless, see if you can answer the following seven key questions:

1. **What are EAM's overall objectives and do we have management support? (Chapter 3)**
   Do you have clear EAM objectives and top management support? Does the EAM team have enough resources to do its job?
2. **Do we have effective EAM governance and organisation? (Chapter 4)**
   This question refers to whether an organisational and governance model has clearly defined EAM-related tasks, responsibilities and decision rights that fit the organisation.
3. **Do our strategic planning processes leverage EAM? (Chapter 5)**
   This question is about the integration of EAM practices and classical strategic planning processes, such as strategy definition, budgeting and project portfolio planning. If decision-making considers the EA perspective, organisations will gradually develop in line with the enterprise architecture vision and targets.
4. **Do we have project execution processes in place that are in line with EAM? (Chapter 6)**
   This question refers to the way one enforces EA-compliant project execution. EAM must ensure that projects are always in line with EA-specific rules, principles and objectives, thus avoiding a chaotic and unintended modification of the EA.
5. **Do we have working processes for enterprise architecture operation and monitoring? (Chapter 7)**
   Furthermore, a continuous monitoring of the EA by means of metrics and KPIs helps to identify weaknesses and optimisation potentials. EAM must identify and keep track of operational changes that cause critical modifications in the enterprise architecture

6. **What are our frameworks, modelling approaches and tools? (Chapter 8)**
   This question refers to a reasonable, pragmatic and decision-oriented approach to modelling the EA with suitable tools and applying suitable frameworks. EAM must be based on a results-oriented approach to modelling in which modelling is not an end in itself.
7. **How do we address EAM's social sphere and introduce EAM in the organisation? (Chapter 9)**
   The introduction of EAM is a complex change process that has a methodological, an organisational and a social dimension. It is necessary to have a clear strategy for introducing EAM that will take diverse stakeholder interests into account.

Do I need to have all of this right at the outset?

Don't try to achieve everything right at the start, but be aware of what is needed

Although it would be nice to have all these building blocks already addressed right at the start of your EAM journey, we realise that it is neither reasonable nor feasible to expect this. As a management concept, EAM is too complex to be implemented in a single step. But even if you cannot implement everything right at the outset, we recommend that you make a conscious decision about the order of the activities based on a thorough analysis of your organisation's maturity, capability, the nature of your management support and your vision. You should also develop an EAM roadmap that fits your overall EAM objectives. When developing your EAM roadmap, you should be able to answer the following questions:

Who are our relevant stakeholders and sponsors?
When will I address the different EAM aspects?
In what order will I address them?
Have I considered the dependencies?
Have I thought about quick wins?

To give you a taste of how an organisation may approach EAM, we provide an example.

How a bank introduces EAM and sets priorities

A large European bank's latest effort to introduce EAM has been a success. Powerful key stakeholders from the IT organisation consider EAM crucial to the bank's long-term transformation. These stakeholders support the EAM initiatives by providing both resources and decision rights. From past experience, the team driving the EAM initiative is also aware that EAM requires a shift in culture, which can only be realised one step at a time. Consequently, a relatively small but empowered team of very experienced enterprise architects with a solid business background generates 'success stories' by following a very pragmatic approach to EAM. Architects are linked to the business departments and are involved in the early strategic planning phases, thus shaping the future domain architectures. They also accompany selected projects that leverage the development of the overall architecture. The architectural projects' measurable and sustainable outcomes, which include reduced costs, increased flexibility and shortened delivery times, are specifically emphasised through the development of a service-oriented architecture. The team does not engage in areas in which EAM awareness is limited and where quick wins would be unlikely. By providing hands-on help and demonstrating obvious impact in areas in which change and success can easily be reached, the team convinces the rest of the organisation step by step.

More information on the topic can be found in Chapter 9. You will also find more examples in the various chapters.

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EAM governance and organisation

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Management summary

An effective model for enterprise architecture management (EAM) governance and organisation is vital. EA governance provides project teams with a structure to guide their decision-making, especially with regard to solutions design and technology choices that optimise the value of architecture components across the enterprise. EA organisation design establishes the effective division of roles, responsibilities and reporting relationships. We propose that the architecture resources be organised into one or more architecture bodies, depending on the level of architecture maturity and corporate structure. The architecture bodies we propose are the enterprise architecture council (EAC), the architecture review board (ARB) and the architecture forum. We discuss different organisational structures and present different decision and escalation processes and practices between which you can choose.

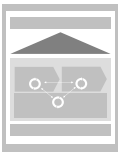
When you apply EA governance, you have to find the right balance. You cannot have too little control, but you also cannot be dictatorial. Too much control would impose onerous and unnecessary constraints on the organisation. The challenge is therefore to pragmatically structure the organisational components dedicated to EAM, balancing between the extremes. Once you've established the best level of control, you can define the roles, responsibilities, and the scope of the activities to maximise the business value. In general, we can distinguish four types of EAM organisation models. Centralised EAM organisations are appropriate for very centralised organisations in which most of the IT services are performed from a central unit or location. The decentralised model is appropriate for organisations that operate largely autonomous divisions, business units or territories. The centre of excellence (CoE) model, also known as the competency centre model, is gaining popularity. In this model, resources are grouped together in areas of specialisation, offered as a shared service to other organisational entities. The fourth model we discuss is the hybrid or federated model, which is a combination of the decentralised model and the centres of excellence (CoE) model.

The frame of reference that you apply when making architecture decisions is another factor that will influence your EAM governance and organisation structure. Our research has identified four distinct frames of reference or architecture archetypes. These are: the

(1) model-driven, (2) strategic applications and vendors, (3) architecture paradigm and (4) governance frames. A dependency exists between the specific architecture archetype adopted by a company and the governance and organisation structures put into place. Certain archetypes are more suitable for certain organisations in terms of size and model. The governance model should therefore support the archetype that is adopted.

There is no 'one size fits all' approach. Every organisation is unique, and while there are generalised governance and organisation models that can provide a useful starting point, they must be tailored to every company's specific needs.

4.1 Introduction and motivation



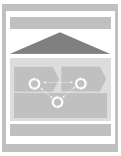
In the preceding chapter, we discussed enterprise architecture management's (EAM's) strategic value and the need for it to be addressed at the top management (CxO) level. We also stated that uncoordinated individual contributions need to evolve into dedicated efforts by a well-organised architecture practitioner team and team efforts should align with the company's organisational structure to maximise business value.

Two unhelpful extremes

You need to avoid two unhelpful extremes when you establish EAM practices in your firm: The first is implementing minimal EAM; in other words, dabbling in EAM without a real commitment. This approach will at best produce sporadic and inconsistent results. At the other extreme, EAM organisations can become self-serving, become enamoured with their own brilliance and lose sight of their true purpose, namely to deliver business value. In this case, EAM organisations become useless ivory towers. An organisation that shall remain nameless established a large, award-winning architecture, which it documented in minute detail (the architecture diagrams alone covered four walls of a conference room from floor to ceiling!), and appeared to cover every conceivable eventuality. There was just one problem: It was so involved and complicated that no one attempting to use it had any idea where to start. The teams that did attempt to use the elaborate architecture ended up significantly over-engineering the solution, which led to major scope, time and cost overruns. This EA team was out of touch with reality. The architecture organisation was not structured to serve and support its business constituents, and no effective decision-making structures were in place. After several well-publicised project failures, with multi-million dollar consequences, the organisation eventually reorganised its EA efforts and put new leadership into place. They discarded the elaborate target architecture in favour of a much simpler and more pragmatic approach.

Studies have shown the challenge and the importance of governance in EAM:

> *'One of the greatest hurdles to achieving an effective architecture discipline is designing a governance model that is both systematic and aligned with established decision-making styles. A recent Enterprise Architecture Executive Council diagnostic sur-*



vey highlights the EA function's struggle with key governance activities such as EA project engagement, roadmapping and planning, and standard setting and governance.' [1]

The right governance will ensure that good decisions are made at the right time and in the right way, ensuring that EAM value is delivered and sustained over time.

Similarly, the right organisation structure is key to effective EAM execution. Having the right people, with the right skills, in the right roles doing the right things in a correctly empowered way is necessary for EAM benefits realisation.

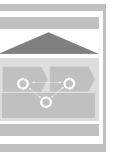
Together, governance and organisation are the keys to maximising and sustaining EAM's value.

Therefore, the questions we will address in this chapter include the following:

What are the roles and responsibilities that you need to define for your EAM organisation?
Why do you need EAM governance?
What is the right level of EAM governance for your organisation?
Where in the organisation should the EA group be situated, and who should they report to?
How should your EAM organisation be structured?

These questions centre around a key truth: There is no one solution that fits all firms. Each organisation is different, with different cultures, decision styles and objectives. An effective EAM governance and organisation structure must therefore be tailored to every company's unique needs.

4.2 Challenges to EAM structuring



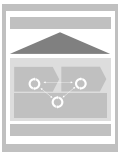
First, we consider some of the various challenges that organisations face and must balance as they develop their EAM capabilities; these include:

being overly controlling of activities versus rubber-stamping them,
a centralised versus a decentralised structure,
the common good versus project needs,
reactive decisions versus proactive decisions, and
a strategic view versus a tactical view.

Implement 'just enough' governance

The first challenge is the balance between **overly controlling impact and ineffectual impact** (rubber-stamping). While this challenge can occur at any EAM maturity level, a common mistake is applying too much control too early in the EAM implementation process. Another mistake is to indiscriminately apply the same governance controls to all processes within the company. For example, the controls that need to be in place for innovation and the early stages of product development may be very different to those that support operational IT environments. The objective is to implement 'just enough' governance based on the current EAM maturity level, and develop the EA governance model in line with the increasing EAM maturity level.

Deciding between **centralised and decentralised** EAM structures (or anything in between) is another consideration. This decision will largely be influenced by whether the company as a whole is centralised or decentralised, although other factors such as the specific EAM goals and objectives and the current EAM maturity level will also influence the decision. Unhelpful dynamics such as corporate politics may further complicate this decision and challenge optimal EAM structuring.



How a leading cargo carrier was challenged to balance between centralised and decentralised EAM

A leading cargo carrier in the international air traffic industry historically had a decentralised structure, with several local business units having their own IT departments. This made the business units very innovative. However, over the years, it caused an almost unmanageable complexity. The local IT units' uncoordinated developments of a central host system, for example, led to an escalation in operating costs and a growing applications landscape complexity. In order to overcome these problems, the company decided to centralise its IT developments and to modernise the application landscape. An EAM department was formed as part of this centralisation. The challenge faced by the CIO was finding a trade-off between a central and a decentralised EAM orientation, avoiding overly centralising and becoming an 'ivory tower', or decentralising the EAM to the project level and risking it becoming a 'paper tiger' driven by the project's needs.

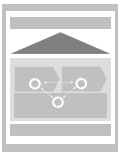
The challenge of balancing between **the common good and project-specific objectives** is similar to the challenge of deciding how centralised or decentralised the EAM organisation should be. This is one of the more difficult challenges, because there are very real cost and time implications regarding developing solutions for the common good versus more directed project solutions. These competing priorities can also produce organisational conflict if the right EAM decision processes are not in place. The clearer the guidance and standards are for determining when a project should serve the common good, the smaller the chance of opposing motivations and politics playing a role. This matter highlights the importance of establishing effective governance and EAM decision processes.

Most EAM organisations' goal is to cover the full spectrum from **reactive** activities (for example, having architecture reviews) **to proactive** activities (for example, developing target architecture and formulating standards). The challenge, however, is to establish a good balance between these activities, based on the priorities and available resources, recognising that it is important to be pragmatic and not to overload the EAM organisation.

Over time, EAM organisations evolve towards more strategic activities

When determining a balance between **strategic and tactical** objectives, it is important to consider how far into the future the EAM organisation's planning activities are projected. EAM organisations generally start with tactical activities such as standard setting, putting guiding principles in place and having architecture reviews, and then evolve towards more strategic activities such as target state architecture blueprints and roadmap development.

4.3 Current state assessment of existing EAM activities and assets



EAM governance and organisation design are usually not conducted in a greenfield way. In other words, you probably have some form of architecture activity being performed at various levels of maturity and in different parts of the organisation. It is therefore important to conduct a current state assessment to identify these activities and assets, as they may influence your EAM governance and organisation planning activities. Your assessment should include investigating the level of formality, as the activities may be very formal or completely informal. Likewise, consider that stakeholders are already involved in the firm and that this must be factored in as part of the as-is assessment.

Similarly, before you determine the appropriate EA organisation and governance, you should gain an understanding of the proposed EAM target state, and should define the process whereby the firm will evolve towards this target as EA capabilities mature.

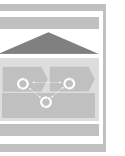
Current state assessment of EA governance and organisation

In summary, the current state assessment should include:

- identifying existing architecture stakeholders and architecture activities,
- assessing the current EAM maturity,
- identifying any pre-existing EAM structure and culture,
- assessing existing EA skills across the organisation,
- determining the existing corporate and IT governance models, and
- capturing any pre-existing or new target state scope of architecture.

Remember that the organisation structure and governance model are interlinked and affect each other. While we write about them sequentially, in practice they should be considered in an integrated way. Please refer to Chapter 9 for more information on how to introduce EAM in your organisation.

4.4 The EA governance model



We have stated that an effective governance model is vital for delivering on EAM's promise. EA governance provides project teams with a framework to guide their decisions, solutions design and technology choices that will optimise IT's value across the enterprise. Effective governance:

- ensures a business mandate and involvement, with the EA development driving real business value,
- fosters ongoing business-IT strategic alignment, and
- drives the adoption of standards and strategy, which lowers the total cost of ownership.

EA governance covers:

- the definition and operation of governance bodies, including the roles, responsibilities and decision rights to ensure effective EA evolution and operations,
- the establishment of guidelines, standards and references to ensure that the right things are done at the right time, and
- integration within project life cycles and other organisational processes and entities to ensure timely and effective decision-making (we discuss this in Chapters 5 to 7).

We will consider each of these in turn.

Governance bodies, roles, responsibilities and decision rights

Many different types of architecture governance bodies have been proposed and described in the literature. Every organisation has specific unique requirements, but most governance structures generally include entities that set direction and standards (setting), and entities that ensure adherence to these standards and direction (vetting). Both the setting and vetting entities could be further segmented, based on the enterprise structure (centralised versus decentralised), geographic locations or architecture domains (particular architecture focus areas).

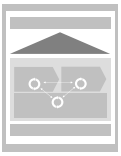


Figure 4.1 shows typical architecture governance bodies and their relationships to IT, business units and project teams, as well as participation and escalation paths.

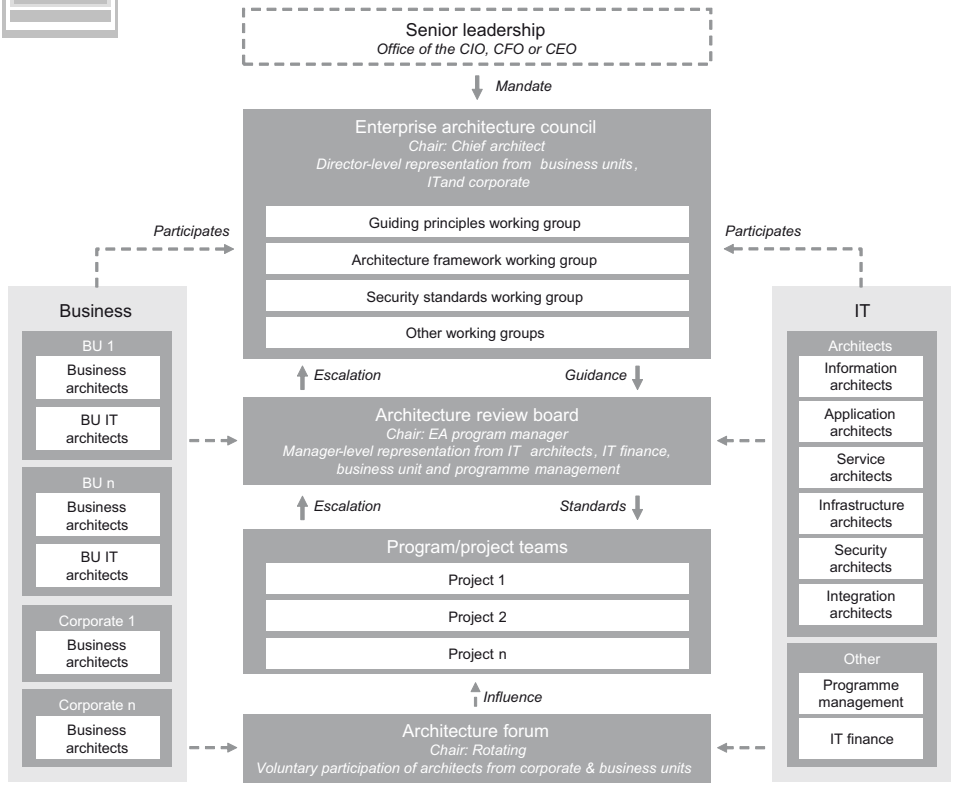
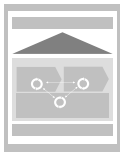


Figure 4.1: Architecture governance model

The principle architecture bodies

In this generalised architecture governance model, the key architecture bodies are the *enterprise architecture council* (EAC), the *architecture review board* (ARB) and, possibly, the *architecture forum*. The intent is *not* that all these entities are required in every situation. The specific EAM goals and objectives, the EAM maturity level and the organisational structure (centralised or decentralised) will determine which architecture body or combination of bodies will be most appropriate at a given point in time.

The ARB provides the point of contact for project teams to ensure compliance with architecture standards and direction. The EAC is responsible for setting best practices, guiding principles, standards, reference architectures and other architecture guardrails,



and may utilise working groups in the development and maintenance of these. The architecture forum provides an option for a less formal structure that can facilitate collaboration between interested parties where more formal structures are not practical or desirable.

The EAC and ARB consist of representatives from business and IT. The EAC is usually overseen by the chief information officer (CIO), although chief financial officer (CFO) or chief executive officer (CEO) oversight is found in some more mature organisations.

Figure 4.1 represents a typically centralised organisation. In a decentralised organisation, the above may be replicated by a division, territory, or business unit. In a hybrid or federated model, some elements can be centralised (such as a single EAC) and other elements can be distributed (such as multiple ARBs). Note that at the early EAM stages, it is possible to combine the ARB and EAC into one organisation, or to simply begin with an architecture forum. We next present more detailed descriptions.

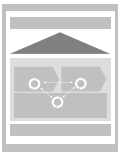
Enterprise architecture council (EAC)

The EAC, which is sometimes called the *enterprise architecture steering committee*, typically serves as the principal oversight body for enterprise architecture. The EAC therefore busies itself with the implementation and governance of EAM within the enterprise. Furthermore, the EAC ensures coordination and collaboration of architecture initiatives in the organisation.

Responsibilities

Typical EAC responsibilities are to:

- set and manage expectations regarding EAM's business value for the organisation,
- establish the overall EAM scope within the organisation,
- be accountable for the EA programme's overall effectiveness,
- define and evolve the EAM organisational and governance structures,
- ensure business alignment,
- coordinate with other entities in the organisation,
- participate actively in business strategy sessions and planning,
- establish, monitor and report on EA metrics,
- oversee the ARB,
- manage escalations from and provide guidance to the ARB,
- set strategic technology direction for the organisation,
- establish the architecture guiding principles, policies and standards,



establish working groups, if necessary, and
approve or deny major project exception requests, and issue waivers for legitimate exceptions.

Participants
EAC members include empowered business and technology stakeholders. The EAC's chair is the organisation's chief architect, who is usually connected to the CIO's office. The following applies to EAC participants:

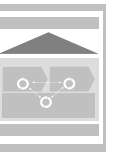
The EAC usually has 5 to 10 participants (depending on the enterprise size and heterogeneity of the business).
The EAC includes director-level participants from business and IT.
The participants should represent the EA layers of the strategy, process, and information system (including the application data and integration unit(s)), as well as the technology/infrastructure layers (see Chapter 1).

Architecture review board (ARB)

The ARB ensures and extends IT's business value by assessing compliance with architecture standards, guiding principles, reference architectures and blueprints. The board resolves non-compliance issues to reduce deployment risk and to ensure constant evolution towards the intended target state.

Responsibilities
Typical ARB responsibilities are to:

enforce standards,
provide architecture guidance to project teams,
review and approve or reject project teams' architecture recommendations,
identify gaps and dependencies,
review project scope change requests that have architecture implications,
adjudicate architecture-related conflicts, if necessary,
issue waivers when warranted, and
forward any irresolvable issues related to the enterprise architecture process to the enterprise architecture council for adjudication.



Participants
The following applies to ARB participants:

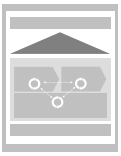
The ARB usually has 5 to 12 permanent members, with additional invitees on an ad hoc basis.
The ARB includes architects and manager-level resources from IT and business.
The ARB usually includes representatives from:
- line-of-business,
- process architecture,
- information architecture,
- application or service architecture,
- infrastructure architecture,
- IT operations,
- IT finance, and
- programme management.

Architecture forum

Sometimes, collaboration is needed between independent organisations, each of which has dedicated architecture resources but no formal reporting lines to a central architecture organisation. In this case, an architecture forum is a useful option. An architecture forum is constituted when the different architecture organisations within business units or territories voluntarily unite and collaborate on topics of mutual interest, such as architecture standards or technology standardisation. An architecture forum helps to drive collaboration. The forum can perform many of the EAC's functions, but is based on voluntary commitment rather than formal responsibility and accountability. An additional benefit is the opportunity for knowledge sharing between groups. The chair of the architecture forum rotates periodically (usually annually) between the participating business units. As with the EAC, various working groups may be constituted to focus on specific topics of mutual interest.

A second scenario where the architecture forum may be appropriate is in companies at an early stage of architecture maturity. As mentioned earlier, it is important to be pragmatic and not apply an architecture enforcement level that exceeds the current EAM maturity level. An architecture forum may therefore be appropriate when the company is just starting out with EAM.

Finally, an architecture forum may be the right structure where EAM is applied to a part of the organisation that is primarily innovation focused. In this case, the emphasis should be more on collaboration and the cross-pollination of ideas, and less on constraining decisions. The architecture forum is well suited to this.



The importance of exception handling

Decision processes and rights

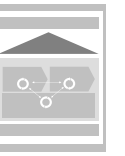
Clearly articulating decision rights is vital to EAM effectiveness. Many different architecture models can exist, but unless decision rights are expressly and unambiguously defined and clearly communicated, EAM is unlikely to deliver the intended value. The effectiveness of decision rights is largely determined by the handling of exception cases – those situations in which different viewpoints, conflicting motivations, and budget or resource constraints exist. Therefore, in considering decision rights, it is vital to establish the exception, waiver and escalation processes. Furthermore, senior leadership must empower and support the decision processes and rights, and leaders must never abuse their authority by overriding decisions outside the established processes.

Decision protocols

Decision protocols must provide a framework for representation and voting rights, participation, decision thresholds, the appeal process and escalation frequency. While many decision protocol permutations can exist, we present two options and highlight their benefits.

Majority decision
If the decision protocol is a majority decision, the following applies:

Group decisions can be reached if a quorum (such as 65%) of voting members is present.
Decisions will be binding, irrespective of attendance (assuming a quorum).
Representatives of business units must be empowered to vote. Delegation of attendance is discouraged; nevertheless, delegated representatives must have the authority to vote.
A majority decision carries.
Close decisions (40% to 60%) can be appealed to a higher authority (e.g., the EAC).
A ranking process should be followed for decisions that relate to the ranking of multiple options (such as project portfolio prioritisation).
All decisions should be documented and communicated to the core and extended stakeholders.
For meeting management protocols, see *Robert's Rules of Order* [2].



Variations regarding the quorum number, decision threshold and appeal range can be adjusted to suit the organisation's needs. This option is the most democratic and is suitable when there is a large number of voting members (10 to 15).

Consensus decision
If the decision protocol is consensus decision, the following applies:

Voting members can abstain (if they have no strong point of view, or if the outcome is immaterial to them). However, every voting member must agree with the decision before it can be approved. If a member does not agree, the decision will not be taken; every member essentially has a veto right.
The delegation of voting responsibility is not permitted, but voting members can vote ahead of time if they are unable to attend in person.
Decisions can be appealed to the next higher authority (e.g., the EAC) if a working group is unable to resolve the issue.
A ranking process should be followed for decisions that relate to the ranking of multiple options (such as project portfolio prioritisation).
All decisions should be documented and communicated to the core and extended stakeholders.
For meeting management protocols, see *Robert's Rules of Order* [2].

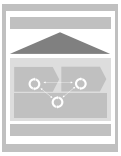
This option suits a smaller group of voting members (4 to 6). It can easily generate escalations, which are usually cumbersome, but in certain organisations this may actually be desirable, as escalations provide senior leadership with insights into the more significant and contentious EAM decisions.

Exception or escalation process

An exception mechanism supports a business unit's need for responsiveness without threatening the governance process's integrity.

Exceptions may be required in the following circumstances:

when a swift response is needed to an urgent business opportunity,
when invalid or obsolete policies, processes, or standards are identified,
when local project needs are unique, and
when there are legitimate cost factors.



Exceptions should also be leveraged as an opportunity to formalise organisational learning, including:

identifying business unit pain-points, and
identifying existing policies, processes and standards that have become obsolete.

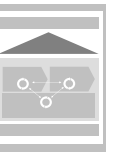
Exceptions, especially for cost reasons, should be strongly discouraged. An exception of this nature usually signals a lack of financial planning for, and commitment to, the target architecture and EAM in general. The organisation should expect an initial cost premium to align with the target architecture. This expectation should be communicated and planned for at the outset.

Exceptions may originate at any of the checkpoints (sometimes called stage gates; see Chapter 6 for more details). Exceptions may also result from situations that require standard processes, policies, or procedures to be circumvented. Exceptions need to be dealt with promptly; failure to do so will result in pent-up frustration and therefore might facilitate maverick activity. To avoid frivolous exception requests, exceptions need to be well motivated. A motivation should include the business impact of not following the prescribed policies and procedures. In the case of an exception, the governance team decisions should be documented. If necessary, the matter should be escalated on the basis of the decision protocols.

If an exception occurs, the organisation should review its policies or procedures to eliminate future occurrences of this exception. However, the organisation should ensure that the additional policies and procedures don't burden the process without adding significant value. If an exception only occurs once and is unlikely to occur again in the near future, a new policy should not be created.

With regard to the governance model (illustrated in Figure 4.1), some organisations deliberately fine-tune their decision protocols so that a certain percentage of decisions are escalated. For example, they might expect 20% of first-level (i.e. ARB) decisions to be escalated to the second level (i.e. EAC), and 5% of second-level decisions to be escalated to the third level (senior leadership). This escalation ensures a desirable level of senior leadership engagement and visibility. If the percentage of escalations is too high, it implies insufficient empowerment, while too low a level may suggest senior leadership abdication, which would have negative long-term implications for EAM. Therefore, firms should track and number the escalations by establishing and tracking an exception metric.

Guidelines, standards and reference architectures

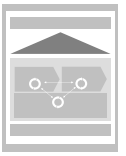


Guidelines, standards and reference architectures act as guardrails that provide project teams with parameters within which to operate. The teams need to know how much flexibility they have and where the limits are. One key to effective governance is balancing flexibility with control, because too much constraint will lead to excessive red tape. On the one hand, if there already is a lot of red tape, firms might consider EAM a bottleneck and project teams might try to find ways to work around the system to get the job done. On the other hand, if there is too little direction and constraint, the potential EAM benefits will not be realised. Therefore, the right balance between flexibility and control must be established. Desired objectives can be achieved by putting pragmatic limits in place, providing some guidance and applying just the right level of constraint.

Guidelines, guiding principles and best practices *influence* project teams and, depending on the context, are usually subject to interpretation and applicability. Standards are generally more universal. Standards are normally enforced, thus providing *control*. A recommended approach is not to create a new standard for every issue that arises, but to identify the top 3 to 5 issues at any one time through periodic assessments and run-time metrics, and to focus on these. For example, if it is evident that data quality is the cause of most of the production problems, the EAM organisation should focus its energies on resolving this issue through new data standards and data quality guidelines before tackling the next biggest challenge. By focusing on the most important issues only, the guardrails can slowly be constrained over time (see Chapter 6). The architecture review board has the authority to issue a waiver with regard to a particular standard. When this occurs, it is important to track the consequences of such non-compliance over time.

Reference architectures are *generalised* models. They encapsulate corporate, vendor, or industry best practices in a model that can act as a starting point. The model can then be copied and adapted to suit the firm's specific needs. A target state architecture draws from these reference architectures, standards and guiding principles. The target state architecture produces a *specific* representation of the desired end state for a particular organisation. These target state architectures can be produced at various levels of abstraction, and are very powerful decision-making tools (see Chapters 5 and 8).

4.5 EAM organisation models



Alternative EAM reporting lines

The initial EA objectives will influence the EAM organisation model, as well as the corresponding lines of reporting. As most EAM organisations started with IT architecture rather than business architecture activities, it is most common to find EAM groups established within the CIO organisation. Even for those more mature EAM groups that are organised and driven from a business architecture perspective, 88% still report to the CIO, and only 12% to the CEO [5]. However, those EAM organisations that do report to the CEO have demonstrated significantly higher levels of business alignment, maturity and organisational acceptance.

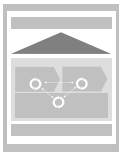
How a global reinsurer improved business alignment and organisational acceptance of EAM

A globally operating reinsurer had a turnover of 45 billion EUR in 2010. The company implemented EAM successfully as an IT-led initiative. The value delivered warranted making EAM an organisation-wide initiative. In early 2008, the company founded the Global Business Architecture department. The department's primary objective was to achieve business-IT alignment. Today, the Global Business Architecture (GBA) department is a main driver and decision-maker in the project portfolio and project management process. Together with the global process owners, it is responsible for developing global standards. The GBA department reports to the CEO. A business architect notes:

'We have a major advantage when it comes to business-IT alignment compared to other companies, since we are organisationally not attached to IT or to the CIO. We belong to the CEO and have a mandate from the Strategy Committee [the highest organisational board at holding level], which means a group mandate … This implies that we have access to the business and to the strategy, and this gives us an extraordinary position.'

Corporate structures can be autonomous business units, very centralised organisations, or anything in between. The existence and location of architecture roles in the corporate structure depends on several factors, including:

the current EAM state and scope,
EAM maturity,
the governance model, and
the size of the organisation.



If the organisation is small and the EAM is less mature, some of the responsibilities may be consolidated in one role. For example, one individual might be responsible for both the business and domain architecture. It is advisable to outline the path from the as-is state to the target state. This can be done by describing the target model, taking into account all the architecture services and resources identified (the target state), and then describing a scaled-back version that includes the milestones on the path towards the target state.

Centralised organisation model

The diagram in Figure 4.2 provides an example of a largely centralised architecture organisation.

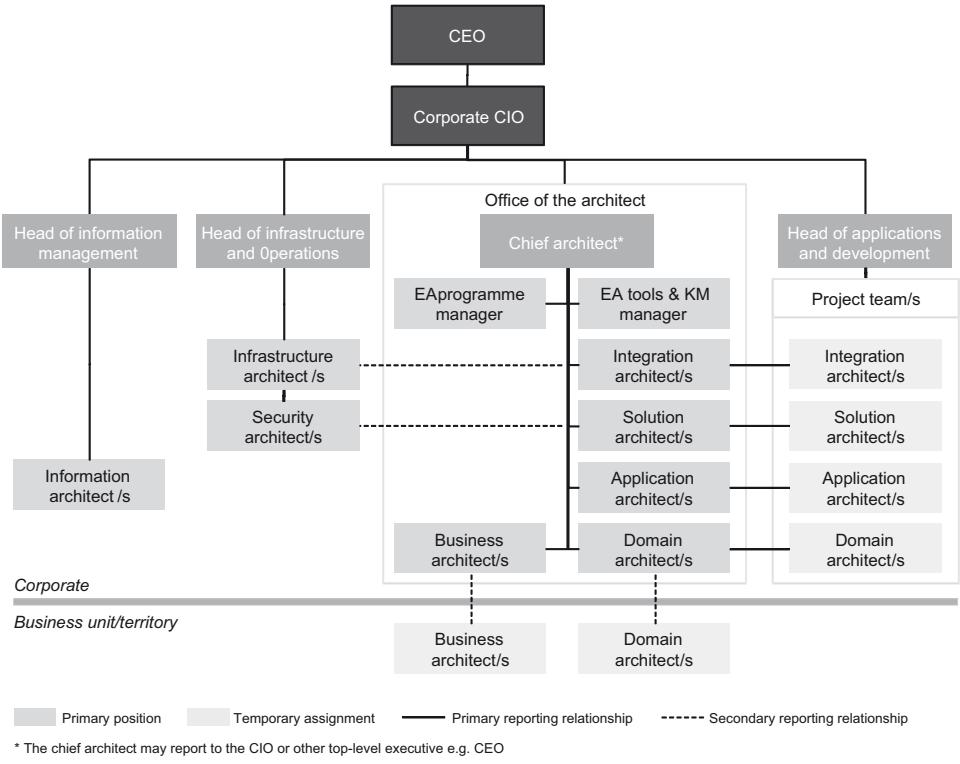
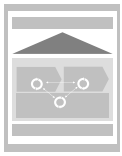


Figure 4.2: Centralised EAM organisation model



This model is appropriate for very centralised organisations in which most IT services are performed from a central location. In this model, an 'office of the architect' is established. This office performs the majority of the architecture services, providing strategy, planning, blueprinting, standards, governance and development support. The majority of the architecture resources have a direct reporting relationship to a chief architect. Certain architecture roles, such as infrastructure, security and information, may play a more fixed organisational role, while business, application and solution architects might have a more temporary project role.

Decentralised organisation model

The decentralised model is appropriate for organisations that operate largely autonomous divisions, business units, or territories. The diagram in Figure 4.3 is an example of architecture resources in a decentralised model.

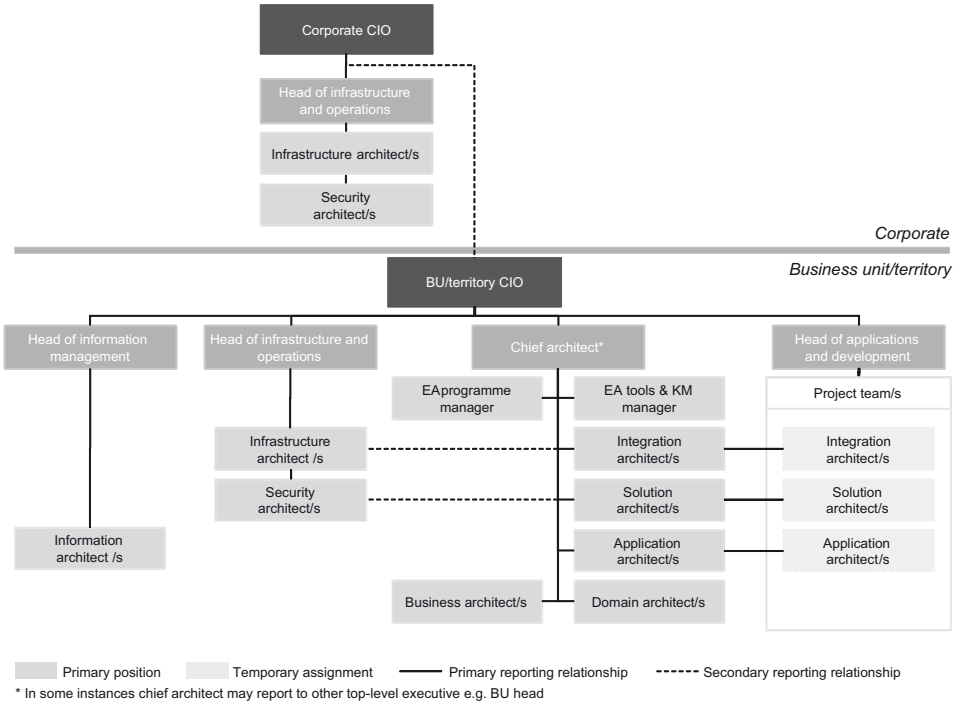
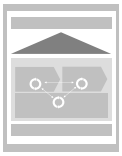


Figure 4.3: Decentralised EAM organisation model



In the decentralised model, the majority of the architecture resources exist within the various organisational entities (divisions, business units, or territories). Each entity operates largely autonomously, and maintains separate architecture resources. The extent and maturity of the entities' architecture capabilities may vary significantly. For example, a large division may have almost all of the architecture resources depicted in Figure 4.3, while a smaller division may just have a few solution and application architects.

In this model, a limited set of architects could still exist at the corporate or global level for a small sub-set of common capabilities, most notably security, email, some infrastructure services and offer support to central units like corporate finance, tax, legal and reporting. In this case, there might be some duplication of roles.

Centres of excellence model

Some firms establish *centres of excellence* (CoEs), also known as competency centres. This approach is gaining popularity. In this model, resources are grouped together in are as of specialisation, which is offered to other organisational entities as a shared service. The diagram in Figure 4.4 represents such a model.

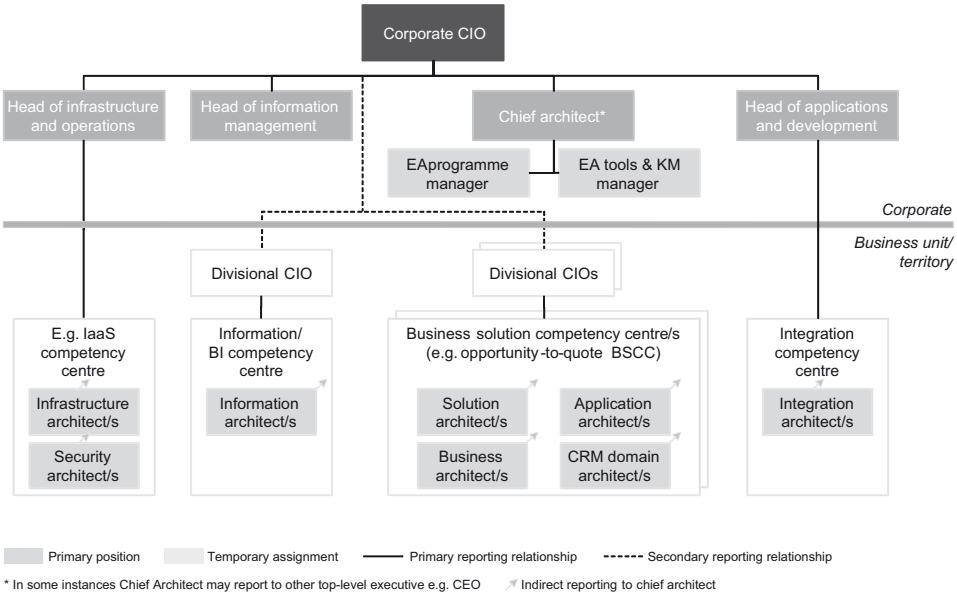


Figure 4.4: Centres of excellence (CoE) model

Common competency centres include:

Business intelligence (BI) competency centres. Responsible for providing common services in business intelligence, reporting and analytics.

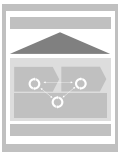
Infrastructure competency centres. Multiple competency centres may exist that cover computing hardware, storage, networking and email. An example could be an *infrastructure-as-a-service* (IaaS) *competency centre*, possibly at the corporate level, as depicted in Figure 4.4.

Business solution competency centres (BSCCs). BSCCs are responsible for the end-to-end functional business process design and business process implementation. A BSCC typically focuses on one or more business domains. The BSCC enables the development of the related end-to-end business process vision, skills, mindset and shared knowledge [3]. An example is an *opportunity-to-quote competency centre* that a business unit has developed and matured, and that provides guidance and services to other business units.

Integration competency centres (ICC). An ICC provides a shared service to address one or more integration 'realms', including meta-data, as well as data-information, applications-services, process and portal-user interface integration.

Responsibilities for different competency centres may be distributed between divisions, territories, or business units. When business units specialise in certain areas and offer that expertise to other units, this has the potential to mature the organisation more efficiently and quickly. Consequently, the architecture responsibilities are divided among the various competency centres, thus allowing greater focus, depth and maturity. Each division is responsible for driving architecture standards and guidance, as well as offering services in its specialty area to other units. Each competency centre may have its own ARB, although a single centralised EAC chaired by the chief architect is recommended. Similarly, architects have their primary reporting relationship to the division or unit hosting the competency centre, with an indirect reporting relationship to the chief architect.

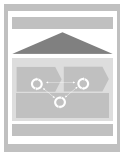
If it is probable that the corporate strategy may entail divestments, the CoE model may not be a good structure to adopt, as key architecture capabilities may be lacking in the business unit to be divested or, conversely, key architecture capabilities required by other parts of the business may be contained within the business unit to be divested.



Hybrid or federated model

Hybrid or federated models are a combination of decentralised models and centres of excellence models. Some functions are centralised or shared by organisational units, and some architecture functions exist exclusively for the benefit of specific units. In fact, it is common for top-performing global organisations to have governance models that deliberately blend centralised and decentralised IT decision-making in order to benefit from the best features of each. According to Weill and Ross, '*Top performing firms balancing multiple performance goals had governance models that blended centralised and decentralised decision making. All top performers' governance had one aspect in common. Their governance made transparent the tensions around IT decisions such as standardisation versus innovation.*' [4]

4.6 Architecture archetypes



As we conclude this chapter, there is one more consideration to address that may influence the selection and implementation of your EAM organisation and governance models. From our interviews, we have identified four distinct frames of reference that shape the architecture decisions made by businesses. We have termed these the EAM archetypes. Table 4.1 below shows the characteristics of each of these archetypes. We assume that businesses use an EA archetype that naturally aligns with the business and EA context, rather than making a conscious decision. However, the set-up has significant implications for achievable benefits and EA operations.

EAM organisation and archetype

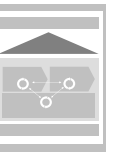
There is a correlation between the architecture archetype that an organisation adopts and the governance and organisation structures that it puts in place. Certain archetypes are suitable for certain organisation sizes and models, and the governance model must support the adopted archetype.

The **model-driven** archetype is most conducive to smaller organisational units (smaller centralised companies, or decentralised business units or CoEs) in which the size and complexity of the EA models are manageable. As the organisation becomes larger (or, more specifically, the architecture's complexity increases), the effort to maintain a central EA model will require increasingly more resources, and a point of diminishing returns may be reached. A key to maintaining the model-driven archetype is to include governance steps that formalise and enforce a model update as changes are made. An organisation might demand that the update takes place before EA signoff at the final project stage and when operational changes are made (see Chapters 6 and 7).

The **strategic applications and vendors** archetype can apply to any organisation model or size that is largely dependent on a specific strategic application and vendor (e.g., a major ERP system). However, this would be more typical of smaller centralised organisations, as larger or decentralised organisations would be more likely to operate a multitude of interconnected systems. Furthermore, industry trends towards more compartmentalised approaches and the rise of software-as-a-service (SaaS) is decreasing the prevalence of this archetype. For organisations that plan to move away from the strategic applications and vendors archetype, a recom-

Table 4.1: EAM archetypes

EAM archetype	Model-driven	Strategic applications and vendors	Architecture paradigm	Governance
EA development approach	Model the as-is state and target architectures, followed by solution selection and implementation	Mostly determined by the architecture of the chosen focal information system	Concentrate on an architecture paradigm	Establish a clear governance structure and an enterprise portfolio of target patterns
Example	Use an EA modelling tool to create a complete model of the as-is state and target architectures. Use these models for EA communication, planning, and development	Support the majority of business processes with SAP and allow the use of other applications only by exception	Decide to follow the SOA paradigm and transform the EA into an SOA; whenever change is requested and accepted, implement it using SOA pattern	Local decision-makers follow centrally defined governance rules and architecture patterns; objectives and borders are common, but implementation decisions are made locally
EAM is facilitated by	Models and frameworks	Single IS vendor / single product strategy	The architecture paradigm	Governance rules and processes, and a well-defined enterprise continuum
Architecture characteristics	Low or medium EA complexity, variety of IS and business processes	Low or medium EA complexity, a central IS that covers most of the core business processes and dominates the IS landscape	Medium or high EA complexity, large number of systems with numerous interfaces, often legacy applications	High or very high EA complexity, complex and decentralised organisational structure, complex political situation
Advantages	Supports logical derivation of strategic investment roadmap	Reduced or outsourced complexity	Makes 'best fit' functionality available	Supports decentralised management style and highest architecture complexity
Disadvantages	Requires significant in-house architecture skills and efforts	High dependency on one IS vendor and its strategy	Complex integration layer development and operations	Managed, but still complex overall EA

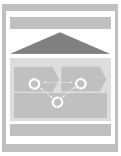


mended approach is to begin to incrementally decouple the strategic system by using service-oriented and middleware technologies, to the point where the strategic system is a collection of services orchestrated in a best-of-breed fashion with other systems (see the following description of the architecture paradigm archetype). Governance mechanisms that support the strategic applications and vendors archetype may include the publication of reference architectures and the more formalised involvement of key vendors or subject matter specialists supporting the application.

The **architecture paradigm** archetype can apply to any organisation model or size, but it is particularly useful for larger organisations with a large number of interconnected systems. For example, *service-oriented architecture* (SOA) and *cloud computing* are two architecture paradigms that are gaining popularity in large and small organisations. From a governance perspective, the chosen architecture paradigm would typically be codified in the form of guiding principles, standards, or reference architectures. Conformance is vetted by the instituted governance bodies such as the architecture review board.

The **governance** archetype is usually adopted by large organisations with many architecture stakeholders. In this type of organisation, a structured approach is necessary to produce alignment, ensure conformance and deliver the intended business value. While these organisations may embrace aspects of other archetypes, such as architecture paradigms, the dominant contributor of business value is a robust and mature architecture governance process.

In conclusion, there is no ‘one-size-fits-all’ governance and organisational model. Every organisation is unique, and while there are generalised governance, organisation, and architecture archetypes and models that can provide useful starting points, these must be tailored to a company’s specific needs.



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Embedding EAM into strategic planning

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F. Ahlemann et al. (eds.), *Strategic Enterprise Architecture Management: Challenges, Best Practices, and Future Developments*, Management for Professionals, DOI 10.1007/978-3-642-24223-6_5,

Table of contents

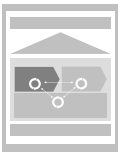
Management summary

Aligning enterprise architecture management (EAM) with the existing management practices guiding a company's strategic and organisational development is a key challenge. Our study reveals that organisations struggle to realise EA's defined objectives and principles if EAM is a stand-alone activity and not linked to existing strategy processes.

In this chapter, we discuss how EAM practices enhance strategy formulation, planning, and evaluation: As a starting point, the documented as-is architecture provides input for discussing different stakeholders' viewpoints and analysing the organisation's existing capabilities. During strategy formulation, EAM techniques assist managers with explicating and refining strategic directions in the form of target architectures. Finally, the documented as-is and target architectures help managers to identify migration plans and resolve interdependencies, which are often overseen without EAM. EAM practices thus ensure that, given the firm's capabilities and limitations, the chosen strategies are feasible.

We conclude that EAM has two important roles in the strategy cycle: Firstly, it supports planning, formulating and coordinating strategic initiatives by means of EA documentation and EAM methods. Secondly, EAM initiates dedicated architecture initiatives that improve the architecture's overall quality and prepare it to support existing and future business requirements.

5.1 Approaching EAM from a strategic perspective



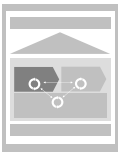
EAM's role in guiding organisational development

Changes in the business environment force organisations to continuously reposition themselves in the market. Repositioning is accompanied by the reorganisation of internal structures, which are often complex and difficult to change. These shifts require the firm to improve its ability to plan and implement change. As a management philosophy, EAM enhances an organisation's ability to sense, analyse and respond more effectively to change by:

Aligning the organisation with the strategic goals. EAM can help management to assess whether business and IT programmes, as well as other initiatives, fit in with the strategic goals. It thus focuses investments and resources on those initiatives that generate significant business performance improvements, instead of wasting them on projects that might have questionable, or even contrary, effects on the strategic goals.

Coordinating the interdependencies and different change cycles in business and IT. EAM assists with synchronising business and IT strategies. Entering a new market, for example, might require redesigning CRM processes to closely interact with the sales agents and customers. This might ultimately generate the need for an additional online sales platform. Although time-to-market is a key goal in this situation, different change cycles might not be compatible. While the market entry strategy will be developed and rolled out to the sales organisation over several months, it might take one or two years to migrate to a new sales platform. EAM can help management to coordinate the implementation of the business and IT changes by outlining a migration roadmap.

Preparing the organisation for agility. Silo applications, redundant and inconsistent data repositories, as well as heterogeneous technical infrastructure components hinder companies from responding to change effectively. EAM allows companies to regain their fundamental structure's transparency; this is a prerequisite to launch dedicated architecture initiatives to overcome overly complex and rigid structures. The architecture's standardi-



sation and modularisation enable swift responses to changing business environments.

EAM's holistic perspective enables organisations to strengthen their strategic competence: Firstly, as-is architecture's documentation and analysis provide firms with a clearer picture of their current state and their corporate assets. Secondly, EAM teases out the desired target state's formulation by explicitly specifying and documenting the target architecture. Finally, EAM guides the purposeful transition to this target state, which involves formulating roadmaps and implementing *strategic business, IT,* and *architecture initiatives*, as well as aligning the *emergent initiatives and operational demands* with the strategic directions (see Figure 5.1).

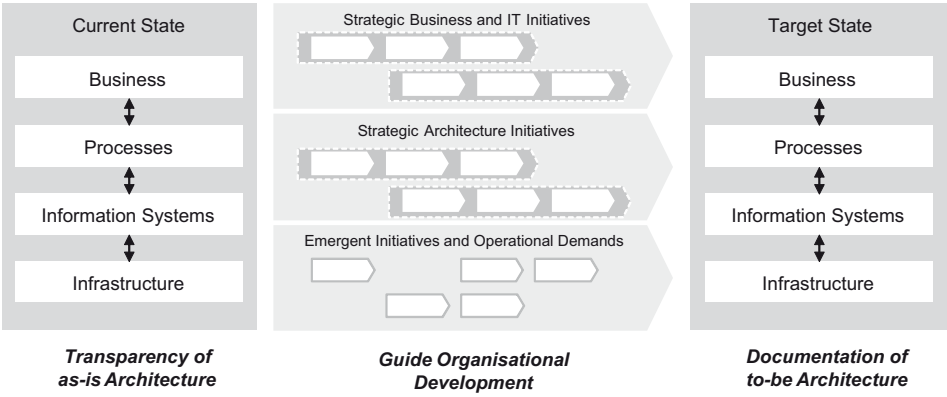
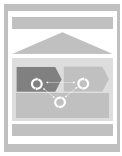


Figure 5.1: EAM's role in guiding organisational development

Strategic initiatives implement far-reaching changes and are a cornerstone of organisational development. They are '[…] collections of finite-duration discretionary projects and programs, outside the organisation's day-to-day operational activities that are designed to help the organisation achieve its targeted performance' ([1], p. 103). Since they shape the firm's development, EA considerations should complement business or IT units' evaluation of strategic initiatives. Owing to the differing objectives, scope, and EAM's role in their initiation, we distinguish between two types of strategic initiatives:

EA practices should support evaluating, planning and implementing strategic business and IT initiatives

Business and IT initiatives are launched as a result of corporate, functional, or regional strategy processes. Business initiatives comprise changes to the business model and product portfolio, customer relationships, channels, operational processes and organisational structures. IT initiatives imply implementing information systems and infrastructure, their migration and operations. For example, a



firm might implement a new ERP system and decide to outsource major parts of the IT function. Since senior managers at corporate, functional, or regional level primarily drive business and IT initiatives, EAM mainly has a supportive role: Firstly, EAM practices, such as EA documentation and additional analysis techniques, can improve the set-up of the initiative and its implementation. Secondly, EAM provides the transparency required to coordinate and actively manage the changes induced by parallel strategic initiatives.

Dedicated architecture initiatives address EA|s structural problems and prepare the organisation for the future

The EAM function can also launch dedicated *architecture initiatives* (e.g., process harmonisation and architecture modularisation). These initiatives are specifically promoted by the enterprise architecture council or EAC (see Chapter 4), which oversees the organisation's EA activities, to create synergies and prepare the architecture for the future. Architecture initiatives are also needed if fundamental problems hinder the business and IT initiatives' effective implementation, and if these problems cannot be solved within their scope. For example, a monolithic legacy systems running on an outdated technology platform might evolve into a hindering factor when new business requirements, such as the increased use of electronic channels, are implemented. In this case, an architecture initiative can address the stepwise migration from wrapping the existing functionality as services to more modular applications that are more responsive to change. While the EAM function acts as the main driver of these initiatives, it works closely with those responsible on the business and IT sides (including the functional management, as well as the business process and application owners).

Besides these two types of strategically planned initiatives, companies are confronted with a large number of short-term operational requirements and unforeseen incidents. As outlined in Chapter 7, these emerge bottom-up, and induce urgent and mostly unanticipated EA changes. EAM is only successful in guiding the transition to the target architecture if it establishes pragmatic guidelines for managing *emergent initiatives and operational requirements* with the defined architecture principles and the target EA. Table 5.1 summarises each of these initiatives' characteristics and EAM's role.

Table 5.1: EAM's role in different types of initiatives

	Strategic business and IT initiatives	***Strategic architecture initiatives***	***Emergent initiatives driven by operational demands***
Goal	Implement corporate, functional, or regional strategies	Improve the overall EA quality and maturity	Implement short-term change requirements and operational demands
Initiator	Senior management	EAM function	Operational units
EAM's role	Supportive: contribute to strategic EA development	Active: drive strategic EA development	Reactive: ensure EA compliance
EAM's tasks	Support formulation and planning of the strategic initiative by means of target architectures and roadmaps Coordinate and actively manage the changes induced by the different strategic initiatives	Kick-start the initiative Formulate, plan, implement and evaluate the initiative	Ensure that short-term changes and demands comply with the architecture principles and support their alignment with the strategic directions (see Chapter 7)

Anchoring EAM in the strategy cycle

To realise EA objectives and principles, EAM practices need to be embedded in existing strategy processes

If EAM is a stand-alone activity without any links to existing strategy processes, the organisation will struggle to realise EAM's defined objectives and principles. This implies that EAM practices need to be carefully embedded in the strategy processes, instead of launching parallel activities. We build on the idea that strategic management is an ongoing process comprising four phases: strategy formulation, strategy planning, strategy implementation, and strategy evaluation [2-4]. EAM practices and techniques add to the strategy cycle's different phases. Figure 5.2 depicts the EAM-enhanced strategy process (upper left cycle) and its interrelationships with the project life cycle (Chapter 6), as well as operations and monitoring (Chapter 7).

During *strategy formulation*, companies elaborate and evaluate different strategic alternatives. They usually start by analysing the as-is state and assessing the firm's internal strength and weaknesses, as well as external threats and opportunities. EAM helps the firm to perform the following strategy formulation tasks:

(1) Analysing the situation. EA documentation and analysis help to capture and assess an organisation's current situation. On the basis of a structured and comprehensive EA model, EAM complements traditional strategy tools by adding multiple perspectives of the organisation's existing capabilities.

(2) Elaborating on strategic options

(2a) Accessing strategic business and IT options. EAM helps to assess the firm's strategic options on the basis of their potential implications for the processes, structures, people, applications and technology. EAM thereby supports the selection of initiatives that are aligned with the organisation's capabilities and potentials.

(2b) Formulation of strategic architecture initiatives. In addition, EAM can develop strategic options to address structural architecture issues, such as complexity, and to prepare the organisation for future requirements.

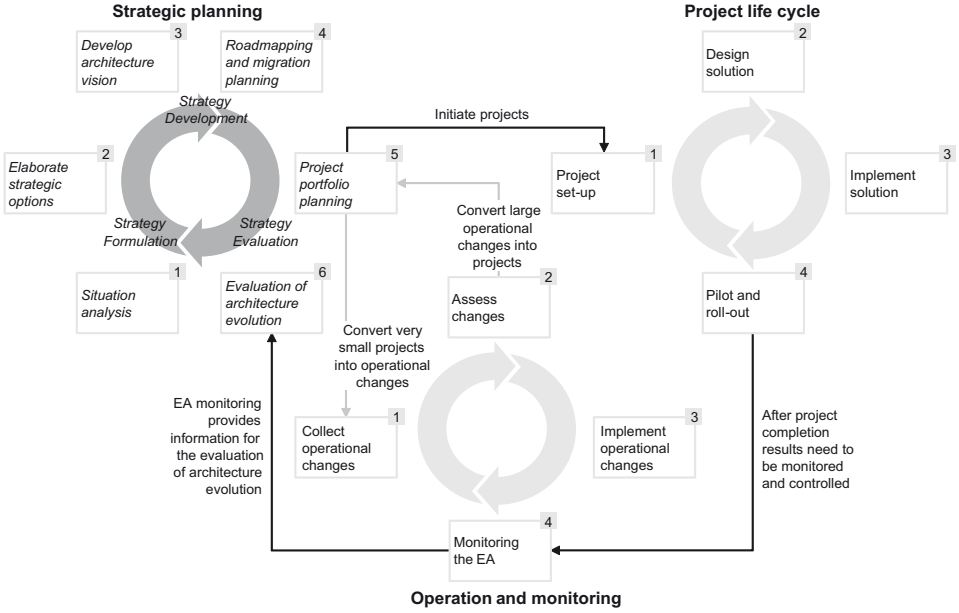
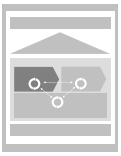


Figure 5.2: EAM process cycles

Strategy planning translates the chosen strategic option into tactical plans by deriving and aligning corresponding strategic initiatives. EAM supports this phase by:

(3) Developing an architecture vision. By developing and documenting target architectures, EAM provides a much clearer and more detailed picture of strategic initiatives' implications and consequences. This explication of the architecture visions eases communication and the further refinement of strategy plans in the subsequent planning steps.



(4) Roadmapping and planning migration. While the target architecture is valuable, roadmaps translate the architecture vision into feasible tactical plans. EAM ensures that roadmaps reflect the relevant constraints and interdependencies at different architecture layers. Roadmaps are an important input for future project teams working on different aspects and highly dependent on one another.

(5) Assessing and prioritising the project portfolio. Strategic initiatives are implemented in projects and programmes. EAM helps the firm to structure its project portfolio by resolving conflicts, promoting the projects that have the highest strategic contribution and revealing the synergy potentials between projects.

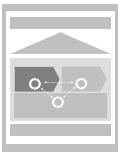
Strategy implementation covers the realisation of associated project programmes and projects. We discuss EAM's assistance during the implementation of programmes and projects in detail in Chapter 6 of this book.

S*trategy evaluation* comprises the monitoring and evaluation of strategic goal achievement. EAM assists in this phase by:

(6) Evaluating the architecture evolution. EAM supports the evaluation of whether the enterprise architecture is developing in line with the architecture vision and the architecture roadmaps. In Chapter 7, we cover additional aspects related to EA monitoring by means of KPIs.

In the following section, we illustrate the strategy formulation and planning phases in detail and highlight the changes that EAM brings about in the different phases. Case examples illustrate EAM's successful integration into the strategy cycle.

5.2 Leveraging EAM for strategic planning



(1) Analysing the situation: Achieving transparency concerning the as-is state

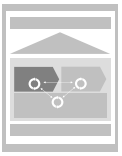
EA documentation complements the traditional information basis for strategic decision-making

Strategy processes depend on a reliable information basis. Especially in strategy formulation's early phases, managers are mostly concerned with situation analysis, i.e. 'identifying the position of the firm in respect of the business environment it operates in and how its resources and capabilities meet the demands of that business environment. Such analysis forms part of the background to which strategic decisions are made and provides insight into the difficulties of implementing strategic change' ([5], p. 19). A well-documented as-is architecture, or baseline architecture, allows a quick overview of a firm's strategy, processes, organisation, information systems and technology infrastructure. It assists with the situation analysis phase by offering insight into cross-domain architecture relationships, generally through projections and intersections of underlying models, but also by means of analytical techniques.

The challenge for enterprise architects is to create EA documentation and reports that can swiftly provide decision-makers with crucial information. Successful EA modelling and documentation require stakeholders and experts' intense involvement, not only to define the relevant architecture models, but to choose the appropriate analytical techniques and easy-to-understand depictions. For example, landscape maps are a practical way to generate overview tables for managers, as well as process and system owners. By interviewing stakeholders about their EA concerns and views, enterprise architects are more likely to determine the right scope, define an appropriate purpose that a view must serve, and the content it should display.

EA documentation should be created step by step

Documenting the EA is not an end in itself. Since documentation requires many resources, one should avoid getting lost in a never-ending effort. The case analysis reveals that architects choose a sequential approach when creating the initial EA documentation. Depending on the sponsors' concerns, architects often start by documenting selected architecture layers, such as the application landscape or the business processes. Starting with this documentation, they add related components from associated layers to demonstrate the interdependencies, such as the business processes supported by the documented applications, or the technical infrastructure underly-



Involve stakeholders and experts in creating EA documentation

ing the application landscape. The level of detail is initially kept to a minimum, with a focus on the understanding of key EA components and their relationships, as well as on defining weak spots. The level of detail increases as an EA initiative matures.

Since EA know-how is distributed across the organisation, the as-is documentation is obtained from workshops or interviews that involve architects, decision-makers and the persons responsible for the EA components. The latter could include functional managers, process managers, application owners, or those responsible for the technology infrastructure. To keep documentation and maintenance efforts at a reasonable level, one should reuse as much of the information already captured for the key EA components as possible. Over the past decade, companies have created comprehensive process or application documentation, and they can therefore start by linking this documentation to or integrating it into the EA repository. However, one should ensure that the overall EA documentation is well-structured and that EA components are linked intelligently to the adjacent EA components. This endeavour requires a well-defined meta-model as a foundation for the EA repository.

Once the main aspects of the as-is state have been captured, organisations must ensure that this documentation remains up to date. The presentation of EA documentation and analysis in planning and operational meetings is a key instrument to ensure their periodic update. Other instruments that are suitable for this task are dedicated EA documentation reviews, as well as the project closure, which compels projects to maintain EA documentation (see Chapter 6).

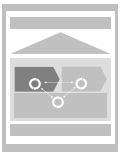
EA documentation at a leading cargo carrier

An international cargo carrier swiftly achieved a comprehensive picture of its current EA by focussing on the most important EA components for defining the future IT strategy right from the outset. The documentation of the application landscape comprised the 60 to 70 core applications that are the carrier's responsibility. The architects subsequently added descriptions of the application interfaces and services. The applications were then assigned to seven primary domains and 25 sub-domains derived from the carrier's core business processes. Regarding the business processes, the architects could rely on the business units' business process documentations and reuse them. Governance mechanisms ensure that project members, in cooperation with architects, incorporate all the changes made while projects are underway into the EA documentation.

A business architect assesses the central overview gained through the EA documentation:

> *'EAM provides overall knowledge of the organisation's business regarding how the business really functions and how everything interrelates. This knowledge is rarely found in the business units or in the projects, but resides within the EA, and constantly increases.'*

Management recommendations



As a basis for a company's situation analysis, gaining EA transparency requires:

Carefully setting the architecture documentation *scope* in order to address the main stakeholders' concerns and to keep the documentation and maintenance efforts reasonable. Successful firms have chosen sequential approaches, starting at a specific EA layer and focussing on the core architecture components at the outset.

A strong *functional management involvement* increases awareness and acceptance of modelling activities. This involvement ensures not only that EA documentation addresses the stakeholders' concerns and views, but also that it closely reflects the current situation.

Management must *mandate the preparation and maintenance of architectural descriptions* as part of project management guidelines in order to ensure that changes are incorporated into the architecture documentation.

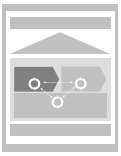
(2) Elaborating on strategic options through EAM

Scanning the environment may reveal major changes to which organisations must adapt. The internal analysis already exposes new or adjusted ways of doing business. Matching the results of internal and external analyses leads to a number of potential strategic options, which are evaluated to determine the organisation's future agenda. EAM's role is to help assess and evaluate these options and to address strategic architecture concerns by initiating dedicated architecture-driven initiatives.

(2a) Strategic business and IT options

EA analyses illustrate how strategic options affect the different parts and resources of the organisation

Strategic changes determine a company's investments and development for the next years. When evaluating strategic options, managers should not only take opportunities into account, but also the organisation's capabilities, potentials and limitations. For example, given the existing skills, business processes and applications, entering a new market may be risky if the planned go-to-market approach differs completely different from that used in the existing markets. Overlooking such implications may hinder successful strategy implementation, or require costly strategy modifications at a later



stage. The EAM function produces knowledge of the interplay between strategic directions, organisational design and the underlying IS landscape, which is very difficult to find in any other organisational unit. It is sensible to use this precious architectural knowledge to assess strategic options in order to more consciously formulate, and select an alternative.

Using EA analysis techniques increases the likelihood that the strategic alternatives under consideration fit the organisation's capabilities and long-term strategic goals. Decisions can be taken more consciously because:

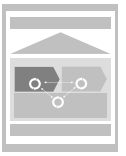
The impact of strategic options, notably the required changes in business and IT, becomes explicit. On the basis of sound EA documentation, architects can better analyse how a specific strategic option, such as an extended product portfolio or the acquisition of a new firm, will affect the processes, structure, people, information systems and infrastructure. The architect can also spot alternatives that have a greater chance of successful implementation, which he or she can then promote.

The scope of the initiatives is set more appropriately. The architect's cross-domain knowledge enables him or her to identify overlaps between different initiatives and to detect unforeseen side-effects. In doing so, interdependencies, or even conflicts with other strategies, are detected earlier.

Business-IT communication is enhanced. With a multi-dimensional EA approach and models, architects help to translate strategic business initiatives to the IT domain. In the same way, architects may explain how strategic IT initiatives provide the technical basis needed to achieve strategic business goals. Furthermore, they recognise strategic IT initiatives that enable new business opportunities.

Ensure architects' participation in strategy processes

However, an important precondition is the enterprise architects' participation in the strategy processes. The chief enterprise architect should participate in strategy and board meetings. The architecture team can contribute by compiling architecture documentation, evaluating different options and thereby prepare the information basis for strategic decision-making.



The architecture team's involvement in strategy formulation at a global insurance corporation

This insurer's architecture team participates in the executive board's strategy proposal evaluation. The architects review the business case, identify the affected processes and evaluate the proposal's effectiveness and hidden effects on the architecture. If the architects have architectural concerns regarding a proposal, they provide a counter-proposal and reconcile it with the submitter. Generally, no strategic proposal is made without an architectural assessment of its overall implications and usefulness.

The architects also attend strategy meetings to record the planned changes and to identify their impacts on the target operating models and target architectures. The architects evaluate and discuss the effects of strategy changes with the various process owners. Their involvement thus helps to explicate the effects on existing processes and process standards.

The insurer emphasizes that the architectural transparency gains facilitate the identification of changes caused by new business models or targets. By assigning the insurer's architecture management to the CEO, architectural implications are considered early on in the strategy process. The architects seek to further strengthen this involvement in future; a business architect describes this as follows:

'Our vision and understanding are that the management board talks to three parties when it wants to introduce a new business model: the head of strategy, the business architect, and human resources.'

Management recommendations

Management must mandate the evaluation of strategy proposals with regard to their impact on the EA.

Management must ensure that the EAM team is placed so that it is actively involved in strategy formulation. The chief enterprise architect should also participate in strategy and boards meetings.

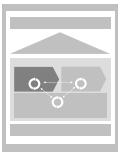
(2b) Strategic architecture initiatives

An EAM is the driver of strategic architecture initiatives

EAM has a supporting role in business and IT strategy planning, but it is also a driver of strategic architecture initiatives. Such initiatives comprise all architectural levels by addressing:

Standardisation and harmonisation, with the goal of reducing the heterogeneity and complexity of business processes, applications, data and infrastructure technologies.

S*ervice orientation and modularisation*, with the goal of creating reusable services and modules, and thereby removing redundancies and leveraging enterprise-wide synergies.



Architecture initiatives prepare the organisation to better cope with future requirements

The implementation of reference models and industry norms, with the goal of adopting best practices.

These initiatives' general purpose is to improve the EA's overall quality by eliminating obvious deficits that hinder its adaptation to a changing business environment and thereby improving cost efficiency [6]. Architecture initiatives, such as standardisation and modularisation programmes, help to prepare the organisation for the future and to address changing business environments. Data standards and state-of-the-art technology components that follow industry norms, for example, facilitate realizing company-wide integrated business processes and engaging in new partnerships with distributors and retailers. Process templates allow the firm to rapidly establish sales and production units in new markets, whereas modular components enable flexibility concerning local consumer needs. Furthermore, software services enable quicker responses to business process changes than rigid silo applications.

Dedicated architecture initiatives ensure that structural problems are systematically addressed

Such initiatives are not new to organisations. However, a dedicated EAM function and architects' close participation in strategy planning ensure that architecture issues are openly discussed and systematically addressed. This is particularly important, since other business and IT projects often do not have the means or the incentives to solve underlying architecture problems. EAM also provides analysis techniques [7] that, for example, assess an architecture's homogeneity level or identify redundancies and gaps in IT's support of the business.

Management recommendations

The EAM team should be encouraged to suggest dedicated EA-related objectives and evaluate business cases for strategic architecture initiatives.

Management must promote architecture initiatives to tackle enterprise architecture deficits. Such initiatives reduce the burden for business and IT projects, which are often beset by architecture issues, but do not have the means to solve them within their project scope.

Management must assign sufficient resources (e.g., a dedicated budget), since it is difficult to create short-term business cases for architecture initiatives; if not, the initiatives' effectiveness may be harmed by architectural constraints, local politics and resource battles.

Strategic architecture initiatives

(1) Global process standardisation at an international insurance provider

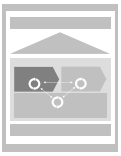
Initiative synopsis	An international insurance provider has assigned several important core processes the status 'global process'. Associated global process owners are in charge of optimising these processes and defining process standards.
Strategic goals	The initiative seeks to harmonise and standardise the core processes in the group and thus establish global best practices across the entire organisation.
EAM's role in the initiative	Global process owners and enterprise architects cooperate closely in the initiative. The EAM team ensures that the global processes fit into the overall architecture. The team also identifies strategic changes' impact on the existing global process standards. Thereafter, based on the EA's current analysis, the architects assess the current level of process harmonisation and standardisation. They report on KPIs that inform the management board of the initiatives' progress.

(2) Modernisation of the application landscape at an international cargo carrier

Initiative synopsis	In the past, a central host system's uncoordinated developments led to an operating cost escalation, as well as high complexity in the cargo carrier's application landscape. An IT master plan addresses modernising the application landscape, replacing the central legacy system and centralising the services and data. The IT master plan comprises a budget of about 50 million EUR and about 50 projects.
Strategic goals	The IT master plan seeks to modernise the cargo carrier's application landscape. It intends to reduce complexity and decrease operating and development costs. Furthermore, it aims to increase the data reliability, especially operation-critical data, such as shipment details.
EAM's role in the initiative	EAM ensures transparency in all the modernisation program's implications, especially as the legacy system impacts all business domains. Based on the EA documentation, the EAM team arranges and aligns the initiatives within the IT master plan. The EAM team also regularly identifies how business changes affect the IT master plan.

(3) Service orientation at a global bank

Initiative synopsis	The bank created a 'SOA Centre of Excellence' in order to set up a repository of reusable service modules and develop governance mechanisms that enforce service orientation in projects. A pilot project proved the SOA concept's feasibility. Subsequent projects made use of the existing services and developed other services.
Strategic goals	The SOA initiative seeks to master the transformation from fixed and rigid applications to modular services. It thus intends to increase reuse and interoperability and to reduce the efforts required to adapt IS/IT structures to changes in the business processes.
EAM's role in the initiative	The enterprise architects were deeply involved in the 'SOA Centre of Excellence'. They identified service candidates and developed blueprints for the future deployment of services. Furthermore, EAM oversaw the identification and deployment of services in projects and monitored reuse of the services provided in the repository.



(3) Developing the architecture vision

The architecture vision refines and explicates the strategic directions

The EAM's core undertaking is to develop an architecture vision explicating the strategic directions. By developing a high-level architecture model, such as a target operating model (TOM), companies describe the primary aspects of the company's future operations, before further refining and detailing the strategic intentions in the form of an architecture model. A TOM determines the cornerstones regarding how an organization operates across process, organization and technology domains in order to deliver value. In respect of the strategic goal of launching a new product, for example, the TOM helps the firm to clarify key aspects, such as:

(1) Which customers and regions will the new product address?
(2) Will the firm keep its revenue model and build on the existing distribution channels?
(3) How should the firm change the existing sales processes and applications to launch the new product?

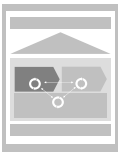
Based on answers to these questions, the target architecture operationalises the desired strategic goals and specifies a coherent vision of the firm's designated future state. The various EA models, such as process maps, as well as application and data models, provide answers to questions such as:

(1) Can the existing online shop and the order management application handle the new product or does the firm need to implement new information systems?
(2) What does this mean for the underlying technical infrastructure?

The target architecture provides a collaborative view that many managers and architects create in a joint effort

The development of an explicit architecture vision facilitates communication related to strategies, as it provides the necessary level of detail to refine the different functional areas. It is also an essential first step to the migration and development of the strategic initiatives' tactical and operational plans. Overall, the firm thus paves the way for a more purposeful development to the elaborated target state. While senior managers must specify the TOM, the target architecture development task is a collaborative process involving business unit managers, process owners, experts and architects. The resulting target architecture represents a collaborative view created by many contributors and taking their different views into account. Ideally, the target architecture integrates the anticipated strategic initiatives' changes, comprising, on the one hand, strategic business and IT initiatives and, on the other hand, strategic architecture initia-

tives. Instead of one global target architecture, organisations often employ complementary target architectures that focus on selected layers, or document specific strategic initiatives. However, architects and strategy planners should ensure consistency between these architectures.



The architecture vision at an international car manufacturer

This car manufacturer's architecture management team set up a master construction plan to document the architecture vision for the global application landscape. In workshops with global representatives, the managers agreed on a shared vision of the required IT support for the main business processes, with the aim of standardising business applications across locations and plants, of which there were more than 600. An EA tool documents the architecture vision in terms of a target application portfolio. Defining the master construction plan is part of the corporate-level planning cycle and provides the basis for the subsequent local planning rounds. By creating a frame of reference for the entire group, the master construction plan improves the use of budgets and complements the project-driven culture with long-term objectives for application standardisation.

Management recommendations

Senior management should specify the target operating model that describes, at a high level, how the firm will operate in the process, organisational and technology domains in future.

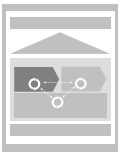
Strategic initiatives' desired effects should be documented by means of the target architecture. This target architecture comprises EA models specifying the organisation's designated future state and keeps projects focussed.

The architects should cooperate closely with the relevant stakeholders, such as the functional managers, process owners and IT experts in order to reflect their concerns and views in the target architecture and to attain stakeholder identification with the planning results.

(4) Roadmapping: Migrating from the current to the target architecture

Roadmaps specify the migration paths from the current to the target architecture

Once strategic options have been evaluated and selected, the architecture vision must be transformed into a migration plan or roadmap. The target architecture – as discussed in the previous section – explicitly describes the alterations brought about by strategic directions. By comparing the as-is state architecture and the target archi-



tecture, management can derive roadmaps (see Figure 5.3). Architecture roadmaps – as defined in TOGAF [8] – that list the individual change increments and place them on a timeline to show the progression from the current to the target architecture, are a valuable tool in this endeavour.

The development of roadmaps is an incremental process. Strategy teams can leverage up-to-date architecture documentations that provide transparency regarding the as-is state and the desired strategic state architectures to identify intermediate states. EAM also supports the discussion of roadmap alternatives, as well as the roadmap decisions by revealing interdependencies in different EA components' migration paths. Roadmap alternatives describe the paths along which the firm can travel to reach the target state. These alternatives should be discussed with decision-makers to evaluate their feasibility with regard to time and budget constraints. Discussions should lead to the selection of a viable roadmap supported by business and IT stakeholders. A global roadmap may be refined into sub-roadmaps with a specific scope, such as a selected EA layer or different planning levels. The roadmap steps suggest the first project ideas to implement the desired changes. Finally, these proposals are translated into the project portfolio for further assessment and prioritisation.

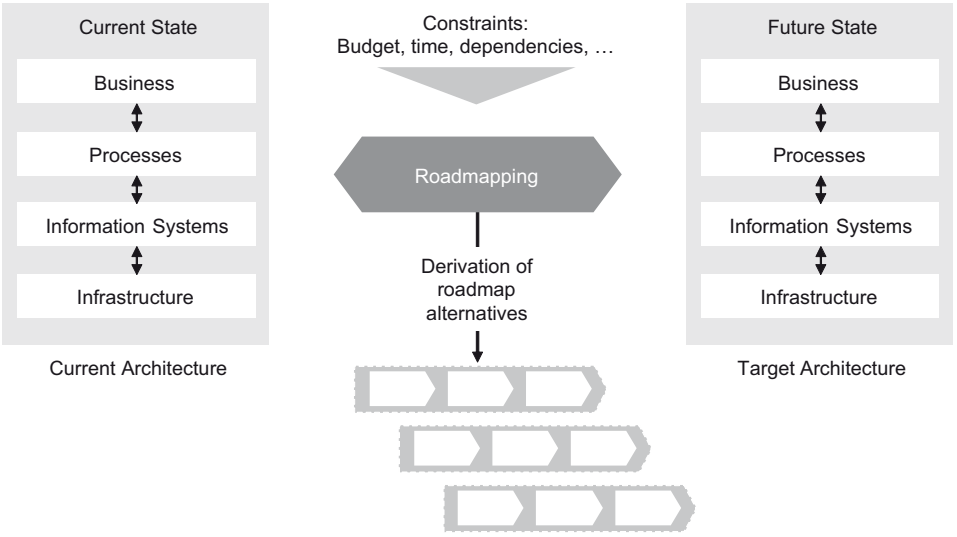
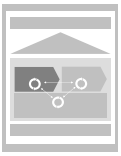


Figure 5.3: Roadmaps as migration paths from the as-is state architecture to the target architecture



Roadmapping at an international insurance company

This insurer defined its architecture vision in terms of target operating models. These models were used to derive roadmap scenarios that describe migration alternatives and lead to the targeted state. Each scenario was evaluated by means of a rough cost-benefit analysis and the intended implementation timeline. An IT architect highlighted the benefits of a target architecture in this context:

> *'The advantage of the target architecture is that one has a long-term perspective and does not decide on an ad hoc basis. […] One has an overview of the planned investments and the main targets, and can budget more precisely with the available money.'*

Evaluating the scenarios resulted in a choice of the most advantageous scenario, from which projects were derived. The insurer thus increased the number of projects that developed directly from strategic directions codified in the target architectures. The insurer consequently addressed strategic changes more proactively. A business architect described the more planned organisational development as follows:

> *'We do not want projects to occur randomly, but each has to be a step towards the desired target state defined by target operating models.'*

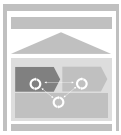
Management recommendations

In terms of roadmapping, managers should:

Motivate the relevant stakeholders to participate in the roadmap planning process in order to achieve alignment between their requirements and constraints in the resulting roadmap alternative.
Define intermediate states in order to create a shared understanding of and commitment on how the target state can be reached.

(5) Assessing and prioritising the project portfolio through EAM

In the introduction to this chapter, we stated that an organisation's strategic development from an as-is to a target state takes place by means of two types of initiatives: *strategic initiatives* as well as *emergent and operational initiatives*. Both types of initiatives generate project demands. These project demands must be aligned in the project portfolio (see Figure 5.4). As discussed in the previous paragraphs, in an EAM-supported process, *strategic project demands* evolve from strategic business and IT initiatives, as well as from strategic architecture initiatives. These initiatives ultimately generate strategic project demands. A project portfolio further comprises additional *emergent and operational project demands*. These are



demands that develop bottom-up from operational needs in the business and IT areas. Chapter 7 further elaborates on the management of this type of change and provides a checklist to identify the architectural relevance of operational and tactical changes.

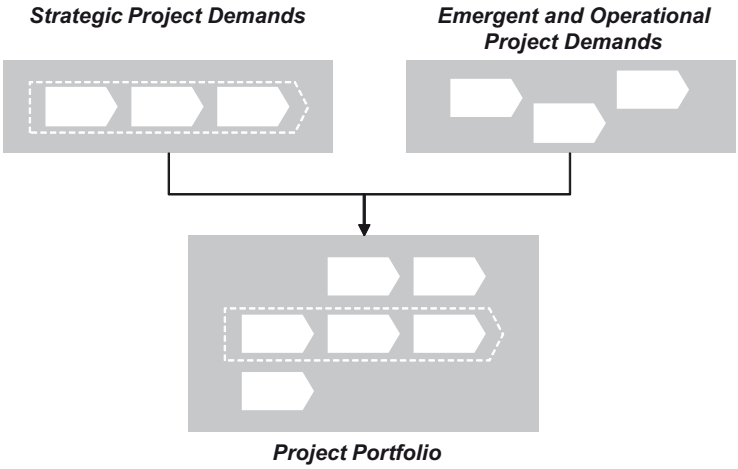


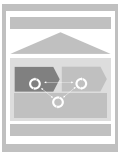
Figure 5.4: The project portfolio comprises strategic and operational project demands

EAM complements traditional project portfolio techniques

Most organisations do not have the resources to simultaneously implement all the suggested project demands in the project portfolio. Therefore, they need to identify the most critical projects and the most promising projects. Assessing a project's strategic contribution, and identifying implementation interdependencies and potentials for shared developments are not new in organisations with advanced project portfolio management. However, EA documentations and analyses techniques enhance these practices and increase their effectiveness. EAM supports the assessment and prioritisation of projects in the project portfolio by:

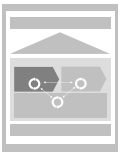
Assessing the projects' strategic contribution and conformance with the target architecture. EAM can help a firm to objectify the assessment of a project's contribution to strategic goals and to evaluate how well it aligns with the architecture vision. It therefore complements existing assessment tools, which are often experienced-based and qualitative. This is especially important in the case of *operational* project requests (see Figure 5.4), which are likely to focus on short-term requirements and sometimes conflict with the defined architecture principles. For example, a project may seek to implement changes in a self-developed application

that will be phased out and replaced by a software package, or it may use technologies that do not conform to the defined architecture standards. EAM helps to ensure that projects align with the architecture vision and that resources are assigned in a way that moves the organisation towards the desired target state.



EAM to organise the project portfolio

Cargo carrier	This cargo carrier updates its project portfolio twice per year. Two to three months beforehand, the business and IT organisations start collecting project ideas in a portfolio tool. Besides business-driven projects, the IT organisation and the architects also recommend IT-driven and architecture-driven projects. The ultimate projects are suggested by development teams or are derived from a strategic IT master plan or from the IT strategy. A central overview of all the project demands allows the project management unit and the architects to analyse the projects in terms of redundancies and dependencies. This is done on the basis of project schedules, a strategic IT master plan and information provided by the architecture documentation. Criteria for project prioritisation include profitability, costs, required resources, business criticality and the projects' correspondence with the IT goals.
Government agency	This European government agency has a federated structure that consists of a variety of local agencies responsible for policy implementation in defined areas. This structure results in a multiplicity of projects across the organisation. The agency's architects record all these developments and create an overview by annually collecting documents from all local agencies on their ongoing and planned projects. The central EAM team uses this information to pinpoint the local agencies' common development potential. On the basis of this information, the architects establish contact between agencies that plan similar projects. They also comment on the planned developments' architectural aspects and use the data to advocate shared development efforts in the way they distribute budgets. These processes have enabled the agency to achieve greater collaboration between all the local agencies. Furthermore, these agencies have coordinated their progress in alignment with the global strategic targets.



Identifying and resolving interdependencies and implementation conflicts in project portfolios. For example, architects can identify critical enterprise architecture components that have been changed by several projects and rethink the portfolio. On this basis, the firm can organise projects to create synergies and avoid conflicts between them.

Identifying potentials for shared developments. EAM reveals redundant activities. Thereby, the firm can identify potentials for the shared development of components or services across projects. For example, the EAM team can identify IT projects that implement similar business process functionalities or comparable technological components. If the team could create synergies between these projects, resource savings could result, thus avoiding redundant developments.

Management recommendations

In terms of assessing and prioritising the project portfolio, we recommend that managers:

Motivate enterprise architects to participate in the project portfolio management processes in order to apply EA methods and analysis techniques effectively, and to ensure conformance with the defined roadmaps.

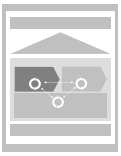
Oversee all strategic and operational project demands that have a critical size or significant impact on the EA.

(6) Evaluating architecture development: Steering strategy implementation

During the *project realisation* phase, the target EA will be implemented in the form of projects. The project life cycle is discussed in detail in Chapter 6. The strategy cycle is concluded with a strategy evaluation phase that monitors and evaluates the strategic goal achievement. EAM supports strategy evaluation by:

EAM regularly monitors and reviews the current EA status

Measuring and reviewing EA status and evolution. EA analysis techniques and reports allow managers to regularly track and discuss the EA status with their peers. For example, a heterogeneity analysis can be applied to assess conformance with defined technology and application platforms. Other checks might reveal consistency issues in the as-is state architecture.



EAM evaluates the progress of strategic initiatives

EAM can readily support further strategic information needs

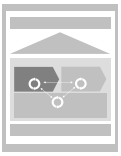
Monitoring the progress of strategic initiatives along the agreed roadmaps. The strategic initiative implementation progress should correspond to the roadmap defining the sequential transition from the as-is towards the target architecture. Managers can steer strategic initiatives more effectively by comparing how the current implementation status, as captured in the up-to-date EA model, corresponds with the implementation status foreseen by the roadmap. EA models can help to trace and resolve the causes of discrepancies.

Linking business performance indicators to EA models. Integrating existing KPIs into EA models allows more advanced analyses than either system could offer. Organisations use, for example, cost information from accounting systems and assign these to EA components such as applications or processes. This could be especially relevant when, for example, monitoring an architecture initiative's achieved operating cost reduction.

As before, the effective application of EAM in this phase depends on up-to-date information in the EA model repositories and the stakeholders' deep involvement. As the EA is constantly developing, keeping the information relevant requires managers in all the ongoing projects to regularly update the architecture changes in the EA models.

Strategy evaluation

European government agency	This government agency's architects regularly review the strategic e-government programme that implements the agency's most important IT strategy objectives for a period of five years. Since the EAM team has an overview of all the projects, it can assess the progress in the various local agencies and can, accordingly, set priorities for the next planning period.
Cargo carrier	Business architects in the cargo carrier's EAM team assume responsibility for controlling the IT strategy implementation. The EAM team also monitors the progress made in realising the IT master plan – a strategic programme that aims to modernise the systems, reduce complexity, displace systems and centralise common data and services distributed among the domains. The architects also analyse how the overall operating costs develop during the master plan implementation.



EAM allows managers to track and evaluate strategy implementation in detail. The main instruments are the agreed roadmaps. The application of EAM analysis techniques provides data about the effectiveness of the architecture improvement and allows firms to identify architectural deficits or inconsistencies early on.

Management recommendations

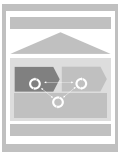
In terms of evaluating the architecture evolution, we recommend that managers:

Understand that achieving and maintaining up-to-date EA documentation are essential for strategy evaluation through EAM.

Mandate the use of measures and performance indicators. The EAM cockpit in Chapter 7 describes a suitable structure and the KPIs.

Understand that incorporating additional data in the EA models may support further usage scenarios and thereby increase EAM awareness and acceptance.

5.3 Management implications



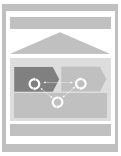
Organisations that do not integrate EAM practices in their existing strategy planning and implementation processes reap only limited benefits from their EAM efforts. Such EAM endeavours are often referred to as 'ivory towers' that lack awareness and acceptance in the organisation. This chapter illustrated how EAM practices enhance strategy formulation, planning and evaluation. However, the benefits of EAM practices can only be gained when the firm acts in line with certain success factors:

Careful integration enables EAM's full strategic effectiveness

EAM practices complement and enhance existing management practices, rather than replacing them. During strategy planning, one can use the documentation of the as-is state (or baseline) architecture to discuss different stakeholders' viewpoints and analyse the organisation's existing capabilities. The EAM practices thus ensure that given the firm's capabilities and limitations one chooses feasible strategic options. During strategy formulation, one should use EAM techniques to explicate and refine strategic directions in the form of target architectures and migration plans. In project portfolio planning, the documented as-is and target architectures assist one with identifying and resolving project interdependencies, which are often overlooked without EAM.

EAM's strategic use relies on a sound EA documentation

EA documentation provides a collaborative view that can be shared by managers, architects and employees: The effective employment of EAM as the basis for strategy planning largely depends on the EA documentation's ability to create a shared understanding of the organisation's current and target states. Instead of striving for completeness, one should concentrate on those EA components and views of most interest for key stakeholders. Furthermore, bear in mind that EA documentation provides the required information basis in an explicit EA model form. In order to enhance situation analysis and decision-making, one needs to add suitable reports and analyses to the EA models. The development of the target EA cannot be undertaken by a small team of architects; it needs to be a collaborative effort by management, subject matter experts and architects. Governance mechanisms must ensure that EA documentation is regularly updated, for example, by mandating timely updates of EA models during project execution (see Chapter 6 for more details).



Top management mandates the use of EAM practices in strategy processes

Strategic initiatives are the means to migrate towards the target architecture: As the development of an EA is a long-term and incremental activity, one should leverage EAM to guide strategic initiatives and, if necessary, launch dedicated architecture initiatives.

Top management must be committed: Since EAM is a management philosophy, top management's wholehearted commitment is required to change established working procedures. This comprises mandating the use of EAM techniques and methods in the strategy process, an appropriate organisational assignment of the EAM function and the architects' participation in strategy-relevant boards and committees.

Table 5.2 provides a checklist summarising EAM's application in the strategy process.

Table 5.2: Checklist of strategic EAM integration

Checklist of strategic EAM integration	*Reference point*
EAM has documented the current state of the organisation in an as-is architecture and has created appropriate EA reports for situation analysis.	➔ *(1)*
EAM contributes to the assessment of strategic business and IT options by identifying and evaluating changes to the different enterprise architecture components.	➔ *(2a)*
Based on regular EA assessments, EAM formulates dedicated EA goals and launches strategic architecture initiatives to improve the architecture quality.	➔ *(2b)*
EAM develops an architecture vision that explicates changes brought about by the strategic initiatives.	➔ *(3)*
EAM supports the development of roadmaps, which describe the transition from the current architecture to the target architecture. EAM supports the selection of the most feasible roadmap.	➔ *(4)*
EAM information is used during project portfolio planning to identify the projects' impacts, their interdependencies and potentials for collaborative developments.	➔ *(5)*
EAM data are used to monitor the architecture's development and its progress in migrating towards the target architecture. EAM is used to evaluate the strategic roadmaps' implementation status.	➔ *(6)*

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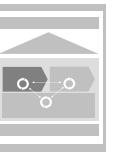

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Embedding EAM into the project life cycle

J Lu r r k

F. Ahlemann et al. (eds.), *Strategic Enterprise Architecture Management: Challenges, Best Practices, and Future Developments*, Management for Professionals, DOI 10.1007/978-3-642-24223-6_6,

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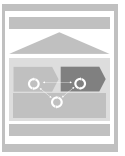
Management summary

Developing a target enterprise architecture (EA) is necessary for the purposeful development of the organisation according to its strategic objectives and vision, but not of itself sufficient to ensure success. Realising a planned EA by means of a set of architecture-aware projects creates new challenges, such as having to translate strategic, long-term EA objectives into operational, short-term targets; additional, numerous stakeholders; the diverging objectives of the 'planner' and the 'implementer'; the day-to-day management of scarce enterprise architecture management (EAM) resources; and the management of hundreds of 'micro-decisions' that all determine the future EA. A holistic EAM should therefore include a set of practices that structures, controls and monitors the projects that shape your EA.

EAM plays an important role throughout the project lifecycle. This chapter presents practices that help execute projects in an EAM-compliant way. During the project set-up phase, approval gates need to be defined, EA information must be made available to the project team, and architects need to be assigned to the project organisation. During the solution design and implementation phases, it is important to ensure that the project team develops a solution that aligns with the target architecture, as well as the architecture principles and standards. For this, project reviews can be conducted at certain points along the project life cycle. It is also useful to put escalation processes in place. They may come into play if enterprise architects and the project team have diverging ideas of what the solution architecture should look like. It is also worth considering how to enrich the existing project status reports with EA-related information. In the piloting and roll-out phase of a project, EAM may aid the search for a suitable piloting environment and help to organise a solution's smooth roll-out. The chapter closes with management recommendations for increased architecture awareness in project practices. Because we acknowledge that each organisation operates in a different environment, we discuss three different modes of EA realisation in the project lifecycle: (1) advising, (2) participating and (3) managing.

6.1 The relevance of embedding EAM in the project life cycle



Bridging the gap between the right strategies and better results

If you have done your homework during the strategic planning process (as described in Chapter 5), you will now have a target state for your EA, a roadmap of how to get there and a resulting project portfolio. This should all be neatly documented in the form of conceptual blueprints, and might even take the form of models big enough to wallpaper your office. Now what? How can you ensure that your organisation realises the strategy? Blueprints alone will not make this happen.

As with any other management practice, EAM requires controlling and monitoring procedures

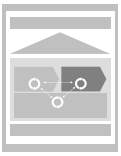
The sound planning of strategic objectives should be followed by such objectives' implementation. A strategy is more likely to succeed if the corresponding project portfolio is properly organised, controlled and monitored. Theory and practice teach us that what gets measured gets done. This simple truth is also valid for enterprise architecture management (EAM). Therefore, this chapter deals with EAM practices that support the target architecture's realisation by controlling and monitoring project progress, and by escalating project problems.

Realising a target EA is a challenging endeavour

Interestingly, firms often experience severe problems when implementing their EA-related strategic objectives. A closer look at the project processes reveals that organisations face several typical difficulties:

Translating abstract long-term objectives into specific short-term objectives. Strategic planning brings about objectives that are long-term, abstract and limited in number. They frequently refer to more than one EA layer or EA domain and affect larger organisational units and executives. However, projects require short-term, operational targets that can be used to steer project teams and individuals.

Numerous stakeholders. Project execution involves significantly more stakeholders than strategic planning does. Whereas the latter already requires specialists from various functions, such as architecture, finance, marketing, or operations, the teams tend to be relatively small. The opposite is true during project execution when



teams tend to be larger, and competency sets (e.g., including programming, quality management and service management) tend to be more specific.

Diverging objectives. The people required to execute a project may follow personal agendas that do not align with overall strategic objectives. Conflicts of interest, politics and opportunistic behaviour may jeopardise strategy implementation.

Complex resource management. Compared to the preceding planning phase, resource allocation in implementation projects is usually more complex due to the need for more detailed planning schedules, higher resource availability, volatility as a result of unforeseen events (e.g., illness and project problems) and difficult effort estimations. This is especially true for scarce resources such as enterprise architects.

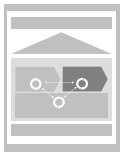
EAM alters strategy realisation processes

In this chapter, we discuss how organisations can address these challenges and implement a project process that oversees all architectural objectives and principles. To this end, we will focus on altering and extending the project life cycle with EAM practices. Project management plays an important role, as larger EA changes are usually carried out by means of projects (and larger project programmes). In this regard, there is no need to re-invent the wheel. The project management discipline has much to offer regarding governing transformation initiatives. Software Development Life Cycles (SDLC), project management standards and project management tools are just a few examples of what can be used. Yet, these techniques reveal little about how to make projects 'architecture-aware'. In this chapter, we therefore concentrate on the question of how EAM can be embedded into the project life cycle. We take for granted the use of concurrent standard project management routines like a SDLC (possibly documented in the form of a project management handbook); we therefore do not provide explicit instructions regarding general project management. Please refer to existing project management standards for more information on how to steer projects [1-3].

Some projects are more relevant than others for realising the target EA; therefore, we distinguish two project types (see also Chapter 5.1):

Projects may be designed to develop the EA; if not, they must at least be EA compliant

Strategic architecture projects (or initiatives) are initiated for architectural reasons and are designed to implement the target EA. Examples are large change initiatives, such as business process reengineering, consolidating the application landscape and harmonising IT infrastructure technologies. What do all these initiatives



have in common? They affect a larger number of architectural components, usually on several EA layers.
Projects may also be derived from **strategic business initiatives**, or they may be **driven by operational demands**. These are initiated without the intention to further develop the overall architecture. Instead, they are set up to solve one or more specific business problem(s). Such a solution usually consists of or affects one or various EA components, which is why this type is EA-relevant and needs to comply with the architecture principles and the overall architectural objectives. An example is the introduction of a new business application, or a new business process as a result of new products or services.

How the project life cycle fits into the overall planning and control cycle

The project life cycle is one of three major planning and controlling cycles influenced by EAM (see Figure 6.1). Whereas the other two cycles are concerned with strategic planning (see Chapter 5), and EA operations and monitoring (see Chapter 7), this chapter includes all the process steps from the project set-up to the piloting and roll-out of solutions developed throughout the project:

1. **Project set-up**. The project set-up usually starts after a project portfolio has been defined and approved. It deals with the required resources' allocation, the project scope definition, goal communication, project risk analysis, cost planning and scheduling.
2. **Design solution**. The solution design phase comprises all detailed design activities prior to the actual implementation. This includes the definition of the architectural components, the selection of technologies, the specification of interfaces, and changes in processes and organisational structures. This happens after the project proposal has been approved in the strategic planning cycle, which includes defining the business requirements and the technical requirements.
3. **Implement solution**. Implementation includes all activities necessary to implement the solution designed in the previous step.
4. **Piloting and roll-out**: Solution roll-out can be a challenging task, particularly for large, multinational companies. For introduction in more than one location or organisational unit, project managers usually use pilot tests that prove the working concept and help develop a solution package that is easy to implement in other parts

of the organisation. After the successful completion of this process step, the solution is handed over to operations and monitoring.

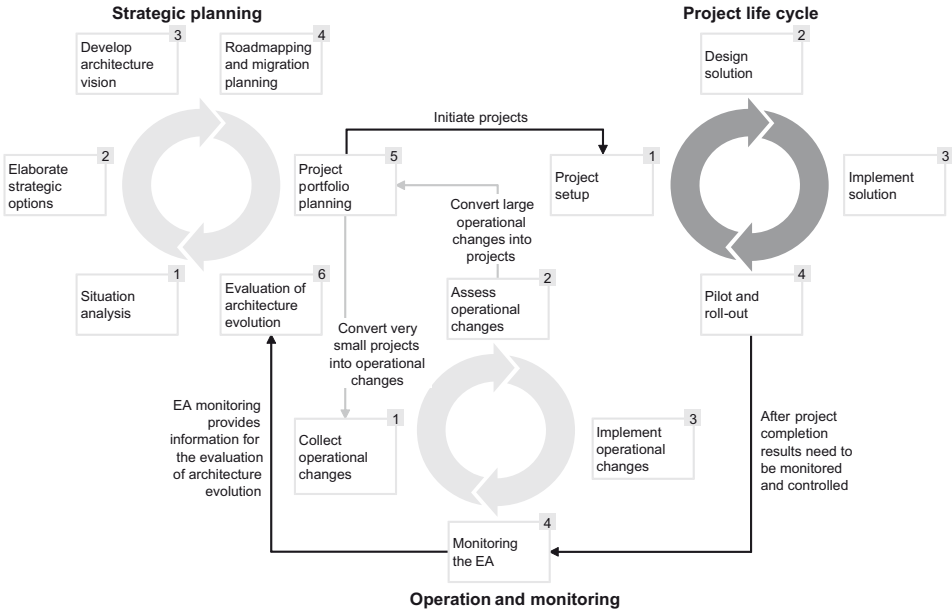
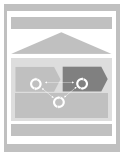


Figure 6.1: EAM process cycles

We structure the remainder of this chapter as follows: The next three sections address the practices that help execute projects in an EAM-compliant way. They follow the aforementioned project life cycle steps. We conclude the chapter by making some managerial recommendations, and provide a model of three modes for incorporating EA into project practices.

6.2 Project set-up: Preparing EA-compliant project execution



During the project set-up phase, the enterprise architects and the project team need to ensure that three important preconditions for an EAM-compliant project execution are met:

1. **Approval gates must be defined**. The project plan must have clearly defined approval gates for checking the project's architectural compliance.
2. **EA-relevant information must be available**. The project team needs architectural information to develop an EA-compliant solution design.
3. **EAM-specific resources must be assigned**. Scarce architectural resources must be managed in a way that maximises their impact.

We'll now discuss these preconditions in detail.

Definition of approval gates

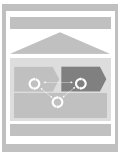
Ensure the use of appropriate approval gates

During a project, several detailed design decisions are made that refine the agreed high-level solution design. Enterprise architects need to ensure that such decisions conform to the target EA and EA principles. Milestones with approval gates are a sound platform for such an evaluation, and architects should therefore ensure that the project is well structured and has sufficient approval gates. They usually do so by adding such gates to the general project process model (or SDLC), which is then used as a template for individual project planning. A detailed list of potential EAM approval gates can be found in Table 6.1 on page 156.

Provision of EA-relevant information

The project team needs architecture-relevant information

Project teams will need architectural information to design architecture-compliant solutions. This information will help them understand how their solution fits into the overall architecture, and will help them follow the architecture principles and standards, as well as the strategic architectural objectives. It is therefore necessary to:



grant the project team access to global **architecture management repositories** that contain detailed information about the present architecture and target architecture, and
provide the project team with **documents from the project initiation process** that describe the project's architectural direction; this specifically includes the project proposal (project charter) and preliminary architectural blueprints for the planned solution.

Information taken from these documents can be used to complete templates required during project execution, for example, the requirements or specification documents. It will also help the project team to develop the solution-specific architecture and document it by means of EA models, if necessary.

The project team should generally have a solid understanding of the following three aspects:

Project role. How does the project fit into the overall strategy? How does it contribute to the target architecture's realisation?
EA integration. What EA layers are affected by the project? What are the adjacent architectural components? What interfaces are needed to these components?
Relevant principles and standards. What architecture principles and standards are relevant for the project?

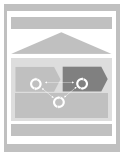
This knowledge will not only allow for the development of a sound and compliant solution architecture, it will also help the team understand its role in the strategy realisation process. This may contribute to team motivation and alignment.

EA-specific project staffing

In any firm, the EA experts' capacity is generally very limited. The challenge is to assign architects to those projects that they will impact most. The following criteria may play a role in assigning enterprise architects to projects:

There are several reasons for assigning architects to projects

Project type. Strategic architecture projects will always require participation of architects in the project team, whereas projects which are carried out to solve one or more specified business problem(s) may not always need participation of an architect.
Architectural complexity. Some projects are architecturally particularly complex, because they involve numerous layers, require many interfaces to adjacent EA components, or involve new design patterns or EA principles. In such cases, experienced archi-



tects can mitigate the risk of project failure and ensure compliance with the target architecture.

Limited competencies. In some cases, the project team might have limited architectural competencies. Furthermore, the team members might lack the knowledge and experience to apply architecture principles and guidelines. In such cases, an enterprise architect can complement a team's skills portfolio.

Quick wins and architectural impact. Sometimes, a project can be an extraordinary architectural success with very little effort. An enterprise architect may prove very useful to achieve such quick wins.

Strategic relevance. Projects with a significant strategic impact might be preferred when it comes to architectural support, because an organisation may want to reduce the risk of failure due to architectural challenges. In such cases, assigning architectural resources might be the result of the project portfolio planning process.

In many organisations, the chief architect and the project sponsor are in charge of assigning enterprise architects to projects. There are two types of assignments: *full membership* in the project team and a weaker, *on-demand consulting* affiliation. Figure 6.2 provides an example of how scarce enterprise architecture resources are allocated to projects.

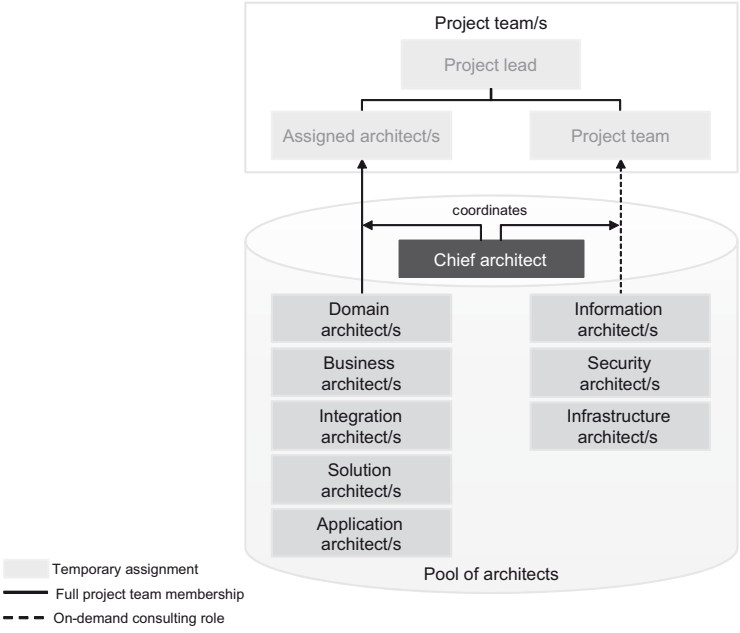
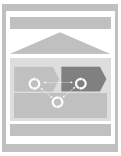


Figure 6.2: Assignment of architectural roles to project teams



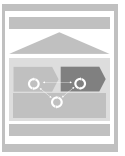
How a large car manufacturer coordinates the assignments of specialised architects to projects:

For each of their business process domains, this firm employs one master architect who oversees software projects. In the early phase of a project, 'he is the single point of contact for the business departments and project managers'. He plans the involvement of the technical competence centres that mostly implement the software and hardware modules. Before he withdraws from a project, he assigns a project architect who focuses on the project's consistence with internal standards, and a technical project leader who coordinates the technical competence centre's involvement. This set-up facilitates the early project phase and allows the master architects to put their project landscape overview to optimal use.

How a European bank manages its portfolio with limited architectural capacity through project prioritisation

This bank has a large portfolio of around 2,000 projects. The EAM team currently comprises eight internal domain architects who each oversees and optimises about 30 applications. Consequently, managing the available architects' capacity is crucial. Architects with particular knowledge of the required domain design high-level architecture for high-priority projects. They also put together the appropriate implementation teams and decide how to use architecture-conformant technologies. On the other hand, domain architects do not strongly influence low-priority projects.

6.3 Solution design and implementation: Keeping the car on the road



Sudden course corrections can be dangerous

A typical problem in the solution design and implementation phases is that projects face obstacles; these require actions that might take the project off the initial course. Common obstacles in EA realisation projects include sudden changes in the requirements, unplanned budget adjustments, time constraints and problems with the solution's realisation. In software development, for example, developers usually identify many ways to solve a single problem, such as using different technologies, programming languages, paradigms, algorithms, and so on. Although this might be an advantage, it also means that these projects can easily veer off the track. Therefore, organisations need a 'guard rail', which EAM practices can provide:

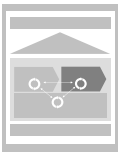
EA reviews help with gaining an understanding of where the project stands in terms of the architecture. Architecture teams carry out reviews every few weeks or months.
Escalation processes allow for controlled deviation from architectural standards and principles.
Progress reporting allows control of the target architecture realisation status. The project manager prepares progress reports every few weeks and makes these available to the enterprise architects and the project steering committee.
Tools help streamline these activities.

Before we discuss these four EAM practices, you need to understand the nature of the architectural work in projects.

The nature of architectural work in projects

A solution requires an architectural fit

During the solution design and implementation, you will deal with architecture projects and projects that address specific business requirement(s). While the former derive from the EA strategy and should thus require less attention concerning their general fit, business-driven projects must often first prove their architectural fit. This means that the project team should elaborate a particular solution architecture that:



fits into the overall present architecture and target architecture, is composed of standard EA components (as far as possible), and adheres to the organisation's architecture principles.

Project teams should assess these criteria with regard to each EA layer.

How the EA strategy finds its way into the projects

We will now describe how the EA strategy is aligned with the projects in the course of the solution design and implementation process (see Figure 6.3): (1) Depending on their type, projects are derived from the EA strategy and the target EA (architecture projects), or they simply result from a business requirement (business-driven projects). (2) In both cases, the enterprise architects should check whether or not the project and the resulting solution comply with EA standards and principles. (3) Beyond this, they need to evaluate whether or not the solution can be integrated and operated once it has been deployed. For these purposes, enterprise architects assess architectural documents, such as functional or technical specifications. (4) During the implementation phase, architects should also ensure that the solution developed is in line with the original project objectives, the detailed specifications and the anticipated solution benefits. (5) Finally, the solution is created and the present EA is further developed in line with the target architecture.

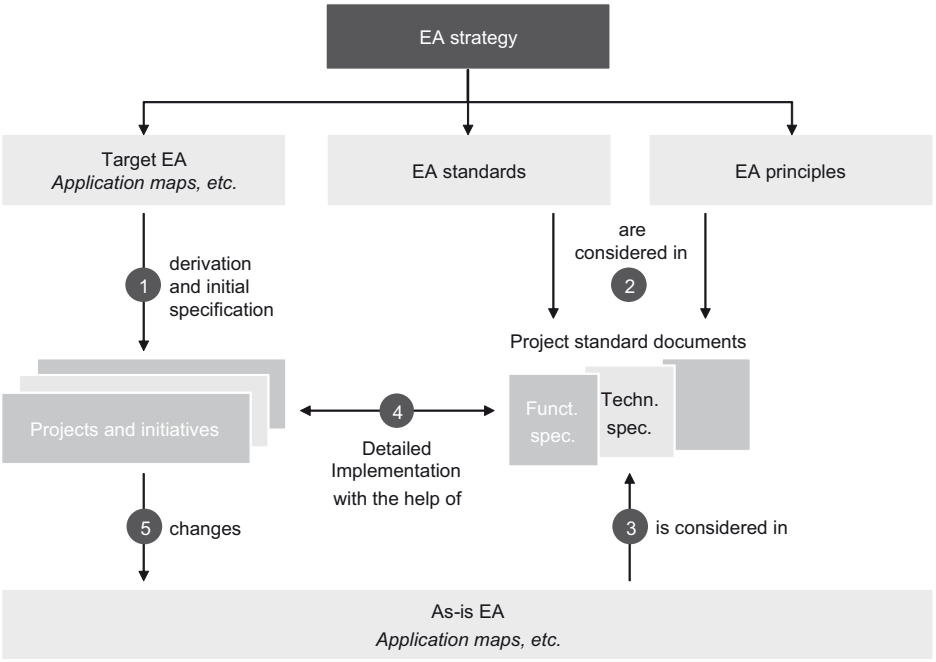
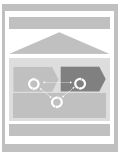


Figure 6.3: How the EAM specifications influence projects

How a professional service firm detects architectural problems resulting from solution designs

The extension of a corporate web portal at a professional service firm included the development and implementation of a travel expense accounting module. On the application layer, this project showed no integration problems, as the data exchange with other databases and the required technical interfaces were straightforward. However, on the business process level, an evaluation showed that the new web portal implicitly created a business process with 24/7 availability, while the accounting module had limited availability requirements. The project thus had to deal with the misalignment of the business processes, as well as with accountability issues.



EA reviews

EA reviews are a means to regularly assess the solution's architectural quality and EA compliance during project execution. The reviews are usually carried out when project milestones are reached or particular project phases are completed, and the project team has finalised the (intermediate) project results, such as specifications, architectural designs and prototypes. During an EA review, a team of architecture experts (in most cases, internal enterprise architects, but sometimes also external service providers) assesses the solution's architecture with regard to its compliance with standards and principles, as well as its compatibility with the present EA and the target EA. Table 6.1 presents typical EA reviews along a project's life cycle.

Reviews along the project life cycle

Some EA reviews may already be undertaken during the strategic planning phase, while others are subject to operation and monitoring processes after the project execution. As a result of reviews, architecture governance activities are more proactive – from their concept through to the design –, with the EA team providing planned architectures, standards, guidelines and consulting input to shape and guide the solutions being developed. During the solution implementation stage, EA involvement becomes more reactive to changes. It evaluates potential changes' architecture impacts, as well as ensures that there are no deviations from the approved architecture direction. For this reason, it is necessary to ensure that there is an architectural 'hook' in the change control process, such as a project steering committee to approve important decisions and review the achievement of milestones. Figure 6.4 presents a process model of how projects are steered from an EAM perspective, illustrating how the EA-relevant reviews fit into a project life cycle and what the integration into EA

The EA involvement changes during a project's life cycle

governance boards (see Chapter 4) might look like. Other approaches to project control are, of course, also possible. Agile methodologies specifically allow for a similar control level when properly applied, and are also more lightweight [4], [5].

Table 6.1: Generic approach for assessing projects from an EAM perspective

EA review	What is the goal of the review?	What is reviewed?
1. Project charter review *Does the project align with the EA strategy?*	Preventing projects that generally violate the EA strategy.	The project charter created when a project is conceived or proposed.
2. Feasibility study *Is the project feasible in terms of architecture?*	Identifying hidden conflicts that compromise feasibility.	The project charter and the content of a feasibility study or proof of concept conducted by a temporary team before approval; particularly relevant to large, strategic projects.
3. Review of the initial concept *Does the initial solution architecture fit with the EA strategy?*	Ensuring that EA goals and EA strategy are considered when approving the project proposal.	The initial solution concept, and specifically its architectural aspects, prepared for final approval in the project portfolio management process.
4. Design review(s) *Does the (detailed) design fit with the EA strategy, EA standards and EA principles?*	Designing the best solution *within the boundaries* of the EA specifications. Accelerating the project in the long term through fewer corrections in the implementation phase.	The *conceptual* solution during a project's design phase; the choice from solution alternatives should receive special attention.
5. Implementation review(s) *Is the solution evolving as planned and in conformance with the EA strategy?*	Ensuring that decisions during implementation do not change the emerging solution in ways that violate the design review agreements. Ensuring sufficient EA documentation during the project.	The evolving solution during a project's implementation phase; the project documents should receive attention, particularly changes to initial specifications.
6. Review of the final solution and roll-out plans *Are there any concerns about the final solution from an EA perspective?*	Ensuring *final approval* by the overall solution's architect; ensuring that there is no conflict with integration into the EA.	The final solution and the roll-out plans.

Table 6.1: *continues*

7. Project review *What can we learn from this project for our EAM programme?*	Reviewing the project ex post to determine the EA methodology's acceptance, as well as the EAM-related processes and communication's shortcomings.	The project, 3 to 6 months after the roll-out as documented in the project plans and related material, including meeting and process protocols.
8. Benefits review *Have the EA goals been met?*	Reviewing the solution ex post to evaluate the impact from an architectural perspective.	The project's impact, following a pre-defined benefit realisation plan. Particularly relevant to large strategic projects; the EA review may be undertaken as part of the general business case review, focusing on the successful integration and adaptation of the solution in the EA.

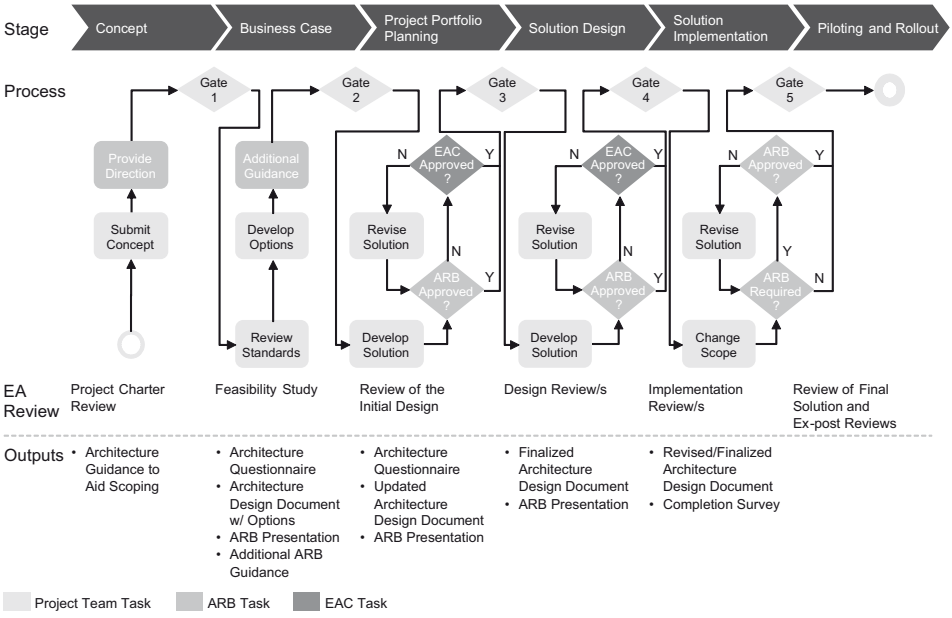
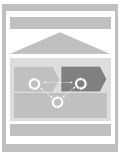


Figure 6.4: Integration of EA reviews in the project life cycle



How a logistics company applies an EA review methodology to control its implementation projects

This company uses domain-specific project boards to conduct reviews at defined quality gates throughout a project's life cycle. Projects are assigned to a domain-specific review board, depending on the domain in which the solution's primary usage unfolds. The following stakeholders usually participate in meetings: the business (i.e. the project sponsor), the development team, IT operations and the architecture team.

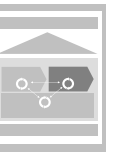
(1) At the start of each project, the team develops the detailed design concept, which includes the business case and an implementation concept, as well as the migration, integration, and architectural information. During the concept's review from an architectural perspective, business and data architects analyse the interfaces, data storage aspects and data consistency.
(2) After approval of the detailed design, the project stakeholders identify, evaluate and select different technical solution alternatives. The designers and architects discuss the solution alternatives with the project team. The architects provide the project team with architecture information. Later, the designers and architects review the resulting architecture descriptions in order to ensure architecture consistency. In this phase, the architects and project members discuss whether the architecture standards can be kept, or whether there are good reasons for making exceptions. If necessary, the review boards resolve these conflicts. At a second gate, the selected solution alternative is then reviewed from an architectural perspective. Unresolved architectural conflicts may lead to the project's termination.
(3) While there are no EA reviews during the implementation, the architects attend the testing phase prior to a solution's roll-out. They assess the implemented solution and the roll-out time plan. The architects ensure that the project's migration plan fits in with other projects.
(4) The architects further support the project review for three months after the roll-out. They help to compare the actual operating costs to the planned costs, and use this as feedback to further improve the architectural practices.

Escalation handling

Escalation mechanisms should solve conflicts, not intensify them

What happens if, during a review, an enterprise architect is of the opinion that a solution design decision conflicts with the EA standards or EA principles? Usually, the architect seeks to successfully explain the problem and to convince the project manager of an alternative design. However, if the project manager insists on the chosen design, an escalation may be necessary. The escalation procedure (as presented in Figure 6.4) should first appeal to the architecture

review board (ARB) and then, if a final decision cannot be reached, to the enterprise architecture council (EAC). Chapter 4 provides more information on these organisational components.



Exceptions are acceptable if they are well justified

Escalation does not necessarily mean that enterprise architects will succeed in having their solution design accepted. In many cases, project sponsors favour the project team because project results are needed swiftly, or because the cost pressure is high.

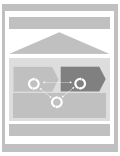
In such cases, project managers can also be tasked with developing a plan for transforming an exceptional solution into an architecture-compliant solution within a given timeframe.

EA implementation progress reporting

EAM can extend the existing project reporting

While project reporting is important for project management and to steer the project portfolio, EAM should extend the reporting processes to document the EA implementation progress. Based on the EA models and documentation, enterprise architects can define the metrics that capture the solution design's quality and progress, as well as the implementation from an EAM perspective. For more information on EA reporting and EA key performance indicators (KPI), please refer to Chapter 7.

6.4 Piloting and roll-out: Closing the implementation



How EA documentation can help

In the piloting and roll-out phase, the solution is tested in practice for the first time (piloting). Subsequently, it is made available to the entire organisation (roll-out). Depending on the EA archetype (see Chapter 4), EA information can be an important input for the different piloting and roll-out approaches:

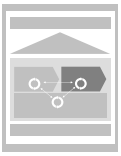
Select the best suitable units for pilot tests

Model-driven EAM. Architects use the EA repository to obtain an overview of the affected business processes, their applications systems' usage, the involved persons, follow-up processes, and so on. They can thus identify organisational units that have an immediate need for the solution, or have particularly good knowledge of the process or system being changed. Such units should conduct pilot tests.

Strategic applications and vendors EAM. The centralised governance structure (which can be introduced with EAM) controls the piloting and the roll-out (see example below).

Architecture paradigm EAM. The roll-out should fit the chosen paradigm. A SOA approach, for example, implicitly supports the provision of reusable services with its middleware-oriented concept. Instead of physical or technical distribution, the difficulty often lies in sufficient communication to ensure that the new solution is used.

Governance EAM. In organisations characterised by this archetype, EA repositories provide important information for roll-outs, similar to the model-driven approach. However, organisations that choose the governance-oriented approach usually have a more complex EA and political situation within their company or corporate group. The focus therefore should be on clearly defined rules and decision rights for pilot tests and roll-outs.



How a food and health company organises piloting and roll-out

In a food and health firm, the architectural group identifies the most suitable or best-in-class markets for the new solution. In these markets, the firm conducts pilot tests within each of the three major geographical regions in which it operates. Business experts usually test the solution and proofread the documentation; with regard to process advancements, these experts improve the mapping of existing processes to the new best practices. The goal is to provide a solution package that is easy to apply. In major projects, there is a sign-off workshop during which all participating markets sign off the new solution on behalf of the rest of the company. Key participants in these workshops are the three pilot organisations, the business domain heads, architects and project members.

The roll-out usually happens as part of an integrated plan that shows all of the domain's deployment projects and helps coordinate the roll-out; it plans all resources needed within a one-year scope. The roll-out is then tracked on the regional level and reported to the central architectural organisation.

Updating the EA information – A "must" in the closing phase

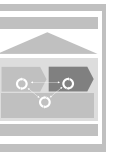
Implementation projects are a step towards the target architecture. As such, they alter the as-is architecture - often in many layers and in various domains. These changes need to be recorded so that the organisation can continue working with up-to-date EA information.

It is unlikely that the project team will do all its modelling and designing solely with EA tools

The best way to keep EA information current is by letting the project team work with the EA repository so that any project-related modelling and design activities automatically lead to updated EA models. However, in many cases project teams operate on a different level of abstraction and have very specific tool requirements that make it hard, or even impossible, to apply the EA toolset. For example, as part of a software project, requirements engineering requires far more detailed models and information about a solution than enterprise architects usually need. It is therefore not surprising that many organisations face the challenge of persuading project teams to update EA information after the solution has been developed and deployed. From our case research, we have learned the following:

It is advisable to connect EA documentation duties to milestone or gate approval processes so that the project team is forced to update the EA repository before it can proceed with the project.

The burden of updating the EA repository can be reduced if the information required is collected and captured step by step



throughout the project life cycle. Very basic information on the solution can already be entered right at the beginning of a project, whereas information that relates to the operation of a solution may only be available after the final roll-out.

Organisations with a low EAM maturity may support project teams by providing assistance when it comes to working with the EA repository. EA tools are often not very intuitive or user-friendly, and if support is provided, this can overcome resistance.

6.5 Management implications

Organisations require a certain EAM maturity and a powerful EAM team to make their project lifecycle architecture-aware

In organisations with a low degree of *EAM awareness and maturity*, it will be difficult to simultaneously implement all the EAM practices described in this chapter. In such cases, it is more promising to follow a step-by-step approach in order to make the project life cycle architecture-aware. A second contextual factor is the *organisational power of an EAM programme*, which determines the extent to which you can implement EA realisation practices (in terms of their reach). Depending on these two factors, we distinguish three basic modes of incorporating EAM into project processes (Figure 6.5):

Advising – a more passive role for architects, due to their relatively low decision power in projects,
participating – a more active role for architects, due to strong management support, and
managing – the alignment of the project portfolio (management) with the EA (management).

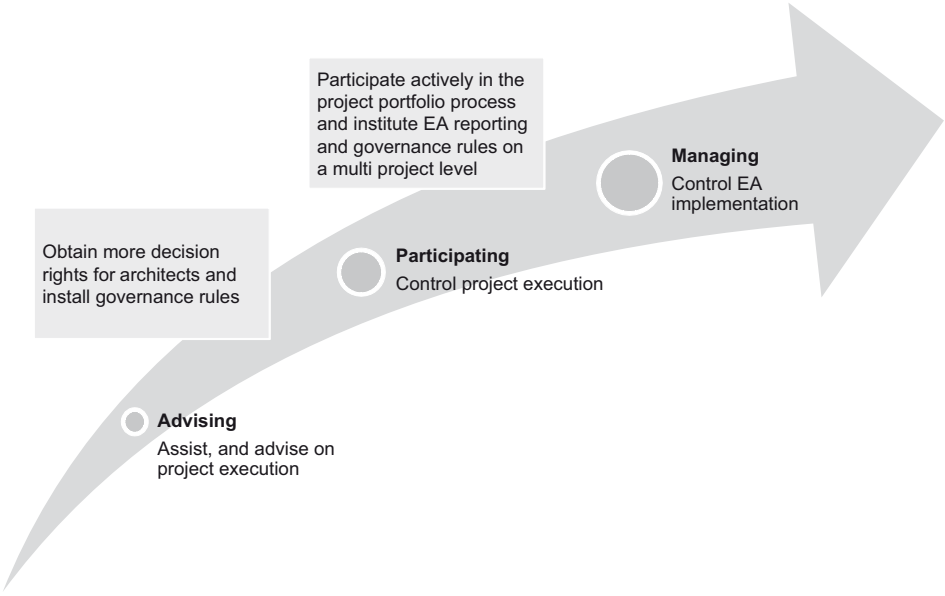


Figure 6.5: How to increase architecture awareness in project practices

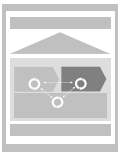


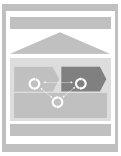
Table 6.2 describes these three modes of incorporating EAM into the project lifecycle. Each of these three modes has specific advantages and shortcomings, which makes it suitable for specific situations. Although 'managing' seems the most mature stage, some organisations may choose to refrain from implementing this stage for cultural reasons, as this mode might impose many constraints on project teams.

Table 6.2: Three modes of EA realisation in the project lifecycle

Mode	Common EA practices	Benefits / Shortcomings	Recommended focus of EAM programme
Advising: assist with, and advise on project execution	Single projects are accompanied and monitored by architects. Architects advise project members, but have no right to suspend project execution. Architects provide projects with information by means of EA documentation.	Projects recognise and consider EA standards and documentation. Deviations from EA standards and specifications become visible. Project managers can push through non-EA-conformant solutions.	Provide consistent, up-to-date EA information. Advise on projects regarding architectural decisions. Initiate a cultural change. Communicate success stories and the advantages of using EA documentation and EA specifications.
Participating: control project execution	Architects can influence project execution. Enterprise architects have veto rights regarding violation of EA standards and principles. Escalation routines for EA conflicts are in place. Project reporting processes include EA information.	Projects follow EA standards and specifications. Higher management is aware of problematic issues that can be incorporated into the next EA strategy definition. No EA implementation monitoring across projects. No transparency about the EA progress and development.	Strive for constructive results and minimise natural resistances. Implement and communicate governance rules that define the architects' work on projects, for example, how architects use their veto rights to activate the ARB (see Figure 6.4).

Table 6.2: *continues*

Managing: control EA implementation	Architecture as a whole is monitored regarding the transition process and the planned architecture. EA-related project goals are defined. The KPI system is in place. EA reporting processes are in place.	Transparency regarding a project’s contribution to the EA strategy. Transparency and control regarding the EA realisation progress. Automated reporting of aggregated KPIs.	Implement clear routines that help to achieve the planned EA. Compare the present EA with the planned EA and track the progress. Facilitate domain-specific exchange between architects. Launch dedicated architecture initiative and projects.
		Reduced local flexibility to implement adequate solutions. Increased administrative and governance efforts.	



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Embedding EAM into operation and monitoring

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F. Ahlemann et al. (eds.), *Strategic Enterprise Architecture Management: Challenges, Best Practices, and Future Developments*, Management for Professionals, DOI 10.1007/978-3-642-24223-6_7,

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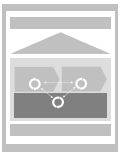
Management summary

Strategic initiatives and projects are carefully planned and systematically develop an enterprise architecture (EA), but many smaller changes occur daily. If not properly managed, these operational changes might cause an organisation to lose control of and deviate from its target enterprise architecture roadmap. However, given the number of changes and their urgency, making changes requires efficient and lean EAM practices that do not delay business operations.

In this chapter, we outline three fields of action related to EA operations and monitoring. Firstly, pragmatic procedures must be established to manage operational changes and their architecture impact. Here, EAM practices help identify and keep track of operational changes that cause critical changes in the enterprise architecture. Secondly, monitoring systems and KPI (key performance indicator) reporting are a prerequisite for assessing the EA's current status and ascertain whether its development is in line with the architecture vision and roadmaps. Ideally, EAM teams define metrics and put procedures in place to track them effectively from the beginning. A comprehensive EAM cockpit covers three complementary aspects: EA impact in business terms, EA's current status and EAM adoption in the organisation. Thirdly, we bring to light additional beneficial uses of enterprise architecture documentation that support the organisation to understand and track complex organisational dependencies. This particularly applies to the areas of compliance, risks and business continuity management.

7.1 How to run the EA: The challenges in daily business



The myth of the stable EA target state

Small changes continually transform the current enterprise architecture

Among an enterprise architect's (EA's) most frustrating experiences is that the architecture constantly changes, even once a desired target state has been reached. Usually unforeseen by EA strategy planning and implementation, individual architecture components change slightly every day. These changes tend to happen almost unnoticed. For example, sudden organisational responsibility reassignments or small business process adaptations might occur, or a bug might need to be fixed urgently in a core information system. Such changes are mostly driven by operational requirements and can be neither suppressed – due to their urgency –, nor become fully aligned with the enterprise architecture strategy – due to the effort required to align them, their perceived lack of strategic importance, or because the architects simply do not notice them.

In total, these permanent changes might significantly affect the EA as a whole. In fact, companies often report a strong correlation between such changes' realisation and support incidents, due to the lack of coordination between and changes' unintended side effects. Therefore, if these changes are not managed properly, organisations do not only face operational problems. They also risk the current architecture's gradual divergence from its proposed trajectory towards the target architecture. At the same time, the frequency and focus areas of these changes may call for a strategic reflection on systematic problems with the as-is EA. They may also question the defined enterprise architecture principles.

Organisations need to prepare for EA operation and monitoring

As enterprise architecture management (EAM) is intended to be more than a once-off effort, it is vital to prepare for EA operation and monitoring. This chapter deals with how you run the enterprise architecture in a typical business setting. It focuses on operation and monitoring, which complement strategic planning (see Chapter 5) and the project life cycle (see Chapter 6). The main steps in operations and monitoring are (also see Figure 7.1):

1. Collecting demands and requests for change,
2. assessing the changes,
3. implementing the changes, and
4. monitoring the EA.

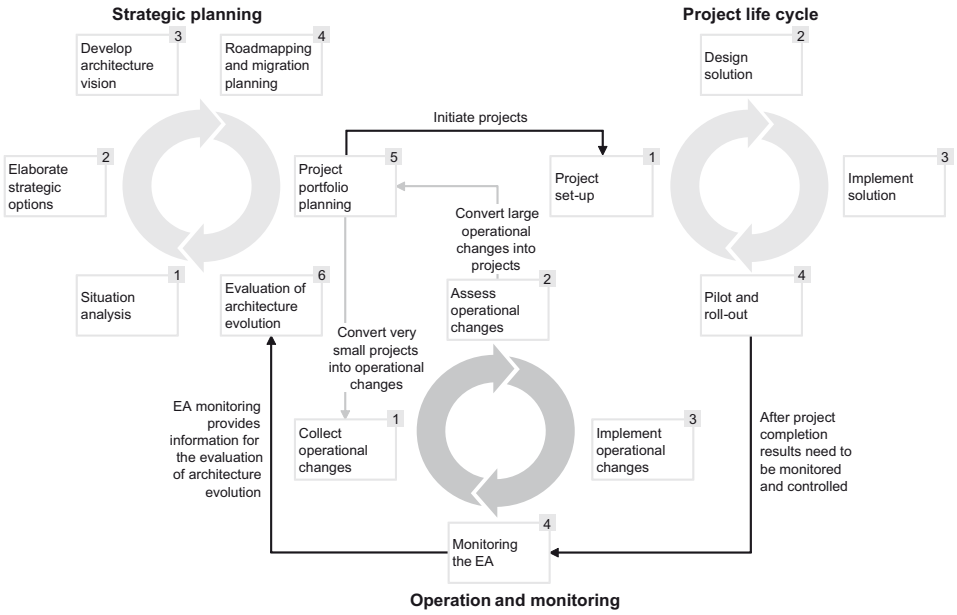


Figure 7.1: EAM process cycles

The operational control cycle and how it differs from strategic planning and the project life cycle

Contrary to strategic changes, operational changes occur in large numbers

Whereas strategic changes are carefully planned and have a long-term to mid-term horizon, the operational control cycle comprises the frequent (planned and unplanned) changes, which typically have a shorter time horizon and a local scope. Table 7.1 compares strategic and operational changes with regard to their size and impact on the EA. Many EA practices, such as comprehensive EA analysis and the design of a target state, migration planning and project reviews, which are applied during strategy development and realisation, are resource-intensive. They are not well suited for managing operational changes. The operational cycle needs pragmatic and 'slim' EA practices to cope with the daily changes triggered by problems, incidents, change and service requests, as well as to solve them within a short time frame.

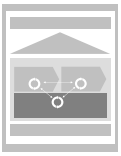
Table 7.1: Differences between strategic and operational changes

Change dimensions	**Strategic changes**	**Operational changes**
EAM process cycle	Strategy planning and project life cycle (Chapters 5 and 6)	Operational control cycle (Chapter 7)
Time horizon	Long term or mid term	Short term
Focus	Realisation of business benefits and performance improvements	(Operational) excellence, stability, risk management
Size of changes and EA relevance	Major (strategic) changes with high EA relevance (global scope)	Many small changes, triggered by problems, change or service requests, with relatively little or no EA relevance (local scope)
Organisational set-up	Projects or programmes	Defined processes to monitor operations and respond to incidents, problems, change and service requests
Realisation effort	Medium to high	Low to medium
Duration of realisation	Months to years	Days to months
Frequency	Tens to hundreds of projects per year	Thousands to tens of thousands of changes per year
Monitoring and control	Integrated with existing budget, portfolio, programme or project reporting	Part of existing KPI systems, such as business process or SLA monitoring and incident reporting.
Risk	Size and impact of changes on the organisation	Number of changes and unintended side-effects, management of interdependencies

The questions that we address in this chapter include:

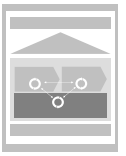
How should operational changes be managed? If the organisation doesn't track tactical and operational changes systematically and consider their impact on architecture, it will deviate from the EA roadmap.

How should the enterprise architecture be monitored? If monitoring is not undertaken, little can be said about the EA's development or current state, and whether these (still) fit the architecture vision and principles. Furthermore, monitoring also provides an important feedback loop to identify systematic EA-related issues and to initiate architecture initiatives.



Which further beneficial purposes can EA documentation be used for? Once EA documentation is available, there are many ways to leverage this information base in order to facilitate decision-making and to support the business and IT functions.

7.2 Managing operational changes



Why even small changes are relevant in EAM

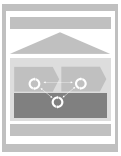
Each operational change alters the EA slightly. But are all the changes relevant for the architecture?

Organisations must constantly respond to unanticipated incidents, and requirements that change their existing EA. Such changes help maintain operational excellence, for example, where business processes are adapted, or system functionality is extended to create management reports or grant new user group's access rights. Operational changes are also required to minimise business risks, for example, when implementing security patches or upgrades. Most of the changes have a defined, relatively local scope. However, the major challenge is that these changes occur in locations all over the organisation, in relatively large numbers and cannot be anticipated.

Why should EAM processes take these operational changes into consideration? Although each operational change changes the EA slightly, its side-effects and implications are often underestimated. In addition, employees who decide on and implement changes are often unaware of potential conflicts with EA targets and their implications. They are not up to date on EAM in general, nor are they trained to analyse how changes affect the EA. In the following examples, we further outline the relevance and consequences for EAM.

Changes to a bill of material data base at a large automotive manufacturer

This large automotive manufacturer is reliant on the information stored in a central bill of materials data base. Over time, many applications interfaced with the bill of material system. The interfaces were usually implemented as hardwired data base requests in the application's source code. At a maintenance life cycle's end, the IT organisation decided to migrate the bill of material system to the latest data base technology. During migration, the data base was reorganised without taking the interfacing applications into consideration. The change resulted in several applications' malfunction. These had to be fixed in time-consuming and costly follow-up initiatives. Finally, an architecture team collected the dependencies between the data base and the interfacing applications in the form of context diagrams and information exchange models. The application staff and project managers improved this EA documentation during a long reconciliation phase. Today, information about the interfaces between applications is stored in a central EA repository and is always consulted before changes are made.



Assessment of local changes to a global IS platform at a large nutrition company

This large nutrition company decided to use SAP as its global IS platform, with the goal of establishing standardised best practices across the different local organisations. A standardised SAP template allowed the company to leverage centralised procurement. It could also conduct aggregated negotiations that improved large-scale deals with suppliers. However, local markets' requirements, such as their tax rates and tariffs, which had previously led to individual IS/IT developments, were a source of problems for the global platform. When implementing business-driven change requests that the local market organisations required (e.g., for financial reports), it was difficult to align the local adaptations and determine their side-effects on the other organisations. In addition, no governance process or EA assessment criteria were in place, which threatened the global template's consistency due to the local adaptations.

Currently, when a local business requirement or change request emerges, a local business excellence (BE) group assesses the requests on the basis of EA guidelines. Such requests are then directly mapped with the EA roadmap for the corporate SAP template. Simultaneously, the different local BE groups collaborate closely with the technical template team, which transfers and implements the local requirements that a BE group has defined to a usable global solution. The nutrition company can therefore be sure that its local organisations simultaneously improve the best practices implemented in the system and adhere to the current global template.

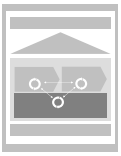
Managing operational changes to the enterprise architecture

Changes should be atomic, consistent, isolated and durable

As these examples illustrate, operational changes must be coordinated and controlled to avoid unforeseen side-effects or a complete deviation from the EA roadmap. This implies that changes fulfil the so-called ACID (atomic, consistent, isolated and durable) requirements [4]:

Atomic means either the change is successfully conducted or rolled back completely.
Consistent implies that the suggested solution for implementing the change integrates seamlessly – and without unexpected effects – with the environment.
Isolated means that the change does not affect other EA changes or components besides those that form part of the suggested solution.
Durable indicates that the change implementation is complete, stable, permanent and documented.

EAM practices support the ACID characteristics in several ways: Ideally, EA analysis techniques help check and approve the consistency and isolation requirements. If the EA documentation is updated after implementation, it contributes to atomic and durable changes.



Most companies have established standardized procedures which facilitate efficient and prompt handling of changes and minimize the impact of change-related issues. Typically, these procedures build on data from a configuration database. To identify the small number of changes that conflict with EA targets or have a major impact on them, these procedures need to integrate specific EAM practices. The goal is to establish pragmatic processes to assess changes that have a significant architecture impact, without slowing down the organisation. Given that most employees outside the architecture teams do not grasp the EA implications of operational changes, a key prerequisite is to create EA awareness and improve EA thinking in the IT operations teams.

Pragmatic procedures should identify the changes that affect the EA

In Figure 7.2, we depict an extended change management process, based on the process suggested by the IT Infrastructure Library (ITIL) [3]. This process complements the change process with additional tasks to analyse the architectural relevance and EA impact of

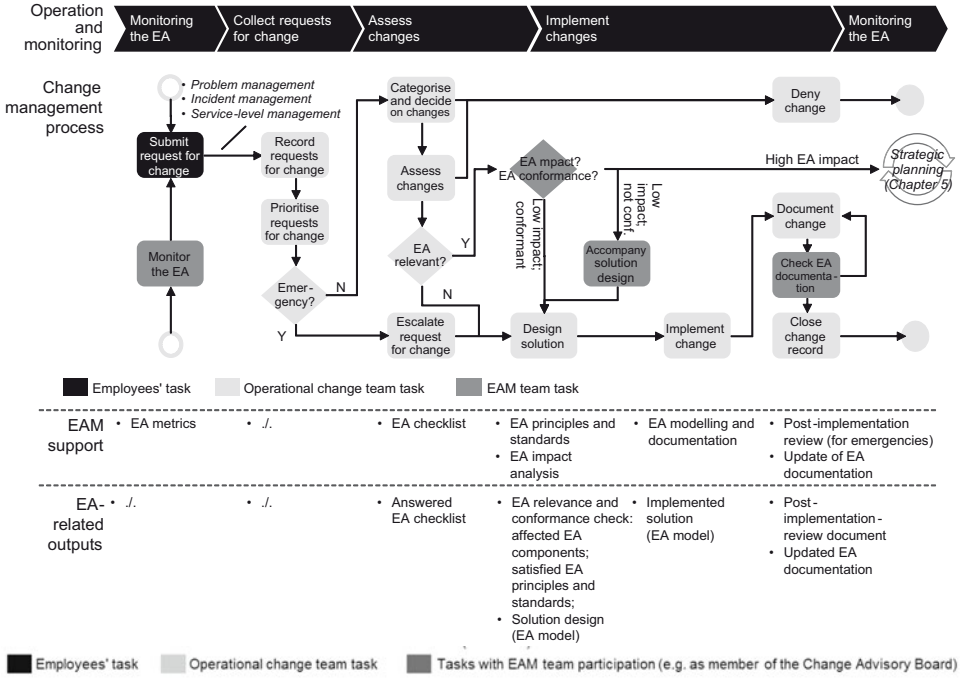
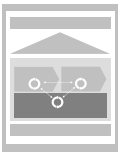


Figure 7.2: Change management process with integrated EAM support and tasks



the requested changes, to verify conformance with EA principles and standards, as well as to complement EA documentation after implementation. Some of these tasks need direct participation of the EAM function. For this purpose, enterprise architects should be member of the Change Advisory Board (CAB) which assists in the assessment, prioritization and scheduling of high-impact changes.

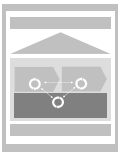
Collect changes

Systematically collect and record requests for change from different sources

Following the IT service management literature [4, 5, 6], different parties, including users and IT operations staff, request changes with different granularity levels and scopes. Firstly, to properly collect and identify such requests, organisations should identify and group the requesting parties, and identify their concerns. Next, organisations should determine the recipients (e.g., service desk) for each

Table 7.2: Typology of requested operational changes

Type	**Service request**	**Incident**	**Problem**	**Other change requests**
Scope	A regular request comprising predefined modification requirements of an existing (IT) service or functionality	An irregular (regarding occurrence) request to recover an existing (IT) service or functionality, due to an unplanned interruption or quality reduction	A request to recover an existing (IT) service or functionality, due to recurring incidents	A request to alter or enhance an existing EA component or functionality that goes beyond a predefined configuration scope
Example	A new user account, a change in the times support is available, installation of new software on new desktop PC	Recovery of an application or of an existing IT service, for example, due to network outages or application errors	Correcting persistent information processing failures of a single EA component	A user interface changes, new functionality, more load capacity
Requestor	Users	User	Operations or EAM team	Business units or functional management
Recipient	Service desk, those responsible for application	Service desk or those responsible for application	Operations or EAM team, those responsible for application	Business analyst or key user
EA relevance	No EA relevance in general, due to predefined modification scope	Must be evaluated ex post due to time criticality	Must be evaluated ex ante	Must be evaluated ex ante



group and the procedures for handling such requests. In Table 7.2, we distinguish between different request types for operational changes on the basis of their requestors, recipients and scope. Experience shows that defining request types and focusing on interfaces between the requestors and recipients help to produce a shared understanding in organisations and to implement a distributed but mutual change management process.

Some requests for change, such as incidents, are business-critical and require immediate recovery. In these cases, the follow-up process always focuses on recovery first, without any further prior EA assessment, whereas all other change types are categorised and assessed by means of standardised and formal procedures. However, organisations must take care to evaluate and document an incident, as well as any escalated change,– ex post to guarantee architecture consistency.

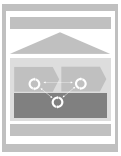
Assess changes

Assess changes to identify the small number of changes that are architecturally relevant

We estimate that only about 1-10% of all operational changes ever affect the EA and should therefore be considered architecturally relevant. An EA-relevant change either has a significant impact on an EA component by modifying its characteristics, or entails significant side-effects in other EA components. In order to ensure the efficient and prompt handling of changes, organisations need a set of decision criteria to determine whether or not a change is architecturally relevant. The check-list in Table 7.3 contains decision criteria that identify EA-relevant changes.

Table 7.3: Check-list to identify architectural relevance of operational changes

Changes are architecturally relevant if they…
alter business-critical EA components (e.g., a product or service offering, key customers, distribution channels, core business processes or applications),
impact (existing) interfaces (e.g., logically or technologically) between different EA components (e.g., two applications),
bear high risks (e.g., high costs, volatile requirements or doubtful investments) and ***impact the business continuity,***
change the main IS/IT security features (e.g., communication with external parties),
impact external factors or ***resources*** (e.g., supplier structure changes), and
violate regulatory guidelines (e.g., Basel II, SOX, KonTraG, compulsory archiving or FDA),
company standards, and ***working models*** (e.g., violation of or non-conformance with architecture principles and standards)



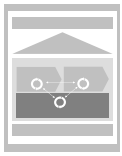
The example in Table 7.4 applies the criteria to potential master data changes. As shown in example 1, a new master data attribute for an instant messaging address is not considered architecturally relevant by five of six criteria, with the exception of '*interface dependence*', which must be checked further. This implies that, with support of EA documentation, the organisation must evaluate whether other applications besides the CRM system will use the new master data attribute and whether interfaces need to be adapted. If so, the change is classified as EA-relevant. Otherwise, implementation can proceed according to existing change management processes.

Table 7.4: Examples of EA relevance of different master data changes

Change example	Business criticality	Interface dependence	Business continuity	Security	External factors	Compliance
1. Introduction of a new master data attribute: In a customer data base, the client's data set should be enhanced with an instant messaging address attribute that can be used in the CRM system.	✗	?	✗	✗	✗	✗
2. Change in an existing master data attribute: The account numbers are changed from five numeric digits to seven alphanumeric digits.	✗	✔	?	✗	✗	?
3. Technology upgrade of a master data base: The customer data base is upgraded from Oracle Version 9i to Version 10g.	✗	✗	✗	✔	✗	✗

Check the impact on EA and all the side-effects of architecturally relevant changes

To change an existing master data attribute (as shown in example 2 above) and to upgrade the technology platform (as shown in example 3 above), there is at least one EA relevance category labelled '*yes*'. This implies that the change passes through an extended change management process of additional EA checking and analysis. In this case, enterprise architects (1) ensure that the change conforms to the organisation's EA principles and standards, and (2) assess the suggested solution's impact on other EA components. For this purpose, the affected EA components are listed in the change description. Ideally, the recipient (e.g., a service desk employee) has already identified the affected business processes, organisational entities, applications, master data and interfaces when recording the change request in the service desk tool.



To estimate the effect of a change, organisations can apply different EA analysis techniques, notably impact, coverage and dependency analysis. Figure 7.3 contains an example in which we assess the impact of a J2EE platform upgrade on the application, task, process and organisation levels. By means of such EA assessments, organisations can ensure that changes meet the consistency criterion, and are seamlessly integrated without having any unexpected side-effects on the environment. Additionally, these types of EA analyses are the basis for coordinating the planned change with other changes to the same EA components (e.g., configuration items, applications and projects). EAM thereby supports configuration and release management to ensure that the isolation criterion resolves dependencies and to avoid conflicts with other changes and redundancies.

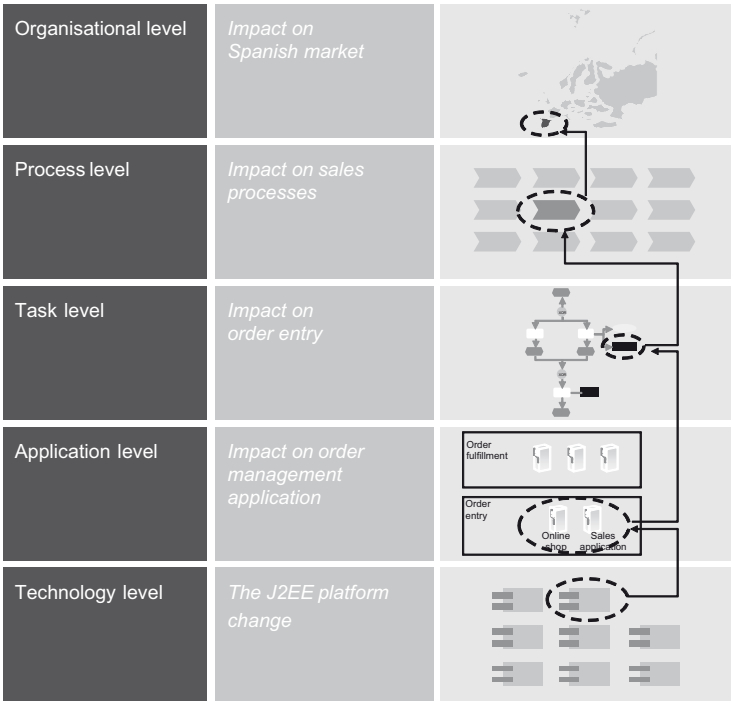


Figure 7.3: Example of an impact analysis

The outcomes of the EA conformance check and the impact assessment determine the subsequent procedure for implementing the change (as depicted in Table 7.5). If the suggested solution is in accordance with existing EA principles and standards and has little impact on other EA components, it can be implemented as planned.

Table 7.5: Outcomes of EA conformance check and consequences

Outcomes of EA conformance check	Outcomes of impact analysis	Consequence	Action
Yes, fulfils existing EA principles and standards	Little impact on other EA components	Solution is EA-conformant; EA will be changed in a controlled and planned scope	Implement suggested solution as planned and update EA documentation
Not in accordance with EA principles and standards	Little impact on other EA components	An alternative solution that fulfils existing EA standards and principles is preferable	Reject change and rework solution
Not in accordance with EA principles and standards	Significant impact on other EA components	Solution significantly alters the EA. It needs further requirements definition and solution design	Integrate change into an initiative or project planned in the strategic EA cycle
Not in accordance with EA principles and standards, but change is imperative or business-critical	Little impact on other EA components	Management decides to escalate change process	Implement escalated solution and update EA documentation

Implement change

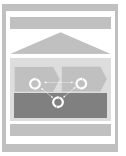
Keep the EA consistent and up to date after implementing a change

The planned changes are swiftly implemented as a durable, high-quality solution. However, a successful change process involves both a working solution and up-to-date documentation. Hence, in respect of all the changes made, organisations must have defined and documented responsibilities and tasks:

Firstly, they must define who will document the changes in the EA repository, where this will be done and in how much detail. Management can react with role descriptions that encompass or enforce documentation tasks, can monitor the documentation quality, and make successful task accomplishment part of employees' compensation schemes.

Secondly, the EAM team must be assigned responsibility to check that the EA documentation in the EA repository is updated before the change is closed.

7.3 Monitoring the EA



EA KPI monitoring is still in its infancy

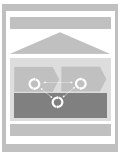
Although the adage 'that which cannot be measured cannot be managed' also refers to EAM, organisations still struggle to define suitable key performance indicators (KPIs) for EA monitoring.

Despite KPI reporting's popularity in the fact-based management approach, our case studies reveal that even EAM forerunners are still at an early stage, either defining EA-related KPIs or running simple EA reports. Simultaneously, many senior managers complain that, notwithstanding their efforts to create EA models, the existing EA documentation does not satisfy information requirements. Accordingly, analysts' studies [1] report that, while many enterprise architects work hard to set up EAM in their organisation, they have a poor record for identifying metrics and tracking them effectively from the beginning. According to the Enterprise Architecture Executive Council [2], of the groups that report on EA:

44% report on the EA environment and activities,
31% report on EA compliance and adoption,
16% report on IT cost savings, but
only 9% report on business value creation.

This underlines that even EA forerunners still fail to demonstrate EA's impact in business terms. Companies face two major EA monitoring challenges: Firstly, they struggle to define appropriate EA metrics, and, secondly, they realise that their information base is not sufficient for the ongoing monitoring of EA-related KPIs.

Currently, IS and IT infrastructure layer monitoring are among the most advanced EA monitoring areas, but are often undertaken by means of fairly simple KPIs. Monitoring is often limited to the number of instances (e.g., applications or hardware components), the incurred costs per instance, or other instance features (e.g., its availability or number of incidents). On the business side, business process owners often capture KPIs for business process efficiency and effectiveness, such as cycle time, customer service level or process costs. However, it is still difficult to display the existing KPIs according to the primary EA components and dimensions, since KPI reporting on the business and IT sides is not linked to the EA documentation. Consequently, creating EA-related KPI reports is a time-consuming manual effort.



In short, the necessary information base is lacking to analyse the multi-level dependencies between EA components, as well as to assess EA's impact on the business or IT performance, as existing KPIs are not tied to the primary EA layers and dimensions.

The EAM cockpit

The EAM cockpit should monitor three complementary aspects: EA impact in business terms, EA status and adoption of EAM

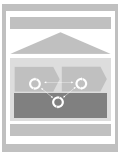
If EA monitoring is taken seriously, companies must create an EAM cockpit that helps track the KPIs related to the most important aspects, as well as the different EA perspectives. As in any KPI system, this cockpit should be multi-dimensional to support the informational requirements of the EA stakeholders, notably the senior management and enterprise architects. We suggest that every EAM cockpit cover three complementary aspects (see Table 7.6):

Firstly, the EAM cockpit must monitor the *EA impact in business terms*, which is the *EA's efficiency and effectiveness at achieving business and IT goals*. As the EA's main purpose is to support the organisation's strategic targets, the cockpit should start by displaying the existing KPI set – as defined by a balanced scorecard or other management reporting system – according to the EA dimensions and layers. For example, business-related KPIs (e.g., customer satisfaction, financial performance or new products' time to market) can be refined and related to EA elements (e.g., key business processes or supporting IT applications). By drilling down these KPIs to the relevant EA components, strengths and weaknesses become visible.

Secondly, the EAM cockpit should track the EA's *current status*, with a specific focus on *EA conformance with defined targets and the enforcement of architecture principles and guidelines.* This provides the basis for measuring progress towards the planned state, but also for escalating non-conformance. For example, the number of instances of a certain EA component (e.g., the number of applications or the number of business process variants) is often a good measure of EA complexity. Architecture principle and guideline enforcement can be measured concurrently by dividing the number of conforming instances by the total number of instances.

Thirdly, the EAM cockpit should also capture *EAM adoption in the organisation* by measuring EAM-related activities and skills. These KPIs provide a backwards glance at the different activities related to EAM implementation, such as the number of projects that used and updated the organisation-wide EA models, the

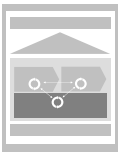
number of employees in EA trainings and the number of applications documented in the EA repository.



As a rule of thumb, EA-related information stored in the EAM tool should link to existing KPI reporting to facilitate the set-up of the EAM cockpit. As a multi-dimensional KPI system, the EAM cockpit complements the firm's existing monitoring systems by providing a holistic and inter-divisional perspective on the EA components.

Table 7.6: Multi-dimensional EAM cockpit

Dimension	KPIs	Stakeholders
EA quality and impact in business terms (efficiency and effectiveness at achieving business and IT goals)	Business KPIs, as defined by the balanced scorecard or other management reporting systems, linked to EA components and layers: **Financial perspective** (e.g., costs, revenues, operating margin). **Customer perspective** (e.g., customer retention rate). **Learning and growth** (e.g., time to market or time to launch new products). **Internal business processes** (e.g., cycle time and service level).	**Senior management** (business units and IT)
EA status (conformance with target architecture and architecture principles)	KPIs that illustrate the EA's purposeful development and its conformance with architecture targets and principles: **Total instances** in respect of the different **EA components.** **Percentage instances** that **conform to the defined architecture standards** (e.g., percentage of data bases using the harmonised customer master data definition; percentage of interfaces that conform to specifications). **Percentage of customisations** and local exceptions (e.g., percentage of local process variants). **The EA component *point costing*** (see EA status example).	**Enterprise architects**
EAM adoption (EAM activities in the organisation)	KPIs that describe the adoption of EA: **Organisational diffusion** of EA knowledge (e.g., number of employees in EA trainings). **Quality of architecture documentation** (e.g., percentage of applications with documentation, age of architecture documentation and documentation filing level per architecture component). **Use of architecture documentation** (e.g., percentage of projects using process models and number of users per model)	**Enterprise architects**



Practical examples

In the next sections, we will describe three practical EA monitoring examples for the three EAM cockpit dimensions. These examples illustrate that EA monitoring improves transparency and generates inter-divisional and multi-level responsibility, whereas responsibilities for traditional KPIs often lie with individual line managers. Thus, EA monitoring links individual management systems to a more comprehensive, multi-dimensional and multi-level enterprise management system.

EA quality and impact: Measuring the application landscape's effectiveness

An application landscape's effectiveness can be assessed with measures of functional and operational readiness

The following example illustrates how a global application landscape's effectiveness can be assessed from both business and IT perspectives. It uses KPIs that characterise this landscape's functional and operational readiness. In Figure 7.4, each row represents an application, and each column a region where the application is used. Functional readiness describes whether the functions required to support a business process are available in the required quality. As a subjective measurement of user satisfaction, functional readiness is captured by means of surveys. In Figure 7.4, we use an ordinal ranking scheme for functional readiness with six entries ranging from (1) very good to (6) not satisfactory. A systematic assessment of all the relevant stakeholders (e.g., business managers and users) and an aggregation of the global and overall average ratings are all taken into account to contribute to a comprehensive picture and to cover different aspects of application quality. The functional assessment is complemented by an operational assessment – in our example, the number of incidents per 1,000 transactions. The assessment uses metrics related to incidents or service requests created automatically from existing information sources, such as the incident management system.

In our practical example, application managers or architects regularly analyse these reports and seek optimisation potentials. Since the report covers the entire application landscape, similar incidents (e.g., problems with Web frontends, which are used by different applications) and common issues in the OEM's order management process can be detected. This demonstrates the advantages of using a consistent EA model to link incident reporting not only to single item in the configuration data base, but also to EA components.

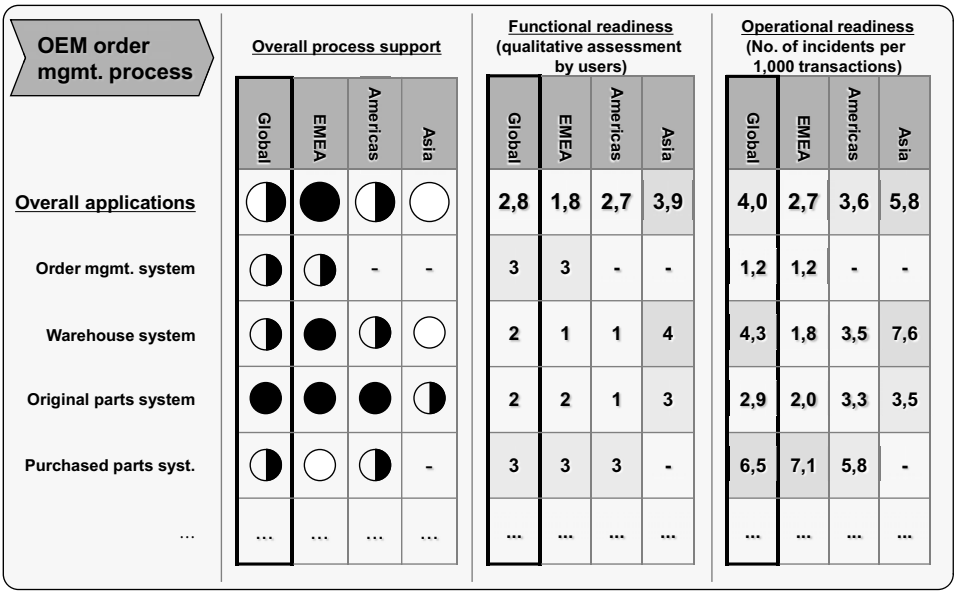
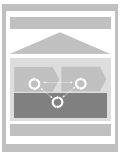


Figure 7.4: Measuring the application landscape's functional and operational readiness

EA status: Measuring EA complexity by means of the point costing concept

The EA component point costing *measures complexity*

Since complexity is an important cost driver, we recommend tracking KPIs that measure EA complexity. Analogous to function point analysis, which is used in software development, organisations can apply the EA component *point costing* to assess their EA's complexity [4]. This concept assesses complexity on the basis of ratings for EA components and characteristics considered to be complexity drivers. For an application, such complexity drivers are an EA component's compliance and security requirements, its business criticality, or multiple dependencies between and interfaces to other EA components. The overall objective is to minimise ratings and, thus, reduce the EA's overall complexity. Table 7.7 shows examples with specific EA component characteristics' weightings. For example, organisations can evaluate their interface's complexity by means of the EA component *point costing* concept, or reduce the number of interfaces based on proprietary technology. If an application's interface rating exceeds 50 points, replacing the direct application-to-application linkages with a service-oriented architecture (SOA), based on an enterprise service bus, might be recommendable. By



means of EA component *point costing*, organisations can quantitatively justify this SOA initiative as a complexity reduction improvement and track its impact on the EA.

The EA component *point costing* requires the definition of EA component characteristics that drive complexity and the estimation of weightings, as suggested in our example. The relevant characteristics and their weightings need to be selected based on the organisation's specific needs and experiences. In addition, EA repositories, or a configuration management data base that encompasses as many EA components and attributes as possible, are further prerequisites to derive reasonable characteristics.

Table 7.7: The EA component *point costing* concept

EA component characteristic	Weighting
Application characteristics	
Core business application (business-critical, extended SLA)	20 points
Supporting business application (not business-critical, standard SLA)	10 points
SOX compliance significance	10 points
Modification of a function (non-upgradeable)	5 points
Interface characteristics	
Point-to-point interface to or from other application (proprietary technology)	10 points
Hub-and-spoke interface to or from other application (proprietary technology)	5 points
Bus interface to or from other application (web service standard)	2 points
…	

EAM adoption: Monitoring architecture documentation

The third example measures EAM adoption in an organisation by assessing architecture documentation. Documented EA models are a prerequisite for applying EA analysis techniques (e.g., impact and dependency analysis) at a later stage. Consequently, organisations should systematically determine EA documentation requirements and assign those responsible for creating it in the different phases of the software development lifecycle (SDLC). Table 7.8 depicts a

reporting system that evaluates EA documentation's existence and quality at defined quality gates in the SDLC.

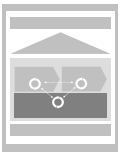


Table 7.8: Monitoring the EA documentation in the software development lifecycle (SDLC)

SDLC phase	Concept		Development	Testing	
Quality gate	1	2	3	4	5
Attributes to be documented	Names of those responsible for application	Business support functional description	Beginning and end of operations	Technical architecture	Operations concept
EA models to be prepared	-	IS land use plan	-	Interface diagram	Deployment model
Those responsible for documentation	Functional application responsible	Functional architect	IT operations	IT architecture	IT operations
Number of applications	644	613	589	445	599
% documented attributes	100%	95,19%	91,46%	69,1%	93,01%
% EA models	Not applicable	85,89%	Not applicable	17,58%	29,29%
Average document age	4,5 years	6,7 months	2,3 years	10,4 months	1,2 years

Determine the EA documentation to be filed in the different phases of the software development lifecycle

In our example, KPIs include different applications' EA documentation existence, measured as the proportion (%) of documented EA attributes and the proportion (%) of available EA models. These KPIs are complemented by the architecture documentation's average age. Accordingly, architects can draw the following conclusions from the proposed KPI reporting: Firstly, how to improve the overall EA documentation for a specific quality gate, (e.g., level 4: technical architecture). Secondly, check and revise outdated EA documents (e.g., level 1: due to changed responsibilities).

7.4 Using EA documentation

EA documentation has many benefits outside the EAM function

Although EA initiatives often begin by modelling and documenting the organisation's architectures, most EA documents are only used during such initiatives, and only by the enterprise architects. However, EA documentation has many benefits outside the EAM function and may even become a critical information source for business.

Litigation risks force an automotive manufacturer to document data usage and storage

To address the risk of potential litigations in the US, one large automotive manufacturer uses EA documentation to protect its intellectual property. In the case of a legal dispute, lawyers are allowed access to information within different IS systems. Owing to the interdependencies between the different applications (car development, production planning and financial IS), the challenge is to protect car construction and development plans or production and quality knowledge that are not part of the inquiry. The manufacturer's architects started documenting these system dependencies, as well as knowledge in the company's data bases, in an abstract but comprehensible way. Business lines use this information to implement measures to protect their intellectual property in case of litigation.

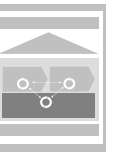
EA documentation can be a valuable information source for continuity, risk and compliance management

In Table 7.9, we provide a short overview of how EA documentation can be used outside the EA initiative's narrow scope. In the following section, we delve into two examples and illustrate how EA documentation supports business continuity and risk, as well as compliance management.

Table 7.9: Use of EA documentation

Scenario	*Stakeholders*	*Goals*	*Relevant EA documentation*
Benchmarking (e.g., for business processes)	Functional management, process management and organisational development	Assess performance and compare to that of competitors, other best practice companies, or industry reference models (e.g., SCOR [7]) Identify best practices and measures for improvement	Documentation about EA components and related KPIs (e.g., costs, processing or waiting time and service levels)
Organisational knowledge management	All employees	Transparent and efficient information provision about all aspects of the EA: Where to find information (e.g., product documentation, process descriptions and application documentation), and who to contact (e.g., roles and responsibilities)	Documentation about EA components with related meta-data, such as responsibilities (e.g., RACI matrix), and attached information (e.g., links to intranet resources or files) EA models can be made available on the company intranet or on wikis
Procurement or sourcing	Purchasing department and logistics	Monitor relationships with external suppliers on the basis of EA information Provide EA standards and guidelines (e.g., development guidelines) with which external contractors must comply	Documentation of EA components and related meta-data (e.g., contracts, outsourced responsibilities for applications) EA monitoring of supervising standard violations (e.g., vendor evaluation per application)
Business continuity management	IT operations and auditors	Manage business risks by identifying the root causes of emerging problems and determining investments in fail-proof resources that support business-critical tasks and processes	EA dependency and impact analysis of different EA layers and components (e.g., applications, processes and customer groups)
Compliance management	Compliance manager, auditors	Document legal compliance and conformance with external or internal standards (e.g., data protection and security standards)	Compliance information linked to attributes of EA components (e.g., SAP FI is SOX compliant)

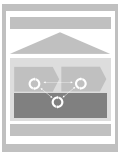
Using EA documentation in business continuity and risk management



EA models help companies understand risks and resource dependencies

The purpose of business continuity management (BCM) is to completely recover operations in case of a disaster or an emergency [8, 9]. Executive management and shareholders care about effective BCM. Their key concerns are to identify the organisation's key vulnerabilities, weaknesses and risks, as well as to circumvent single points of failure. Business continuity management consists of three main phases: Firstly, to analyse and develop a comprehensive contingency plan; secondly, to provide procedures to ensure continuous operations; and thirdly, to conduct ongoing analyses to improve business continuity management.

To provide the required procedures to ensure continuous operations, it is imperative for BCM planners to understand the priorities, risks and dependencies of their organisation's resources. Given that multi-level dependencies and the mass of available information related to corporate resources are the main challenges, BCM can benefit from systematic and well-structured EA documentation, which displays the different EA components and their relationships. Since EA documentation builds on predefined models, it can also be used for automated analysis. Compared to flat documentation (e.g., reports or interview transcripts), EA documentation restricts the scope for interpretation [9]. Analysis results can either be presented in a cross-reference report or in a visual representation, for example, as a dependency graph. Such a dependency graph makes the complex web of interrelationships visible and answers questions such as [10]: How are the applications distributed across server clusters? or which business processes are affected if we switch off a certain network node? If EA components' documentation is complemented by additional attributes for risk, priority or benefits, reports can be generated to display critical organisational or IS resources. EA documentation therefore reduces guesswork. Simulation or 'what if' scenarios that use different EA planning scenarios allow emergencies' impacts to be assessed. Informed choices can be made and BCM procedures can be improved by comparing different variants, for example, with or without redundancy of critical or non-critical EA resources. Furthermore, formalised EA models of all architecture layers can ensure continuous operations during emergencies by documenting the responsibilities (who) and emergency solutions (what, how and when) in few words but with great clarity and accuracy.

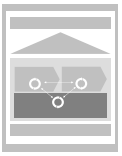


Assign responsibilities and document whether EA components comply with regulatory guidelines and principles

Using EA documentation in compliance management

Compliance management's purpose is to document adherence to regulatory guidelines and principles (e.g., Solvency II, Basel II or SOX), as well as internal data protection and security standards. Internal and external auditors, government agencies and executive management are concerned with and monitor whether process documentation requirements, resource responsibilities and obligations to preserve records are met and are available on demand [11]. In order to leverage EA documentation for compliance management, organisations must complement their EA models by assigning employees to take ownership and by adding compliance classifications to EA components (e.g., to processes, applications or data). Based on this information base, they can apply coverage analysis to show conformance with certain regulations or assignment to a responsible person [10]. Furthermore, EA models and compliance analysis can be used to assess whether certain authorisation or recovery mechanisms, access rights or ownership policies have been implemented, and whether the user actions and changes are traceable. Depending on its focus and granularity, EA documentation can also be used to support certain certification procedures, such as ISO-9001 or BS-7799.

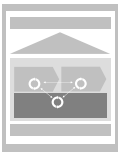
7.5 Management implications



When EAM activities are launched, much effort goes into developing EA models, documenting the current EA architecture and designing the planned architecture. However, the operational changes that continuously alter the EA are often overlooked. If not properly managed, the sum of the changes can cause the organisation to lose control and the EA to deviate from its path towards the target EA. In order to establish EAM practice, three key issues must be highlighted:

Managing the high number of operational changes and their impact on the EA
Firstly, changes' EA relevance must be evaluated. To identify the small number of changes that conflict with EA targets or have a major impact on them, employees need to be EA aware, but also trained and motivated to identify EA-relevant changes. Smart and efficient rules should be defined to assess the changes' EA relevance without slowing down the organisation. We recommend the use of pragmatic processes with simple check-lists and quality gates with (enterprise) architects doing the assessing and decision-making.

What gets measured gets managed – establishing EAM-related KPI reporting
To create the first KPI set, the existing KPIs must be displayed according to EA components and layers. Initially, this can be done manually and will generate interesting insights into and discussion about the organisation's strengths and weaknesses. It will also help to create awareness of EAM activities among the employees. As EAM matures, the metrics should be complemented and a comprehensive EAM cockpit should be built. Ensure that KPI reporting covers three key dimensions: Firstly, the EA's status as described by statistics on EA instances and their conformance to architecture principles; secondly, how well the EA supports the company in meeting business objectives, which can be assessed by linking the business KPIs to EA models and instances; and, thirdly, EAM adoption as measured by the availability and quality of the EA documentation, as well as the training and skills in the organisation.



Getting the most from your EA documentation
Finally, the many benefits of using EA documentation outside the EAM function should be explored, most importantly in the areas of compliance, risks and business continuity management. This can be achieved by talking to the stakeholders who need to understand and maintain information on complex organisational dependencies.

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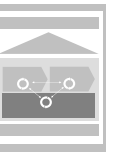

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