Chapter 1

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

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:

Adaptation to the changing environment is a competitive factor

Poorly coordinated changes generate risks and paralyse business

- **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
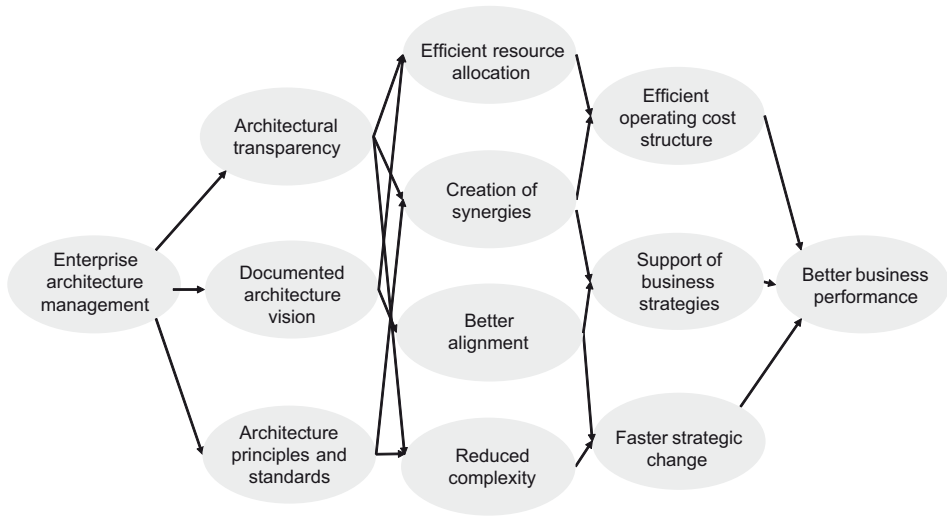
Figure 1.1: EAM effects

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.
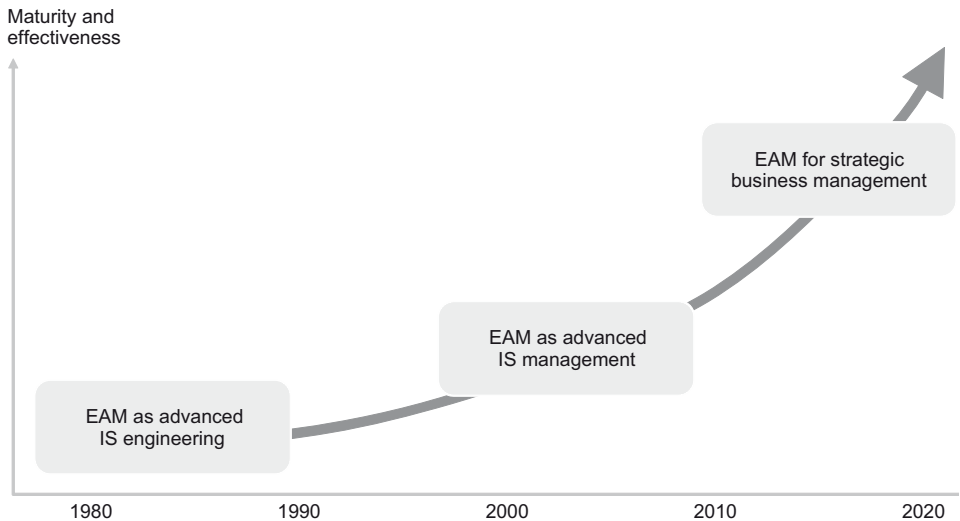
Figure 1.2: EAM development phases

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

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

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^{TM}) [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

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:

EAM becomes a strategic function attached to a board member

- **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.
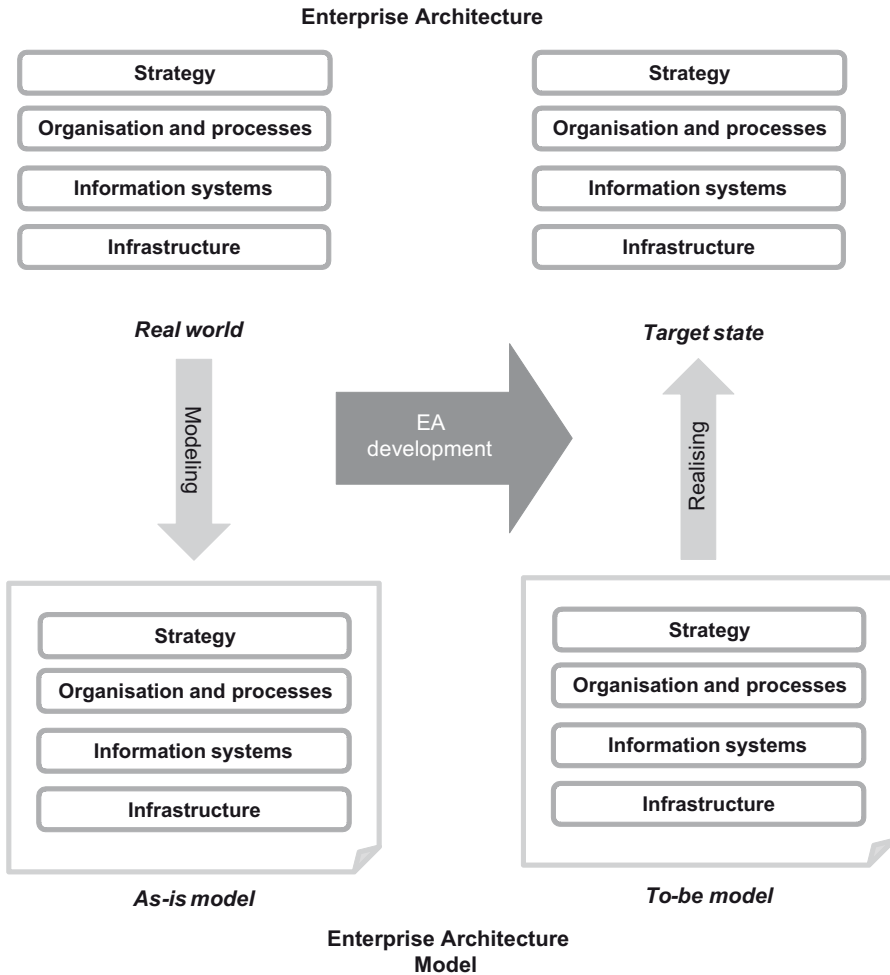
A working definition of enterprise architecture

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.

Enterprise Architecture

| Strategy |
| Organisation and processes |
| Information systems |
| Infrastructure |

| Strategy |
| Organisation and processes |
| Information systems |
| Infrastructure |

Real world   *Target state*

Modeling

EA
development

Realising

| Strategy |
| Organisation and processes |
| Information systems |
| Infrastructure |

| Strategy |
| Organisation and processes |
| Information systems |
| Infrastructure |

As-is model   *To-be model*

**Enterprise Architecture
Model**

Figure 1.3: Terminology

Enterprise architecture models and their layers

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:

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

- 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.
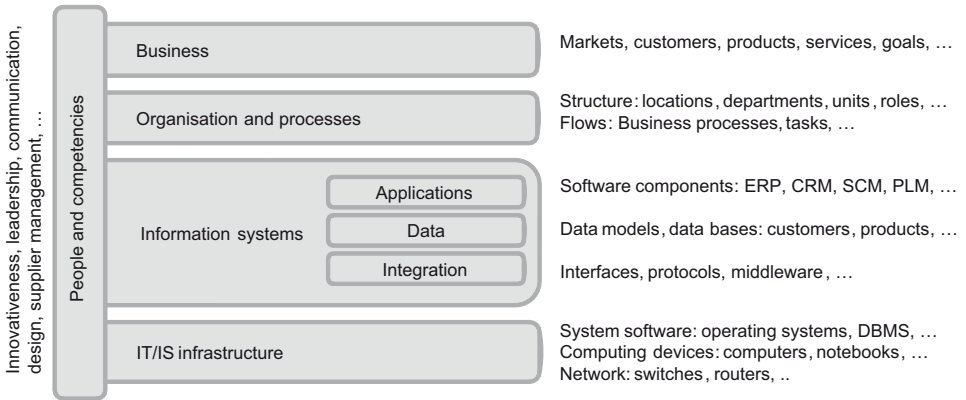
Figure 1.4: EA layers

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.

These layers build up hierarchically and relate to each other

Managing the enterprise architecture

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

EAM is becoming a real management discipline

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 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:

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

- **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?

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.

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

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 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.

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

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.
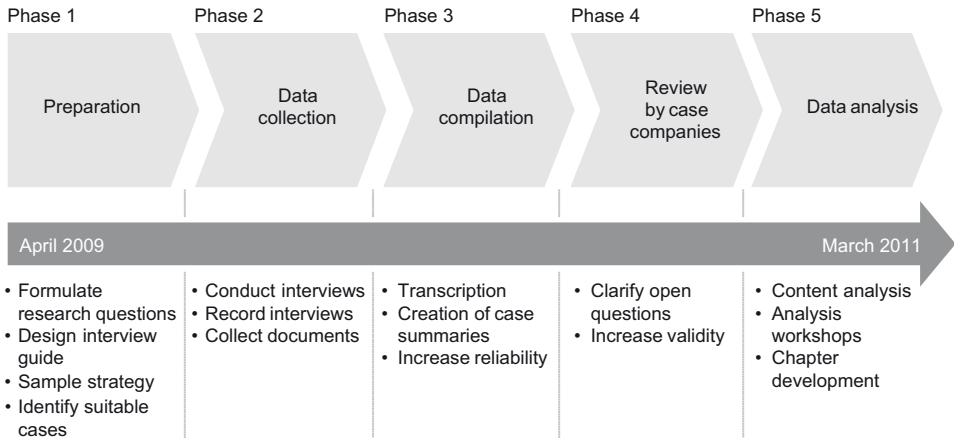
Figure 1.5: Research process

Phase 1: Preparation

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

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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