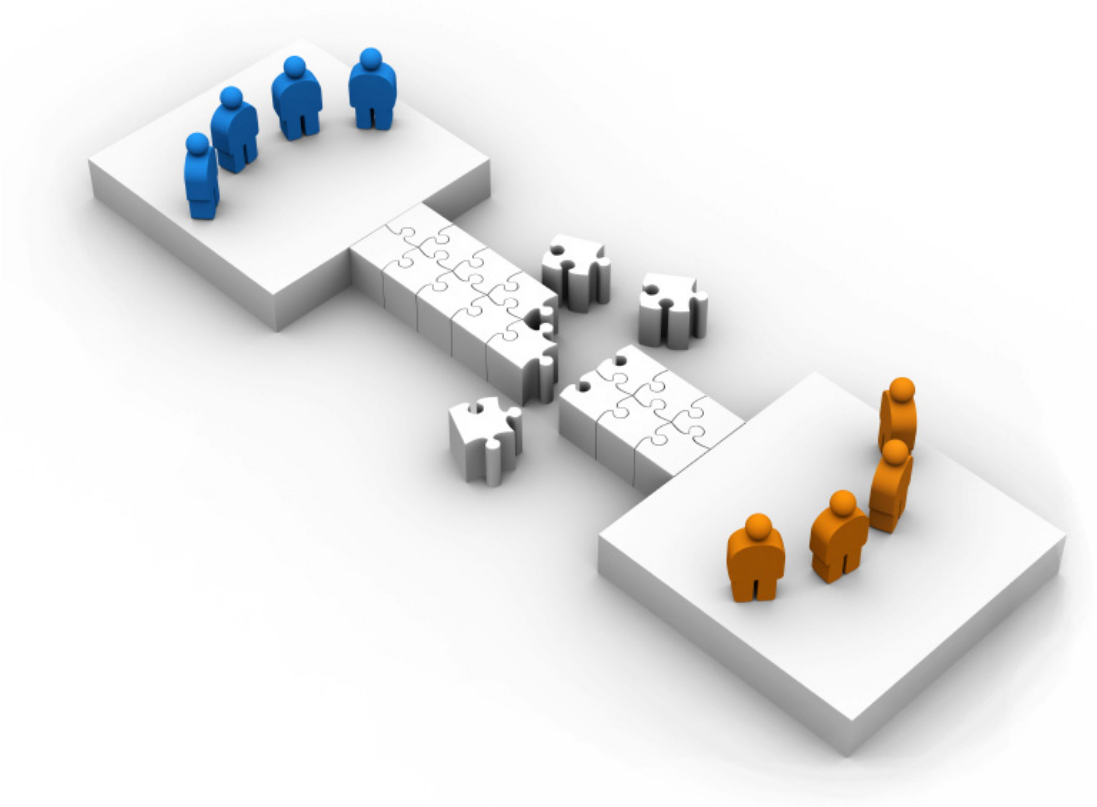
Relevance and Usability of Enterprise Architectures during Post Merger IT Integrations



Jan Willem van Houwelingen

Master Thesis

Relevance and Usability of Enterprise Architectures during Post Merger IT Integrations

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Management Summary

The need for delivering business value to shareholders is ever increasing. Organizations face higher and higher expectations when it comes to growth. Mergers and acquisitions enable high growth figures and leverage cost downsizing by realizing synergy on operations and IT. The number of mergers and acquisitions are heading towards a record. Despite that, the percentage of mergers that realize the intended synergy levels and cost downsizing is very low (Luftman and Kempaiah, 2006).
IT synergy is often an objective for an IT integration project. IT synergy can be realized in three ways, strengthening or levering core business, reducing costs or benefits from a technology transfer. This research investigated the relevance and usability of enterprise architectures in the IT integration process. On basis of the theoretical framework a conceptual model has been derived which is used to assess the results gathered from multiple case studies in the bank and insurance industry. This resulted in a number of conclusions.

The IT integration process consists of a number of activities; it starts with the IT due diligence, then the analysis of the post-merger IT integration decision making situation, which results in the chosen IT integration strategy and ends with designing the target situation, the enterprise architecture. An enterprise architecture is an integrated architecture of a collection of components existing in an organization. These components are present on the business, application and technology level of an organization (ArchiMate, 2005). Between these components, relationships exist which enable the traceability of changes in the architecture. In the design process of the target architecture after a merger IT synergy can be realized. Enterprise architecture frameworks deliver a set of methods to facilitate this process.
The IT integration process is characterized by a number of aspects which influence the integration effectiveness. Enterprise architectures deliver a relevant contribution to the communication, decision making and project management activities. This contribution is on its turn subject to the efforts of the integration team. The enterprise architecture is most effective when exerted in an integrated fashion. This enables the possibility of delivering different views of the architecture to different stakeholders on different levels of detail. The views turn out to be a very effective mean of communication. Designing the target situation for components on the application layer and the IT infrastructure on the technology layer, more in depth sources of information are needed then solely the enterprise architecture, it is too abstract for this type of application. The usability of enterprise architectures depends on the stakeholder in the integration process.
Change management in IT integration processes faces next to designing and migration the business and IT situation another challenge; changing people and aligning them to the newly designed organization. Enterprise architectures are not suitable for this type of issues. The contained information is too high level and only applicable for supporting the ‘hard’ skills in managing a change project.
Enterprise architecture frameworks should be extended by supporting detailed information about applications, interfaces and hardware requirements, this enhances the decision making process. IT synergy objectives benefit from an integrated approach. Therefore, business and project managers should jointly determine the information requirements in an IT integration.

Preface

During the writing of this preface I realized that this is the last effort in finishing my Master's thesis. I have spent the last six months almost entirely, evenings and weekends included, on conducting research and writing a report about it. Realizing that the job is almost done fills me with satisfaction.
This thesis is the final project of the Master's course Business Information Technology at the University of Twente. During my time at the University I have learned and experienced a lot of new things, met new friends and had a lot of fun. Although this adventure comes to an end, a new one starts and the gained knowledge, experiences and friends are coming along.

This Master's thesis is the result of the research I have been conducting at KPMG. In this process I experienced KPMG as a competent and challenging environment with motivating colleagues of which some became friends. I therefore have chosen to continue my career at KPMG.

Although this work is from my hands, I would not be able to realize it without the help and support of others. Therefore I would like to thank everyone who has made a contribution to me or my work. Especially my University supervisors, Fons Wijnhoven and Klaas Sikkel, who have enormously helped me by triggering me to rethink my work and keep me sharp. My company supervisor, Mariska Ooms, from whom I received great input to the research, helped me to clarify my thoughts and has taught me to keep the right balance between work and life.
Furthermore I would like to thank all my friends, colleagues, and fellow interns who made the job a lot more fun. I would like to thank my parents, my brothers and other family for their support in the good and the bad times. Finally, I would like to thank Veronique for her endless faith in me and by always being there when I need it.

Houten, 14 September 2008

Jan Willem van Houwelingen

Contents

1 Introduction

Mergers and acquisitions are often started by shareholders' wishes. Organizations can expand their operations, increase their turnover and penetrate new markets by acquiring an existing firm. Besides these possibilities, a merger or acquisition enables the opportunity of scale enhancing synergies. Synergies on the IT level deliver possibilities to lower costs of business-supporting IT systems, to increase the performance of IT and to enable new IT opportunities.
The first chapter gives an introduction to this research. It starts with the context of the area of mergers and acquisitions and architecture. After this, the objective of this thesis is made clear, and the research questions by which the objective is met. Finally, the research approach and the structure of this thesis are given.

1.1 Mergers and acquisitions

The number of mergers and acquisitions is despite the current global economic loan crisis, or credit crunch, still rising and is heading towards a record amount of mergers and acquisitions within the technology market (PWC, 2008). Mergers and acquisitions (or M&A's in short), are the transactions of merging two or more single entities, or acquiring a single entity by another. When looking at organizations, these transactions, often called deals, are the process of buying an organization (acquisition), and integrating it with the current organization (merger).

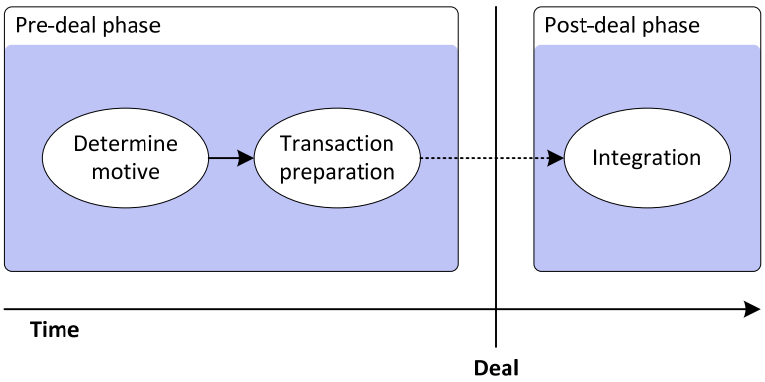

Figure 1.1: M&A process

M&A's are the result of the composed strategy of an organization. The M&A mechanism is a method to realize certain goals which are described and laid down in the mission and / or strategy of an organization. In terms of strategy, examples of M&A intentions are numerous; they can be used to realize external growth when acquiring another organization, they can be an entry mode for penetrating new markets, they can be used to increase the rate of return to maximize the profit, or they can be used to increase the level of synergy or efficiency of operations (Trautwein, 1990).
When comparing the number of initiated mergers and the number of successful mergers, it seems that integrating organizations and their businesses is far from easy. Different studies show different numbers, but about 25% of the initiated mergers succeed according their forecasted synergy levels, time schedule and costs (Alaranta and Henningsson, 2008).
To make integration successful, different aspects of mergers and acquisition come into play. One of these aspects is IT integration during a merger. The success of IT integration depends on numerous aspects.

The merger and acquisition process is depicted in Figure 1.1. The entire merger and acquisition process can be abstracted into two components; the pre-deal and the post-deal phase. The pre-deal phase of an M&A process starts with the merger objective. After the merger objective has been determined, the pre-deal phase of an M&A process continues with the transaction preparation. The transaction preparation contains all tasks and processes such as due diligence projects and price negotiations, which need to be completed before the actual deal takes place.
When the deal between the involved parties has been closed, the post-deal phase of an M&A process starts. Depending on the intended merger motives, the integration of the acquired and acquiring organization starts. The integration of existing IT systems takes place in the pre- and post-deal phase of an M&A process, which 'roughly denotes the creation of linkage between to previously separated information systems' (Markus, 2000). The linkage of information systems is a very general term to denote IT integration. IT integration can involve much more, or much less efforts than just linking existing IT systems.

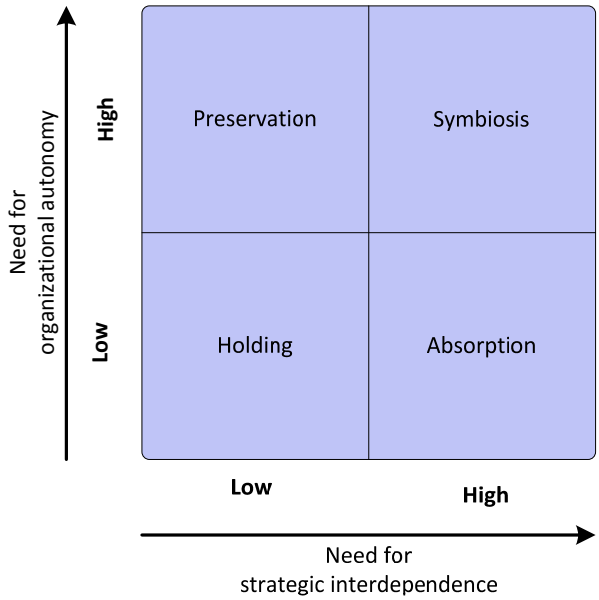

Figure 1.2: Merger objectives (adapted from Haspeslagh and Jemison, 1991).

As described, the M&A process starts with determining a merger motive. On basis of all possible motives, Trautwein (1990) identifies six different theories on merger motives. A merger motive is a direct result from the defined strategy of an organization, where on that point, the merger consequences are perhaps predicted, neverteless, far from realized. It is therefore very important to clearly state a merger motive, or intention, which supports the strategy of an organization, before starting to initiate the merger.
One of the six identified merger motives is the efficiency motive. This motive determines an M&A as a method to achieve synergy. Synergy can be distinguished as financial synergy, where the cost of capital is lowered, as operational synergy, where operations of multiple organizations are combined, or as managerial synergy.

If we take a look at Figure 1.2, we see the four merger objectives identified by Haspeslagh and Jemison (1991). These merger objectives represent the desired level of integration of the two organizational entities, the acquirer and the acquired.
According Haspeslagh and Jemison the merger objective is determined by two dimensions; the need for strategic interdependence and the need for organizational autonomy. These two dimensions result into four possible integration approaches:

- **Holding**, in this approach the acquired entity is left untouched;
- **Preservation**, the newly acquired entity is partially integrated into the acquiring organization;
- **Symbiosis**, both entities, the acquirer and the acquired organization are equally transformed to create a new organization;
- **Absorption**, the newly acquired organization is fully integrated into the acquiring organization.

From a merger motive perspective, only the last three approaches; preservation, symbiosis, and absorption, are suitable to support the synergy strategy.

1.1.1 IT synergy

According Henningsson (2007), there are many reasons why acquisitions occur, except they all have one aspect in common, the ultimate goal of an acquisition is to create value for the shareholders of an organization. Value can be created on several ways, and one is to create more value with the same amount of resources. IT synergy describes the situation in which the result of two or more combined functions is greater than the sum of the separate results of the functions could manage (Lubatkin, 1983).
A merger can be seen as a success, when the merger objectives are met. The added value of a merger or acquisition can be measured with the following equation (Goldberg et al., 2001):

Net value added = (stand-alone value – actual market value) + (synergy value – premium)

The value of an organization can according the equation be raised in two different ways. The first option is to acquire an organization which is undervalued by the market. This implies that the stand-alone value is more than the market value.
In the current era of information awareness this is most likely very difficult. However due to circumstances in the economic world, such as the current credit crunch, companies may switch owner for a bargain.

The second possibility to add value by a merger is when the realized synergy value of a merger is higher than the premium paid on top of the market value.
In the pre-deal phase of an M&A process, price negotiations take place in the transaction preparation process. The negotiated price for a deal when acquiring an organization is based on its market value and the premium on top if this. The premium consists of transactions costs, anticipated synergy value, etc. When the actual synergy value is higher than this premium (after integrating the two organizations), the deal has realized a positive net value added.

From the definition of business-IT alignment point of view, the meaning of IT synergy can further be explained. The business-IT alignment process has the goal to enhance the effectiveness of the business-IT relationship to realize strategic business goals. These strategic business goals are the merger objectives, and as for realizing synergy, this is creating more value with the existing parts from an organization.
The newly defined business has specific goals, nevertheless they all have in common that the business needs to be supported by IT. This entails that along with merging businesses, IT has to be taken into account on the same level.

Integrating IT systems apart from the merging businesses does not deliver the predicted synergies. During the integration process, the business-IT alignment, IT staff and cultural differences need to be taken into account when merging organizations want to realize synergy.
IT synergy is thus increasing the value of IT, which on its turn enables more business value of an organization. There are three possible sources of value by which IT can play a crucial role (Goldberg et al., 2001):

1. **Strengthening or levering core business**, accessing new target groups of customers, segments or penetrating new markets, and changing the product / service portfolio;

2. **Reducing costs**, the efficiency theory. When applying the principle of economies of scale, more operations can be done with the same amount of resources or the same amount of operations with fewer resources;

3. **Benefits from technology or skill transfer**, specific capabilities or competences present on one of the merging organizations can be transferred to the other. This enhances the adroitness of the newly formed organization.

1.1.2 Realizing synergy

Realizing the intended IT synergy after a merger is more than just linking two IT systems. As previously described, the business-IT alignment is very important in realizing strategic business goals. When it comes to integrate different IT architectures, all surrounding components and factors like cultural differences and IT planning are part of the integration process (Alaranta and Henningsson, 2007).

IT intensity

The intended synergy success of IT integration is related with the effectiveness of the integration during mergers and acquisitions. Synergistic potential can be realized by high levels of integration. However, due to increasing coordination costs and inter-organizational conflicts, negative synergies may also occur in integration projects. It is therefore important to select the functions and units of the existing IT systems which have high synergetic potential

and on basis of that to decide which integration strategy will be chosen (Weber and Pliskin, 1996).
The IT intensity of an organization determines the possible IT synergetic potential of a merger. Organizations with a high level of IT intensity are for instance banks and insurance companies, located in the service-oriented industry. IT plays an important role in their administrative tasks, critical business applications and supportive processes.

Next to the level of IT intensity, organizational culture is widely acknowledged as a critical success factor for IT integrations. Weber and Pliskin (1996) argue that organizational culture is also an important factor for effective integration of IS in a mergers and acquisitions.
Merging organizations will both have the problem of dealing with two different cultures which are brought together along with the merger. A negative attitude to each other during the merger process directly reduces the merger effectiveness. As this research is not typically studying the behavioral sciences and results of cultural differences in mergers and acquisitions, this topic is left further untouched. But is should be kept in mind that cultural aspects are a very important boundary condition on merger effectiveness, and therefore synergistic potential.

Strategic IT planning

Strategic IT planning is an important part of the IT integration process. After setting up the strategic business goals, the to-be situation of the business has been designed. The supporting IT has to be aligned with the business and therefore, a strategic IT planning has to be made.
On the level of IT integration, IT planning is used to determine what the current state of the separated IT architectures is, and to design the target situation in which both architectures are integrated.
Within this strategic IT planning, not only the IT architecture has to be assessed, also the business-IT linkage, business processes and functions need to be taken in to account. Such an overview is denoted by an enterprise architecture. The current enterprise architecture needs to be mapped, and the target enterprise architecture needs to be designed. These architectures form the basis of the IT planning process (Segars and Grover, 1999).

1.2 Objective

Given the context of this research, IT integration projects during merger or acquisitions are more and more facing high expectations. Existing developed enterprise architecture frameworks are able to create enterprise architectures, but are not always prepared on integrating two, or more, existing architectures.
This research aims at assessing the usability and relevance of enterprise architectures, to find out how enterprise architectures can positively contribute to certain aspects of the post merger IT integration process.

This objective will be achieved by giving an overview of the domain of business integration, different enterprise architectures and IT integration. In this theoretical framework, the business objective of realizing synergy will be taken into account.
The theoretical framework will be used to abstract important concepts and to create a conceptual framework. The conceptual framework will be used to assess the gathered information from the empirical research. These results will give an answer to the stated research question.

1.3 Research questions

From the objective of this research the following central research question has been formulated:

> *What is the relevance and usability of enterprise architectures in realizing IT synergy after a merger?*

The central research question contains three important domains which will be studied in detail. The order follows the chronological order of a merger. A merger starts with the synergy objective and business integration, which is described in the introduction. After this, an architecture is made of the target enterprise organization, which is used in the IT integration process. From these three domains sub-research questions are formulated.

Enterprise architectures are models of the business processes and IT architecture of an organization. Enterprise architectures are the design of the relationships and system logic between the business and IT organization. But how can these organizational descriptions be used in mergers and acquisitions?

- *What are enterprise architectures?*
- *What views of the world do enterprise architectures support?*
- *What roles do enterprise architectures perform in the different phases of the integration process?*
- *Are enterprise architectures useful and relevant in integrating existing architectures? If so, which properties apply and which generic concepts can be used?*

IT integration is the process of integrating two or more IT architectures. The integration of IT architectures can be an intended objective from a merger perspective. Different IT integration strategies exist, with different objectives and different methods. From a merger point of view, which strategy and method would fit the intended objective of increased efficiency on operations best?

- *Which integration strategies can be used to integrate IT architectures?*
- *How does an enterprise architecture improve business IT alignment?*
- *How is the post merger IT integration process designed?*
- *Can enterprise architectures be used to increase the managerial process of IT integration?*

1.4 Research approach

To answer the research questions stated in section 1.3, a research model has been created using the methodology of Verschuren and Doorewaard (2005). Figure 1.3 shows this research model. This thesis consists of three main parts, a theoretical framework, a conceptual model and the conclusions.
The research starts with a theoretical framework on business integration, enterprise architectures and IT integration. On basis of this theoretical framework a conceptual model is created. The conceptual model will be used to assess the gathered information from the case study research and the interviews with professionals. The results from this empirical research form the basis of the conclusions and the objective of this research.

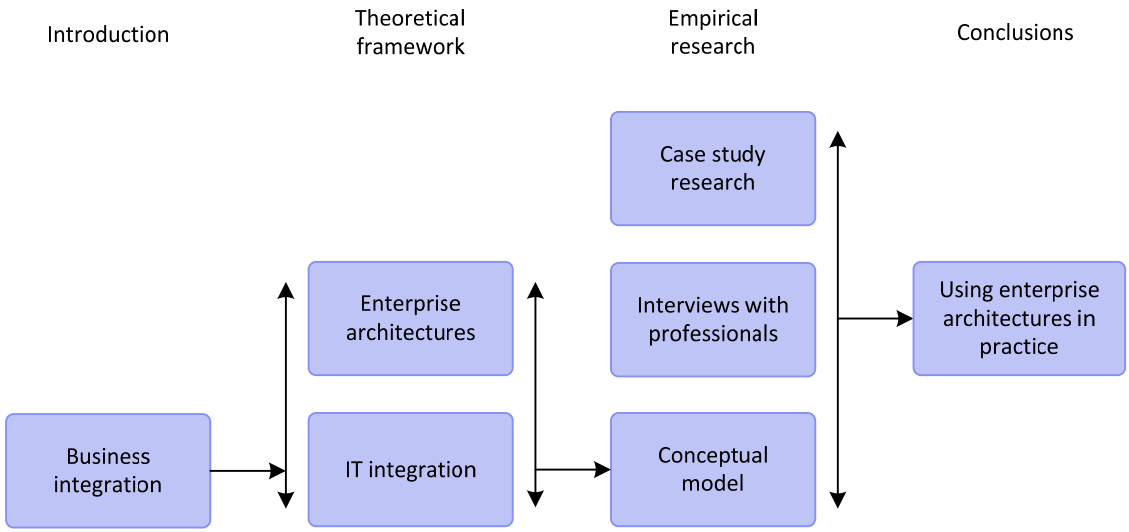

Figure 1.3: Research model

1.5 Thesis structure

The structure of this thesis is depicted in Figure 1.4. The thesis starts in chapter one with the research introduction, the research questions and the objectives of this study. Chapter two, enterprise architectures and chapter three, IT integration form the theoretical framework.
After the theoretical framework, chapter four forms the basis of the empirical study of this research. In this chapter the research design is described and the conceptual model is introduced. After that, in chapter five the results from the case study research and the interviews are given. Chapter six at last concludes this thesis with a discussion about the results. This leads to conclusions on the central research question, research implications and practical implications. The chapter ends with recommendations on future work.

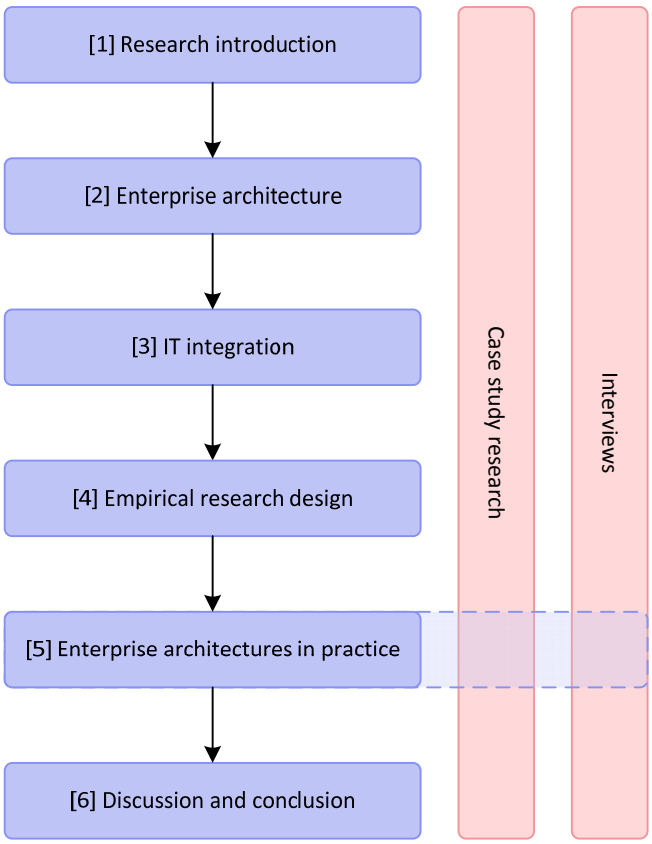

Figure 1.4: Thesis structure

Theoretical framework

2 Enterprise architecture

The introduction described the synergy possibilities of IT in a merger or acquisition. After the deal has taken place, integration of the existing IT architectures starts. At this point, the as-is situation of the enterprise architecture is determined. This forms the starting point of the business / IT change process which leads to the target situation after the merger. This chapter describes the concept of enterprise architecture and three enterprise architecture frameworks will be assessed.

2.1 Definition of enterprise architecture

Enterprise architectures deliver an approach with a set of design principles, methods and models that can be used to design and realize the structure of an organization on enterprise level. The term 'enterprise' in this context is the collection of organizations and/or entities with the same objective. An enterprise architecture is in that perspective an integrated architecture of a collection of all components existing in an organization (TOGAF, 2007).
The organizational architecture can be described with an architectural description, which is possible with the use of (enterprise) architecture frameworks. These frameworks offer tools and techniques and a set of design principles according which the enterprise can be modeled.

Realizing IT synergy requires organization wide understanding of the current business and IT, and the target situation which has to be realized after the deal has taken place in mergers. In such projects, IT integration can mean integrating existing IT architectures, copying one architecture to another, or bringing new information technology into practice.
Numerous articles and books address the issue of business IT alignment, and also the topic has been identified as a major issue among IT executives (Luftman, 2006). Nadler et al. (1992) state that the organizational effectiveness is not obtained by local optimizations, but is realized by well-orchestrated interaction of organizational components. For this purpose, enterprise architectures can be used to create clarity among stakeholders in the integration project.

However, what is exactly an architecture? Architectures are common used in the design process. If we take a look at the more theoretical explanations, the following definitions of architecture can be found. Dietz (2004) gives the following definition for architecture:

> "An architecture gives the global design of a system that has been designed according design principles that account systems' classification".

This high level concept of architecture tells us that an architecture has to obey certain rules and design principles by which it can be classified. This also implies that architecture is a convention, with the purpose of uniformity. Dietz correctly states in his article that such a convention (architecture) places a normative constraint on design freedom. The IEEE Std. 1471 (2000) uses the following definition of architecture:

> "The fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution."

Key concepts that can be derived from these definitions are design, components, relationships and design principles. Different enterprise architecture frameworks each adopt different techniques and methods used for modeling enterprise architectures, but all contain the same concepts of architecture.

2.2 Enterprise architecture frameworks

To create an enterprise architecture, different frameworks are available. To get an overview of the existing methodologies, in this section three different enterprise architecture frameworks are discussed.
The scope of architectural engineering for IT integration projects stretches from enterprise architecture to IT architecture. Within this scope, different enterprise architecture frameworks take on a different place, and have a different set of methods and techniques. Table 2.1 shows the three enterprise architecture frameworks discussed is this chapter and their architectural scope.

Architectural integration scope	Enterprise architecture framework
Enterprise architecture	TOGAF
Enterprise & IT architecture	ArchiMate
IT architecture	IEEE Std. 1471-2000

Table 2.1: Architectural integration scope of enterprise architecture frameworks

Although there are many more enterprise architecture frameworks available, like the 4+1 model (Kruchten), the IFW model (Evernden), the RM-ODP framework (ISO/IEC CD 10746-1) and the Zachman framework (Zachman and Sowa), the three selected frameworks are explicitly chosen as they together completely cover the complete scope of the organizational architecture. ArchiMate supports the design of a complete integrated architecture of the whole organization, the business, application and technology layer. TOGAF supports the design of partially integrated architecture, it includes the business and application layer. The IEEE 1471-2000 framework at last supports also a partially integrated architecture, the technology layer and parts from the application layer.
Stakeholders in the organization can be a linking pin in this context. A project manager on the application level deals with processes on all three levels. Such persons benefit the most of a complete integrated architecture.
The TOGAF enterprise architecture framework addresses architectural engineering on a high, enterprise level with more generic concepts, focusing on processes. The ArchiMate framework on the other hand is an architectural framework capable of modeling both the enterprise as the IT architecture. This is accomplished by using generic and specific concepts, but also by identifying the relationships between enterprise and IT concepts. The IEEE Std.

1471-2000 framework at last only addresses the IT architecture from a software engineering point of view. It uses only specific concepts to design an architecture.

The three different enterprise architecture frameworks have different design techniques, views and modeling principles. This results in different concepts. In the development of a framework, a balance has to be made between the use of organizational' specific concepts and general architectural concepts (Jonkers et al, 2003).

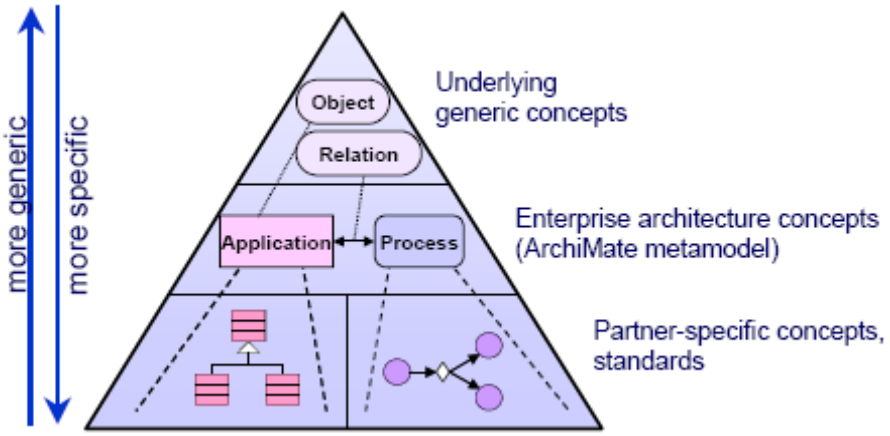

Figure 2.1: Balance between general and specific concepts (De Boer et al, 2004)

Figure 2.1 shows the trade-off between general and specific concepts in enterprise architecture frameworks. The more specific concepts adopt an architecture modeling method or language used by a specific organization. On the other side are the more generic concepts which address general concepts such as 'object' and 'relationship'.
The three described enterprise architecture frameworks in the following sections each have a different approach on this modeling balance between generic and specific. This in turn, means that the usability and relevance of the different enterprise architecture frameworks depends on the information needs (requirements) from the different stakeholders.

The three architecture frameworks are described in the following sections, starting with TOGAF, then ArchiMate and at last the IEEE Std. 1471-2000 framework. For each framework an explanation will be given, its design principles and methods, the used concepts and/or views and for the ArchiMate framework an example will be given in the form of an architectural design of an insurance company.

2.2.1 TOGAF

Explanation

The Open Group Architecture Framework (TOGAF) is a detailed method and a set of supporting tools for developing an enterprise architecture (TOGAF, 2007). The first version of TOGAF appeared in 1995, only providing a methodology for technical infrastructures. Over the years it evolved into its current edition (version 8) providing an enterprise architecture framework and method.

Design principles and methods

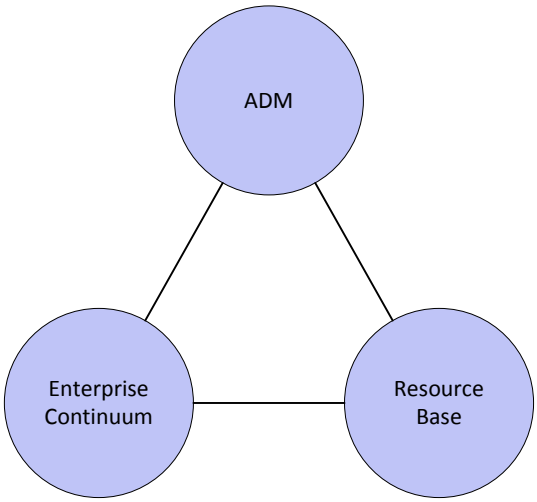

Figure 2.2: TOGAF

The TOGAF framework consists of three main elements, which are shown in Figure 2.2 (Lankhorst & Van Drunen, 2007):

1. The TOGAF **Architecture Development Method** (ADM). This method is used for creating an organization-specific enterprise architecture that aligns with the stated business requirements;

2. The **Enterprise Continuum**. This continuum is a repository of all kind of architectural assets such as models, patterns, foundational architectures and industry-specific architectures from the enterprise itself and from the global IT-industry.
   When using the TOGAF ADM, on certain points it advices users of existing architectures from the repository, enabling a sort of best-practices approach.
   TOGAF provides two reference models for the Enterprise Continuum:
   a. The TOGAF Foundation Architecture, an architecture with generic services and business functions;
   b. The Integrated Information Infrastructure Reference Model, based on the Foundation Architecture it helps developers designing architectures.

3. The TOGAF **Resource Base**. A collection of resources intended for users of TOGAF such as guidelines, architecture views, case studies, templates, background information, etc.).

The TOGAF Architecture Development Method is considered to be the core of TOGAF. The ADM is an iterative, stepwise approach over the whole process of developing of the overall enterprise architecture. The ADM development process is displayed in Figure 2.3.

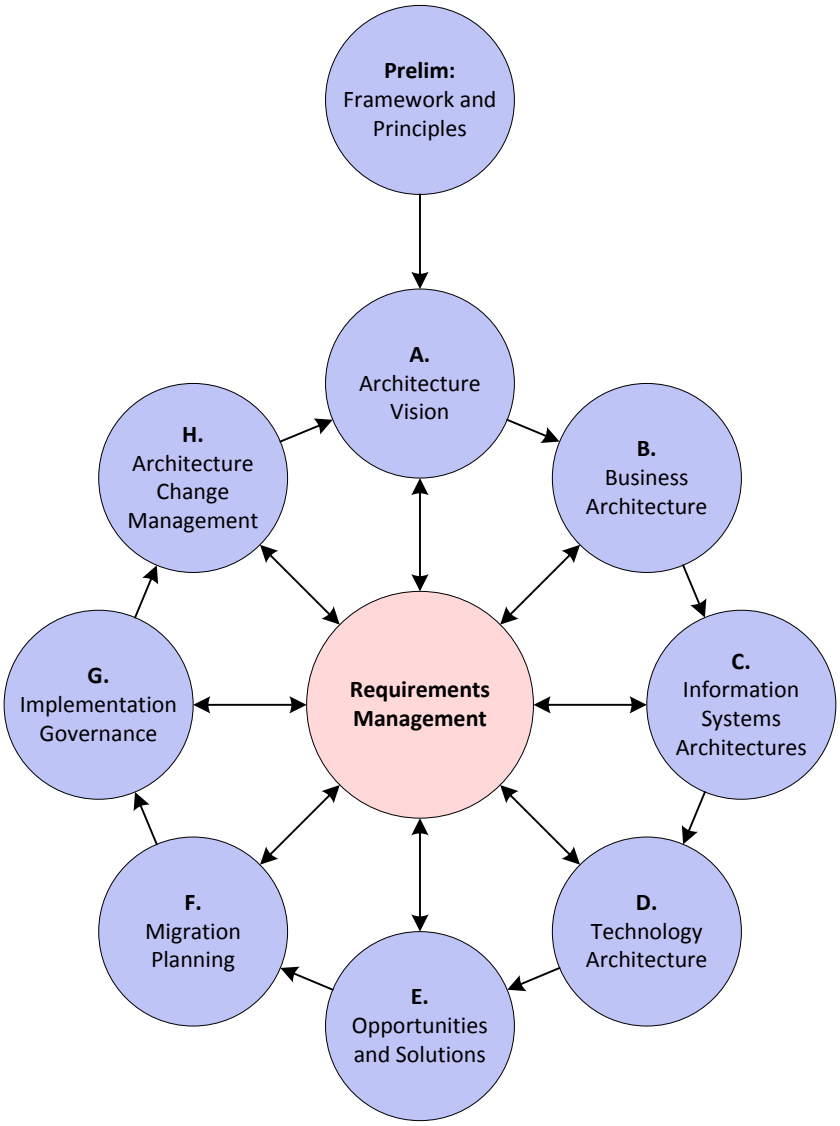

Figure 2.3: TOGAF ADM development process (TOGAF, 2007)

As the TOGAF ADM process is iterative for every phase, each time it is started, the enterprise architect needs to define the scope of the enterprise architecture. This involves deciding the level of detail, the length of the time horizon, the coverage of the enterprise architecture and the use of the available resources in the Enterprise Continuum and from the Resource Base.

In the process of developing an enterprise architecture with the use of TOGAF, the ADM process is concentrated around the principle of requirements management. The requirements follow from all phases in the process, starting with defining the architecture vision, and iterating as much cycles as needed. Each phase in the TOGAF ADM process consists of a cycle of activities.

Figure 2.4 shows the development cycle of phase D (technology architecture). The separate phases each are also an iterative, cyclic process. This ensures that the results of all phases are complete and according the enterprise architecture wide scope, vision and level of detail.

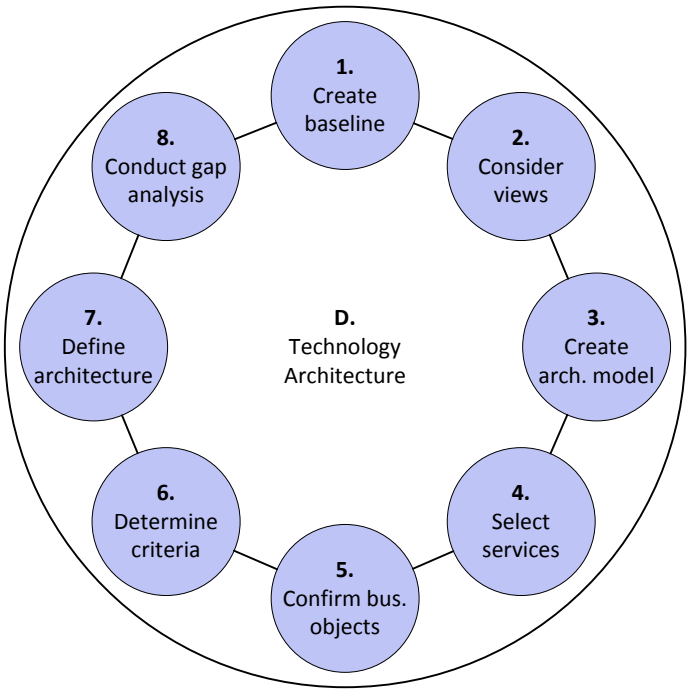

Figure 2.4: Architecture development cycle (TOGAF, 2007)

Concepts and views

Next to the identified concepts and developing methods by the TOGAF framework, the architecture development process has a number of architecture views and corresponding viewpoints. The views in the TOGAF ADM development process form together a subset of the enterprise architecture, the four identified architectural views are (TOGAF, 2007):

1. The **business architecture** views, these views address the concerns of the users, planners and business management. It consists of the business strategy, organization, governance and business processes;

2. The **data architecture** views, this defines the structure of the logical and physical data assets and data management resources of an organization;

3. The **application architecture** views, this architecture defines the individual application systems, how they interact and their relationships with the business processes;

4. The **technology architecture** views, this layer holds all technology components of an organization such as software, hardware, IT infrastructure, middleware, networks, communications, processing, standards and the support of application services.

An overview of the TOGAF ADM views and the stakeholders is given in Figure 2.5. The figure is composed of four columns with views for the different stakeholders.

<table>
<tr><th colspan="4">To address the concerns of the following stakeholders…</th></tr>
<tr><td>Users, planners, business management</td><td>Database designers and administrators, systems engineers</td><td>System and software engineers</td><td>Acquirers, operators, administrators, managers</td></tr>
<tr><th colspan="4">… the following views may be developed</th></tr>
<tr><td>Business architecture views</td><td>Data architecture views</td><td>Application architecture views</td><td>Technology architecture views</td></tr>
<tr><td>Business function view</td><td rowspan="5">Data entity view</td><td rowspan="5">Software engineering view</td><td rowspan="3">Networked computing hardware view</td></tr>
<tr><td>Business services view</td></tr>
<tr><td>Business process view</td></tr>
<tr><td>Business information view</td><td rowspan="3">Communications engineering view</td></tr>
<tr><td>Business locations view</td></tr>
<tr><td>Business logistics view</td><td rowspan="5">Data flow view (Organization data use)</td><td rowspan="5">Applications interoperability view</td></tr>
<tr><td>People view (organization chart)</td><td rowspan="3">Processing view</td></tr>
<tr><td>Workflow view</td></tr>
<tr><td>Usability view</td></tr>
<tr><td>Business strategy and goals view</td><td rowspan="3">Cost view</td></tr>
<tr><td>Business objectives view</td><td rowspan="5">Logical data view</td><td rowspan="5">Software distribution view</td></tr>
<tr><td>Business rules view</td><td rowspan="3">Standards view</td></tr>
<tr><td>Business events view</td></tr>
<tr><td>Business performance view</td></tr>
<tr><td></td><td colspan="3">System engineering view</td></tr>
<tr><td colspan="4">Enterprise security view</td></tr>
<tr><td colspan="4">Enterprise manageability view</td></tr>
<tr><td colspan="4">Enterprise quality of service view</td></tr>
<tr><td colspan="4">Enterprise mobility view</td></tr>
</table>

Figure 2.5: Views in the TOGAF ADM development process (TOGAF, 2007)

2.2.2 ArchiMate

Explanation

The ArchiMate project is a research initiative from a consortium with several for-profit and non-profit organizations. With the ArchiMate project they aim to support architects with concepts and techniques to visualize, communicate and analyze enterprise architectures (ArchiMate, 2005).

Design principles and methods

The ArchiMate language has been developed for modeling enterprise architectures. From its objective, it does not model one specific architectural domain, but it focuses on a wider architecture that covers the whole organization. ArchiMate thus enables the possibility to model the global structure within a domain, but also the relationships between different domains.

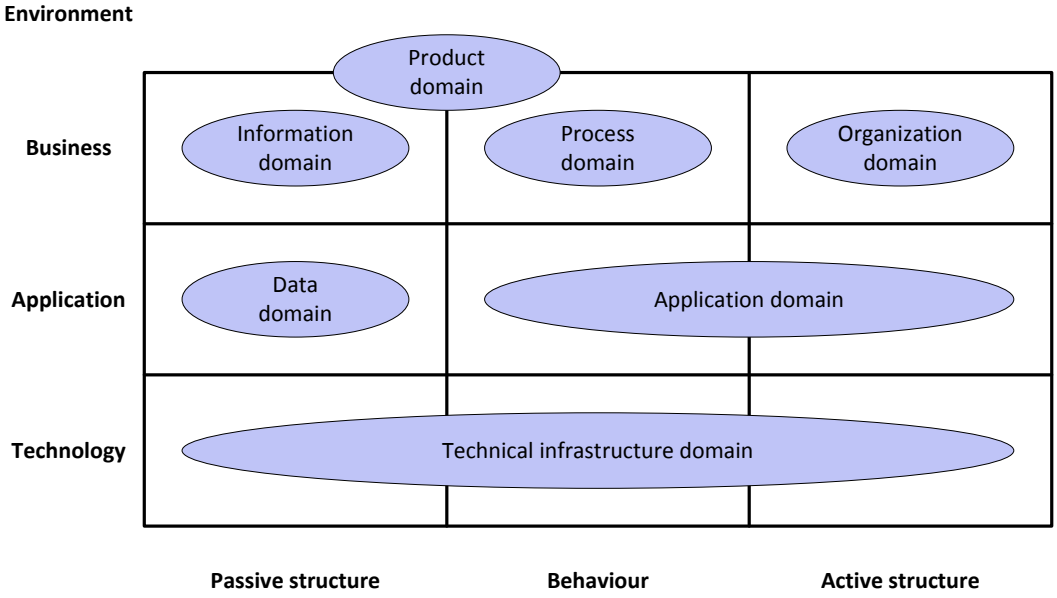

Figure 2.6: ArchiMate language framework (De Boer et al, 2004)

Figure 2.6 shows the ArchiMate language framework. In this framework the different architectural domains are depicted, which are mapped on three different main layers. The three main layers identified by ArchiMate are (Lankhorst, 2007):

1. The **business layer** offer products and services to external customers, which are realized in the organization by business processes (performed by business actors or roles).

2. The **application layer** supports the business layer with application services which are realized by (software) application components.

3. The **technology layer** offers infrastructural services (e.g., processing, storage and communication services) needed to run applications, realized by computer and communication devices and system software.

In this model, a number of architectural domains are depicted. Jonkers et al (2003) and Lankhorst & Van Drunen (2007) distinguish the following domains within the three layers:

- The **information** domain, holds all information that is relevant to enterprise architecture from a business perspective;
- The **product** domain, which describes the products or services that are offered by an organization to its customers;
- The **process** domain, describes the business functions and their process;
- The **organization** domain, describes the actors and the roles they have in the business processes;
- The **data** domain, describes what type of data can be automatically processed;
- The **application** domain, describes the software applications that enable the business functions and processes;
- The **technical infrastructure** domain, describes the technical hardware platforms and the communication they have with the supported applications.

Concepts and views

The ArchiMate language abstracts from domain-specific concepts, to make it possible to create one enterprise architecture model of heterogeneous domains. The 'compatibility' with different architectural descriptions is made possible by two design principles from ArchiMate:

1. Concepts of different languages are described in terms of the ArchiMate general concepts, the descriptions are translated into the ArchiMate model;
2. Descriptions in different languages are associated with the ArchiMate objects, this can be done with a formal mapping onto the model or with a more simple text description.

The identified domains in the ArchiMate language framework are also abstracted to general domain concepts. The domains are categorized in three columns; the passive structure (information aspect), behaviour (behaviour aspect), and the active structure (structure aspect).
With these layers and concepts of domain-specific descriptions, a set of main concepts has been made, which forms the basis of the ArchiMate language. A detailed overview of the concepts is given in the ArchiMate Quick Reference (see Appendix IV). Figure 2.7 shows an ArchiMate model with the general concepts. Top-down it shows the business layer, the application layer and the technology layer.
On each layer, the concepts of a general enterprise architecture are depicted. Between the different concepts and layers, relationships are identified. This brings the advantage of being able to see for example which application components are linked to specific processes or network nodes. For different stakeholders, different views can be identified which only show the relevant information.

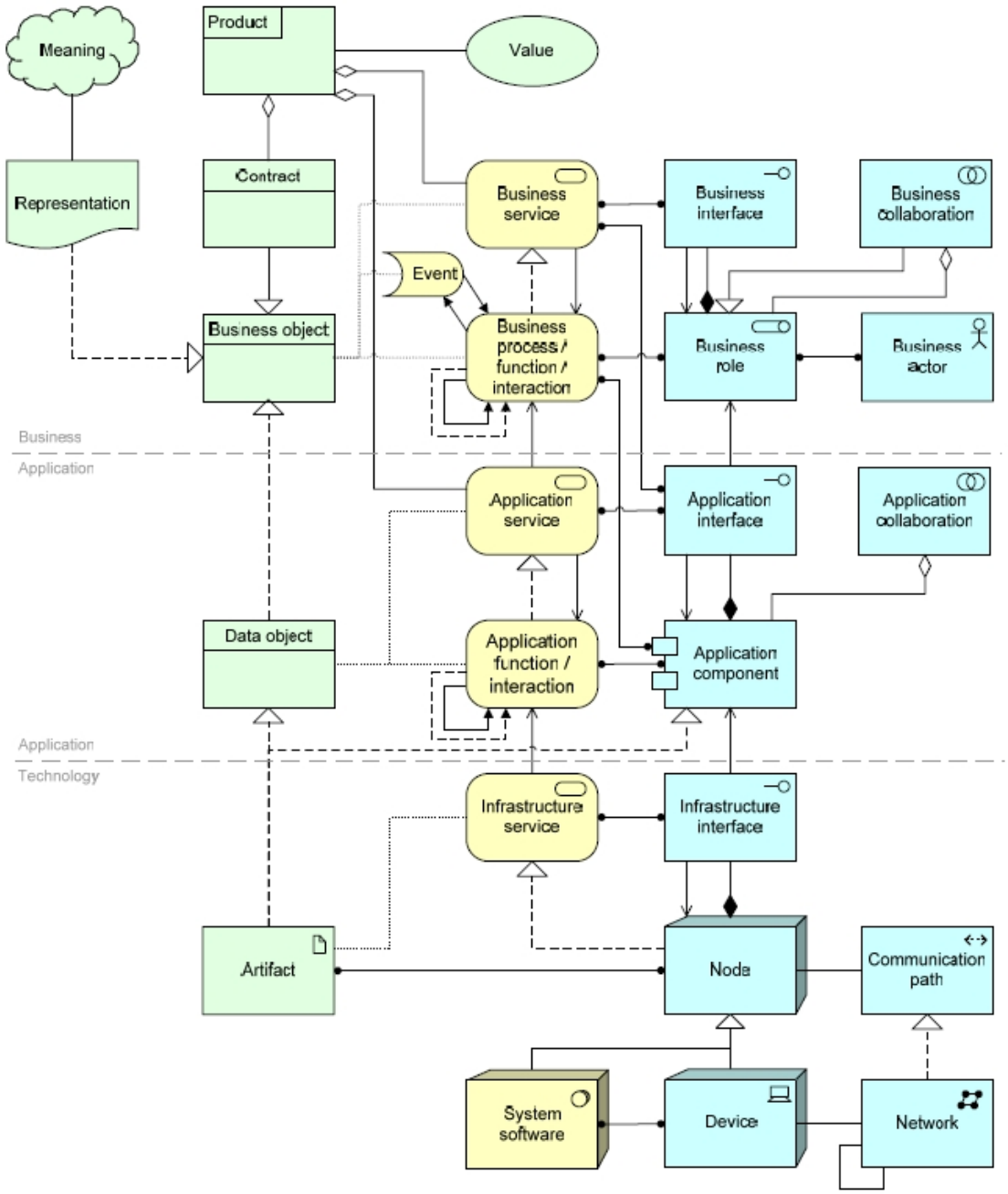

Figure 2.7: Three layers with concepts and relations of ArchiMate (De Boer et al, 2004)

ArchiMate example

In Figure 2.8 a service-oriented architecture of an insurance company modeled with the ArchiMate framework is shown. The example shows seven layers which cover the three main layers, the business, application and technology layer. On each level different components or roles are identified, for example the client role which is a client of the ArchiSurance company. The business services are in this example related with the specific business processes. The business processes are realized by the application services and components. The components are in turn realized by the IT infrastructure and IT components. Clearly can be seen that all components in the enterprise and IT architecture are related. This enables quick impact analyses of changes and migrations in IT integration projects. The concepts in the ArchiMate view are chosen on such a generic level that processes and IT components are

visible and are linked with the front end of an organization, the customer and the products and services of the organization.

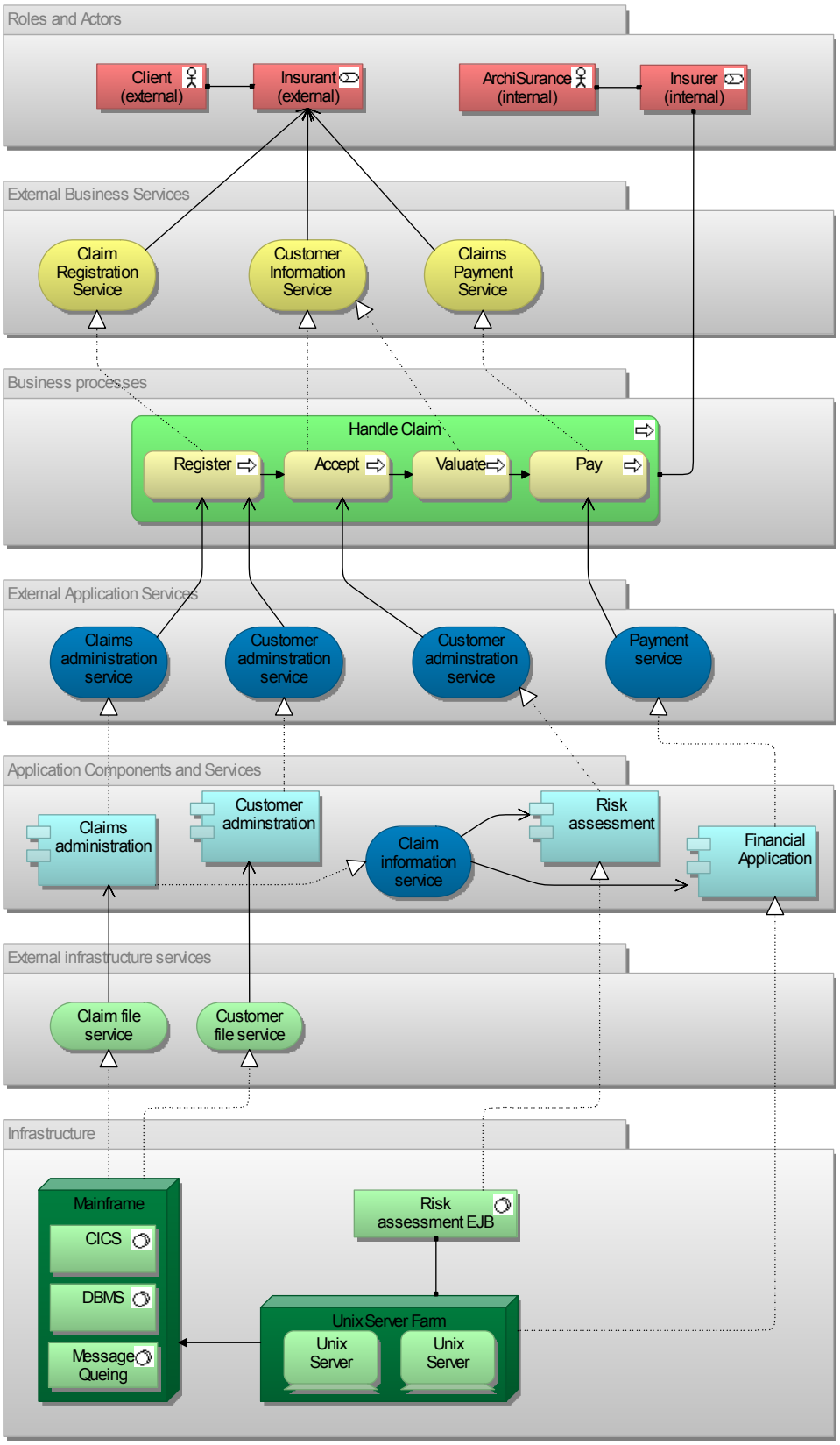

Figure 2.8: Service oriented enterprise architecture of an insurance company (Jonkers et al., 2007)

2.2.3 IEEE Std. 1471-2000

Explanation

The IEEE Std. 1471-2000 architecture framework gives a standard for the design of software-intense systems. It displays a number of concepts (entities) and relationships, which form the basis for architecture.

Design principles and methods

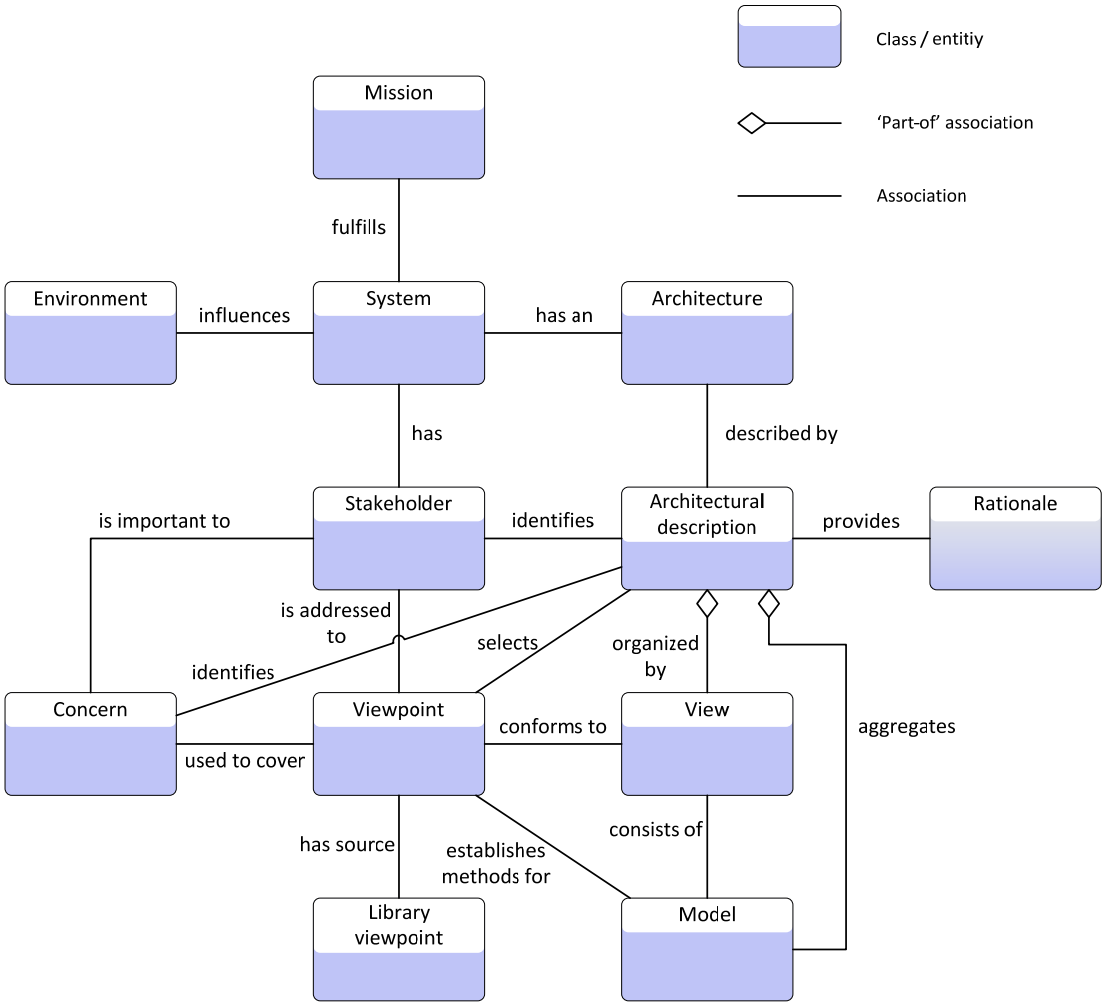

Figure 2.9: Conceptual model of architectural description (IEEE Std. 1471-2000)

The IEEE Std. 1471-2000 gives a list of architectural descriptions for where this standard is being used in practice for describing architectural information in system development (IEEE, 2000):

a. Expression of the system and its evolution;

b. Communication among the system stakeholders;

c. Evaluation and comparison of architectures in a consistent manner;

d. Planning, managing, and executing the activities of system development;

e. Expression of the persistent characteristics and supporting principles of a system to guide acceptable change;

f. Verification of a system implementation's compliance with an architectural description;

g. Recording contributions to the body of knowledge of software-intensive systems architecture.

Concepts and views

The entity-relationship diagram (ERD) in Figure 2.9 displays a number of entities and relationships which are important for the architectural viewpoints (IEEE, 2000). For reading purposes, the multiplicities are not shown.
Analyzing the IEEE Std. 1471-2000 framework it shows the world view of architectural design. As said, in this model the concept of system plays a central role. From here on the conceptual model will be described from a systems' view. Only the most relevant concepts and relationships are described.
The system in general is influenced by its environment. A change in the environment should result into a change to the system, in order to keep the alignment with the environment.
The system is designed to fulfill a specific (or more than one) mission. It is the reason of existence for the system. The mission is important to the stakeholders of the system. In addition to that, stakeholders have certain concerns relative to the system. These concerns involve the development or operation of the system, but are always concerning a critical aspect of the system. Examples are performance figures, security levels, applicability, effectiveness, etc.
Key stakeholders are the architect and the client, other stakeholders include users and developers. The architect designs the system for a client on basis of a request. The objective of the architecture differs along the goal the client has, the architect has to keep this in mind during the design. Further more, this could be a design criterion. The architectures of two existing systems (for example enterprise architectures) may be used during IT integration in the post-merger phase of the deal. Both architectures should therefore be prepared and usable for this purpose.
The concept of view conforms to a viewpoint, in such a way that the viewpoint determines how the view is created. Certain tools or modeling methods can be used for the representation of the view, for instance the Unified Modeling Language (UML).
Every system is designed according a specific architecture. This architecture is the defined set of design rules and conventions. The architecture is described by an architectural description. This description forms the basis of the view and rationale by which an architecture is designed.

The architectural description can be used for a variety of tasks, the following have been identified by IEEE (2000):

- Analysis of alternative architectures;
- Business planning for transition from a legacy architecture to a new architecture;

- Communications among organizations involved in the development, production, fielding, operation, and maintenance of a system;
- Communications between acquirers and developers as a part of contract negotiations;
- Criteria for certifying conformance of implementations to the architecture;
- Development and maintenance documentation, including material for reuse repositories and training materials;
- Input to subsequent system design and development activities;
- Input to system generation and analysis tools;
- Operational and infrastructure support; configuration management and repair; redesign and maintenance of systems, subsystems, and components;
- Planning and budget support;
- Preparation of acquisition documents (e.g., requests for proposal and statements of work);
- Review, analysis, and evaluation of the system across the life cycle;
- Specification for a group of systems sharing a common set of features (e.g., product lines).

The tasks and addressed issues in the list are typically parts of the post-deal phase of an M&A process. The process of IT integration is built up of some tasks, which can be done with the help of enterprise architecture frameworks.

2.3 Comparing the enterprise architecture frameworks

In the preceding section the whole scope from enterprise to IT architecture engineering has been described using three architecture frameworks. The three described enterprise architecture frameworks have a different approach in enterprise or IT architecture engineering, but they share some important issues.
ArchiMate identifies three layers (business, application and technology) of architecture, where TOGAF with its ADM process also identifies the need for these architectural views. TOGAF adds another layer, the data architecture view. From an ArchiMate point of view, this layer is covered by the inter-domain relationships between concepts of different architecture layers. The categorization of the views and viewpoints of TOGAF uses the same taxonomy as the IEEE Std. 1471-2000 framework. As these categories of both frameworks are compliant, this enables the comparison and abstraction from concepts for the creation of the conceptual model. The IEEE Std. 1471 only supports architectural design on the technology layer, and partly on the application layer. These results are drawn in Figure 2.10.

	TOGAF	ArchiMate	IEEE Std. 1471-2000
Business	✓	✓	✗
Application	✓	✓	–
Technology	✓	✓	✓

Figure 2.10: Organizational architecture coverage

ArchiMate differentiates three architectural domains, the business, application and the technology level. In these three levels a number of viewpoints have been identified which show the scope of ArchiMate. TOGAF recognizes almost the same views in the TOGAF ADM development process (Figure 2.11). This enables a one on one comparison between the views of TOGAF and the viewpoints of ArchiMate. The business layer corresponds with process H, A and B, the application layer corresponds with process G and C, and the technology layer corresponds with process F, E and D. The overlap in views on the three organizational layers are used to determine the most important enterprise architecture concepts in the conceptual model.

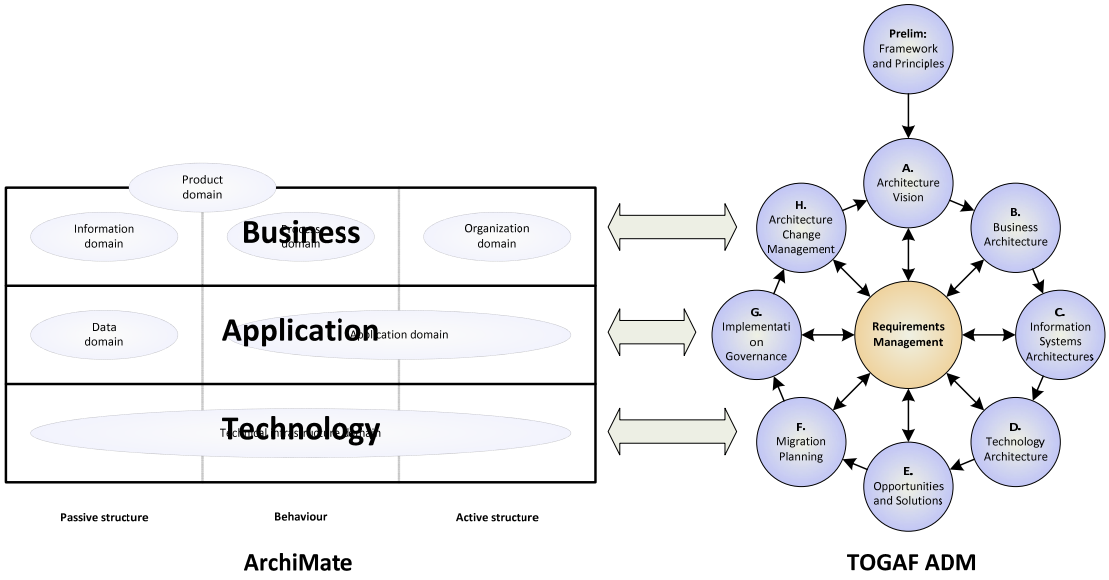

Figure 2.11: Correspondence between ArchiMate and TOGAF (Lankhorst and Van Drunen, 2007)

The identified uses and tasks for the IEEE Std. 1471-2000 framework tend to be very general. Consequently, the uses and tasks are also applicable for the other two frameworks, especially for the IT architecture engineering part of ArchiMate and for some aspects of TOGAF.

2.4 Chapter summary

The goal of this chapter was to answer the first two research questions of enterprise architecture:

- *What are enterprise architectures?*
- *How are enterprise architectures classified and which views upon the real world are used?*

In this chapter the concept of enterprise architecture has been explained. An enterprise architecture can be seen as an integrated architecture of a collection of all components existing in an organization (Dietz, 2004; TOGAF, 2007).
Enterprise architectures are used for several purposes. The uniform design principle of an enterprise architecture framework ensures the compatibility of different architectures and understanding among stakeholders.
This enables the possibility of using enterprise architectures for communication purposes, decision making upon existing architectures and project planning. In chapter 3 the IT integration process and its sub-processes will be described in more detail.

Three enterprise architecture frameworks are introduced. These are the ArchiMate framework, the TOGAF framework and the IEEE Std. 1471-2000 framework. For each enterprise architecture framework the core capabilities and tools are shown, as well the views or different architectures they identify.
The three frameworks differ on the level of used concepts and applicability, the TOGAF framework is used for architecture on the enterprise level, ArchiMate is used for architecture on the enterprise and IT level, and the IEEE Std. 1471-2000 framework is only used for the IT architecture.

3 IT integration

The preceding chapters described the areas of business integration and enterprise architectures. In this chapter an overview of IT integration is given as part of the post-deal phase in an M&A. Important subjects on this matter are the business IT alignment, integration strategies, the integration process and the available integration methods for application and IT infrastructure integration.

3.1 IT integration

After the deal in a merger and acquisition process has taken place, the post-deal phase starts. The IT integration process is one of the activities in this process. The post-deal phase is where the intended synergy value has to be created. This phase bears great value in the perspective of merger success. This means that the merger success depends on the intended IT integration outcomes. Along with the merger objectives, IT integration is considered one of the key issues in merger success (Wijnhoven et al., 2006). Despite the high importance of IT in an organizational integration process, it is often seen as a closing entry. This results in poor IT performance, delays in project planning and too much focus on the strategic and organizational fit between the two merging organizations.
To meet the intended IT integration objectives, an integrated view of strategic, organizational and IT characteristics is needed. Such views are not trivial, and there no methods available which deliver a 'one size fits all' integration project (Wijnhoven et al., 2006).

IT integration can be described as the linkage of two previously separated IT systems, but this only addresses the physical linkage of IT integration (Markus, 2000). To realize intended IT synergies with the IT integration, more effort is needed than just linking the IT systems. The IT needs to be in line with business processes and service, to enable the merged front-end sides of the new organization.

3.1.1 Business IT alignment

Central in the process of IT integration stands the business IT alignment. From the classic belief business is where the money is earned and IT is considered as a cost center. Although, in current business, IT is often a core competence of the organization. IT enables the business and thus the offering of products and services by a company. Think for instance of banks and insurance companies. Their products are almost completely computerized, handling millions of transactions per year, calculating risks, storing large amounts of data, etc.
From a business IT alignment perspective, the IT integration process has to be shaped and managed. The strategic alignment model from Henderson and Venkatraman (1992) in Figure

3.1 depicts the concepts and relationships of this concern. The four main areas of interest on this matter are the business strategy, the IT strategy, the organizational infrastructure & processes and the information system infrastructure & processes.

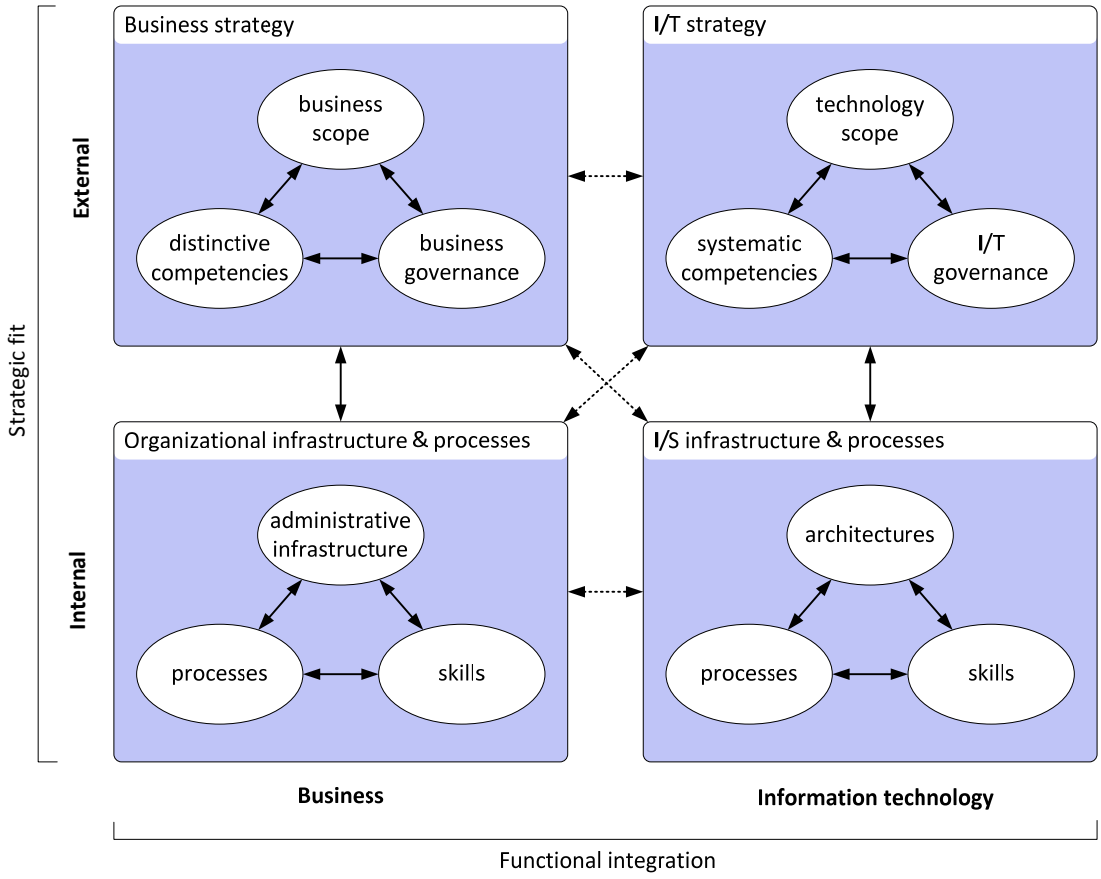

Figure 3.1: IT integration alignment model (Henderson and Venkatraman, 1992)

The four main areas are all related to each other. From the business strategy the organizational infrastructure and processes are shaped, the same accounts for the IT strategy; it determines the layout of the I/S infrastructure and the processes. Within each of the four areas different concepts are identified which describe how the specific area are designed.
The solid arrows depict the relations between the area's with the same functional integration, e.g. business or IT. The dashed arrows on the other hand depict the relations on the level of strategic fit, internal or external. Within change projects in the post-deal phase of an M&A, the alignment in an organization is initiated on the external level of strategic fit. This means that a top-down project planning and decision making is needed to realize the desired level of business IT alignment (Alaranta and Henningsson, 2008).

3.2 IT Integration strategies

To realize an integrated IT architecture from the separated IT architectures different integration objectives and methods are conceivable. The IT integration objective is derived from the merger objective and implicates the applicability of integration methods.

3.2.1 IT integration objectives

The IT integration objective is part of the IT integration strategy. The strategy defines the vision and future state of the current and acquired IT infrastructure. From the merger objective, a desired level of IT integration is derived. The IT integration objective can be defined as a merger ambition level. The following three levels can be identified (Wijnhoven et al., 2006):

1. **Complete integration**, this is the highest level of IT integration. Two separate IT architectures are completely merged;

2. **Partial integration**, only the most important IT processes and systems are integrated. These IT components contribute the most to the anticipated IT synergy. The integrated parts are most often the business processes or products and or services with the highest IT intensity. Other IT processes and systems are dealt with in a later stage, possibly changing the integration objective to complete integration.

3. **Co-existence**, this is the lowest level of ambition. With this objective, the current and the acquired IT remain unchanged. They are linked with each other for data exchange and consolidation if necessary. This objective is appropriate if IT synergy is not an objective on the short term, having high upkeep costs and maintenance.

The three identified ambition levels of IT integration objectives can be aligned with the merger objectives from an M&A process. The merger objective with the lowest level of integration (holding) is not applicable in IT integration. It prescribes that both entities are totally left intact, without any linkage. If that would be the case, there isn't any form of IT integration. In Table 3.1 the three levels of merger ambition are shown, together with the appropriate IT integration objective.

Integration ambition	Merger objective	IT integration objective
High	Absorption	Complete integration
Moderate	Symbiosis	Partial integration
Low	Preservation	Co-existence

Table 3.1: Merger and IT integration objectives (Wijnhoven et al., 2006)

3.2.2 Aspects of IT integration

As described earlier, mergers and acquisitions are complicated processes with numerous aspects. Issues arise on the level of infrastructure, vision, culture, IT intensity, etc. The same is true for IT integration.
Based on literature, six dimensions of IT integration in mergers and acquisitions can be identified (Henningsson and Carlsson, 2007). Table 3.2 lists the six dimensions along with a description and their classification.

Dimension	Description	Classification
Synergetic potential		
Technical economies	Synergetic benefits from merging physical processes so that a higher output can be realized with the same amount of input.	Marketing, production, experience, scheduling, banking, compensation
Pecuniary economies	Increased ability to dictate market prices due to having more market power and market size.	Monopoly
Diversification economies	M&A can result in having more diversified skills and competences; this realizes the ability to develop different products for unrelated markets to spread risks.	
Organizational integration		
Interdependency type	Organizational units with relations to each other can have three types of mutual dependencies.	Pooled, sequential, reciprocal
Degree of integration	The aspirated merger objective.	Holding, preservation, symbiosis, absorption
Cultural difference	Cultural differences between merging organizations can lessen the merging capabilities.	Similar, colliding
Integrated activity	Which part of the organization being object for integration is related to the amount of resources needed?	Operational, functional
Intentions & reactions		
Friendliness / hostility	The merger can have a friendly or hostile intention. The merger intention is based on the stated objective.	Rescue, collaboration, combination, takeover
Reaction	Changes in the organizational environment trigger different reactions amongst empoyees.	Turnover rate, level of distrust
Phase-models	An M&A process can be modeled according a phase-model, although different models are using a different number of phases, the process is similar.	Pre-deal, post-deal
IS ecology		
Function	The IS ecology exists of different IS systems. The functions of these systems differ, to create a new IS ecology after a merger, and functional dependencies should remain intact.	Infrastructural, informational, transactional, strategic

Integration architecture		
Integration level	Post-deal enterprise integration can take place on several levels; the merger objective should inherit the aspired integration efforts.	IT, infological, organizational
Integration structure	Within the enterprise architecture, the IT systems can be linked with each other in several ways.	P2P, middleware, Enterprise-wide, Meta-level, SOA
IS integration role		
Proactive / reactive	Within the M&A process, IS/IT integration takes currently mostly place in the post-deal phase, where it also should be part of the pre-deal, due diligence phase.	Proactive / reactive

Table 3.2: Six dimensions of IT integration in M&A's (adapted from Henningsson & Carlsson, 2007)

The six dimensions of IT integration depict the area's on which certain decisions have to be made. The results of these decisions imply certain behavior from the target organization. Between some of the six dimensions relationships can be identified, which are critical success factors in the process and synergetic potential of IT integration:

1. **Synergetic potential – organizational integration**, the desired level of IT synergy determines the IT integration degree and used method. Higher synergetic advantages require significant higher level of efforts and resources;

2. **Synergetic potential – IS integration role**, the IS integration role can be performed in a proactive or reactive way. For high levels of synergetic advantage, the IT integration should be taken into account in early stages of the merger process. Proactive behavior is thus required.

3. **Organizational integration – intention and reactions**, the factors listed in the dimension intention and reactions determine for a great part the success and feasibility of the organizational integration. The merger intention and reactions from employees are possible obstacles in the integration process and result.

4. **Integration architecture – IS ecology**, the function of the IS ecology, e.g. business critical or support systems, have an impact on the applicable integration architectures. Not all types of linkage are suitable for business critical systems.

5. **Integration architecture – IS integration role**, the type of IS integration role influences the result of the integrated architecture. A reactive role results in a more gradual conformation of the IT architecture to the merger objective.

Concluding, the merger objective, the chosen integration method and the IT role are important issues in realizing merger success. The five critical success factors make clear that integration choices have to be made to realize the intended IT synergy. To be able to make these

decisions the right information is needed, which should be delivered by the use of enterprise architectures. Different integration stakeholders exist, which have a different role in the success factors. Their information needs differ, and the total information supply by the enterprise architecture should cover all the different needs. In the empirical research the delivered information of the enterprise architecture is mapped against the stakeholder's information needs.

3.3 IT integration process

When the strategy and integration objectives of a merger project have been set up, the integration planning has to be designed. The integration planning process consists of a number of tasks, located in the pre-deal and the post-deal phase. These tasks are the setting of strategic objectives, search and screening, strategic evaluation, financial evaluation, negotiation, contracting, designing the integration strategy, designing an integration plan, and executing the integration plan (Alaranta and Henningsson, 2008).

3.3.1 Integration plan

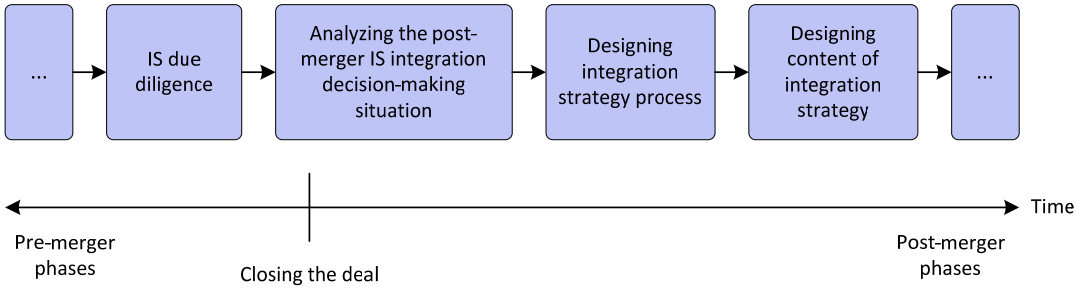

Figure 3.2: The post-merger IT-integration plan (Alaranta and Henningsson, 2008)

Alaranta and Henningsson (2008) propose an approach for analyzing post-merger IT integration plans, of which the identified phases are depicted in Figure 3.2. The most important phases for the post-merger IT integration plan are:

- The pre-merger **IS due diligence** for assessing the assets and IT environment of the acquired organization. This information is used to determine the acquisition price;
- The **analysis of the post-merger IS integration decision-making situation**, who will participate in decision-making, how can this process be configured, etc.,
- Deliverables from both preceding phases is used to design the **integration strategy process**, this results into the configuration of the planning profile to shape the decision-making process;
- The planning profile is then used to **design the content of the integration strategy**; this holds the actual tasks to be done in the integration project, the chosen integration method, etc.

From this analysis of the post-merger IT integration planning process a number of key aspects can be derived that play a significant role in the degree of effectiveness and success of the IT integration process. It is crucial that sufficient attention is paid in the IT integration process to these identified aspects (Alaranta and Henningsson, 2008; Earl, 1993):

1. **Communication**, between the different stakeholders and phases in the IT integration process communication takes place in the form of documentation, alignment and information sharing. Project teams can only succeed if they are able to access all important information and share results with others;

2. **Decision making**, from the acquired and existent organization both environments needs to be assessed to determine which skills and knowledge is at hand. On basis of derived information decision-making should be made possible. Also the right person should be chosen to guarantee the right outcomes for the organization;

3. **Project management**, the IT integration planning process consists of numerous tasks and deadlines. The project needs good management in terms of facilitating the IT integration project, time planning, deliverables, and involve the right stakeholders and knowledge-carriers.

The success factors from section 3.3 are part of the three identified aspects. The aspect are used in the empirical research to assess the usability and relevance of enterprise architectures in IT integration projects.

3.3.2 Stakeholders

In the integration process different stakeholders are responsible for a part of the process. To be able to do their job as intended they need the appropriate information. This information can be identified as the information needs of a stakeholder. These needs are information requirements in the IT integration process, which should be supplied by the used enterprise architecture.

Organizational layer	Stakeholder
Business layer	
	CIO
	Business manager
	Project manager
Application layer	
	CIO
	Project manager
	Application developer
	User
Technology layer	
	CIO / CTO
	Engineer

Table 3.3: Stakeholders

For this research a number of stakeholders are identified which have relevance to the total integration project. They are differentiated on the three organizational layers, showed in Table 3.3 (Alaranta and Kautz, 2007; TOGAF, 2007).

3.4 Application integration methods

The highest level of integration is realized with complete IT integration. This delivers the highest potential IT synergy, especially in high intensity IT environments such as banks, insurance companies and telecom companies.
In this research only the complete IT integration scenarios are investigated. These are the cases in which the merger objective is to realize high synergistic advantages from the merger. These synergistic advantages can be expressed in solid numbers with regard to profit or turnover, business goals or reorganizing organizations.

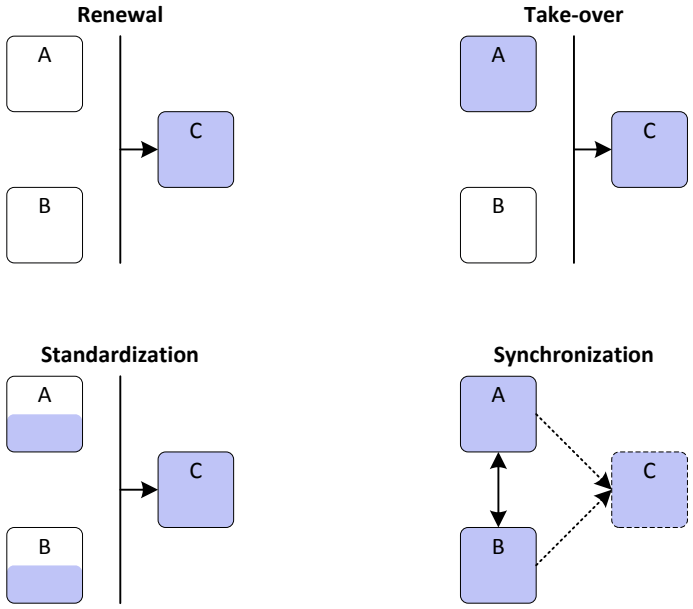

Figure 3.3: IT integration methods (Wijnhoven et al., 2006)

According different sources (Johnston and Yetton, 1996; Wijnhoven et al, 2006) there are four different methods available for realizing complete IT integration (Figure 3.3). These are:

1. **Renewal,** with this method the existing IT environment and processes from organization A and B are completely abolished. Instead, a complete new IT architecture is designed and realized for the merged organization. This requires a lot of time and resources, and may not bring the anticipated IT synergy on the short term. In the long run the business IT alignment could be optimized to a high level, but from the business continuity perspective it is not an easy option;

2. **Take-over**, with this method, one of the two existing IT environments of the merging organizations will replace the other. The newly formed organization adopts on of the two IT environments, which suits best from a business IT alignment perspective. In this situation, either the IT environment of organization A or B, will become the sole IT environment, C, in the merged organization. This enables fast integration of both companies, but may lack complete support of all business operations. Next to this, this may cause resistance from one of the two merging partners. Some mergers originated with this method in mind, when one of the two IT environments is far superior to the other, it enables a big improvement for the other partner.

3. **Standardization**, is the process of combining different parts from both merging IT environments, A and B, to form the new IT environment C. From both IT environments the best parts are selected from a business IT alignment perspective. Both companies may have IT solutions for the same functions, in that case the best option is selected for the merged IT architecture. This is also known as the best-of-breed strategy.

4. **Synchronization**, with this method the original IT environment from both merging partners, A and B, are left intact. The two IT environments are linked with each other with hardware and software bridges. This enables data exchange and (periodically) synchronization of data. The combination of both IT environment A and B can deliver new data which is stored or processed in the (small) newly form IT environment C. All three environments (A, B and C) stay intact and in use in the merger organization. Although this is a method for IT integration, it delivers only slight synergistic advantages, but may be in line with the merger objectives.

3.5 IT integration methods

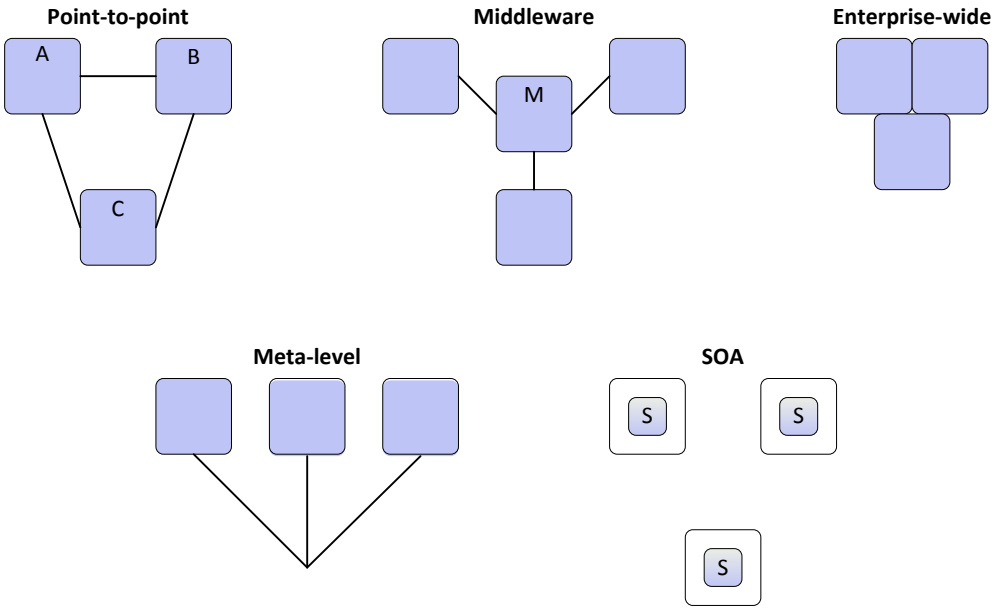

Figure 3.4: Technical solutions for IT integration (Henningsson and Carlsson, 2007)

The four IT integration methods depicted in Figure 3.3 describe how different IT environments from merging partners can be integrated. They prescribe possible linkages and in which situation they are applicable. Next to this issue of merging IT environments from two merging partners, there is the issue of how to link the different IT systems on a technical solution level. There are different possibilities to link different IT systems or applications, five possible solutions are depicted in Figure 3.4 (Henningsson and Carlsson, 2007; Markus, 2000).
The five solutions depict how the target IT environment can be designed. In comparison with Figure 3.3, the solutions depict the target situation 'C', but zoomed in on a lower level.

Point-to-point refers to the software bridge that is installed between all applications, enabling communication between them. The middleware solution is in fact the same solution, but replaces all separate software bridges with one central bus through which all applications are connected. An enterprise-wide solution refers to the use of an enterprise resource planning (ERP) system. Different applications share the same database, thus reducing the number of redundant information. Integration on the meta-level adds a meta-layer on the different systems. Information is extracted into data warehouses, enabling data operations on all data instead of on separate systems. At last, the service oriented architecture (SOA) which can be seen as a software or architectural design. It accesses software via an interface, enabling the use of software modules, called services.

3.6 Chapter summary

This chapter gave an answer to the first three research questions on IT integration:

- *Which integration strategies can be used to integrate IT architectures?*
- *How does an enterprise architecture improve business IT alignment?*
- *How is the post merger IT integration process designed?*

Three IT integration strategies for realizing synergy have been identified, complete integration, partial integration and co-existence. The holding strategy does not deliver any synergetic benefits. From these integration strategies a IT integration method can be chosen.

Integration ambition	Merger objective	IT integration objective
High	Absorption	Complete integration
Moderate	Symbiosis	Partial integration
Low	Preservation	Co-existence

Table 3.4: IT integration strategies

An enterprise architecture delivers an integration view for business, application and technology. With this, the impact of changes on any level show the result on other levels. This enhances the business IT alignment process. Enterprise architectures without this integrated view lack this possibility, and are thus not improving the business IT alignment issue.

The IT integration process is described, covering the pre- and post phases of the merger. From this process three aspects have been derived which influence the success of the post merger IT integration.

Research design

4 Empirical research

The theoretical framework provides a basis for the empirical research. In this chapter the empirical research methodology and the conceptual model are described. On basis of the theoretical framework the conceptual model and the information requirements model are made which are used to assess the usability and relevance of enterprise architectures in practice.

4.1 Methodology

In order to be able to answer the stated research questions in this research, a theoretical and empirical research study is conducted. The empirical research continues where the theoretical research ends. On basis of findings in the theoretical framework, the empirical research approach and methods are chosen. For this empirical research, a case study research approach is selected.
The case study research method is an empirical research approach that investigates contemporary events or phenomenons within their real-life context. Thereby it doesn't require control of the behavioral events. This enables the investigation of events, such as mergers or IT integration projects, that took place in the past. Furthermore, the case study research approach is a method by which qualitative research questions can be answered, such as how and why questions. This results in the explanation of events in terms of descriptive or prescriptive measures (Yin, 2000).

The case study research approach is most successful when the inquiry relies on multiple sources of information. The different sources of information are used to triangulate the observations and evidence. Within this triangulation, prior theoretical propositions can be included for analysis. Different sources of evidence are further needed for the internal and external validation of the results.
In this research two types of sources are selected in the case study research approach. These are documentation and interviews, which are described in more detail in section 4.4.
The sources of evidence are used to assess the usability and relevance of enterprise architectures in practice during IT integration projects after a merger. To comply with the needed quality aspects of case study research, a conceptual model is designed to map the gathered information from both sources to the identified concepts and issues from the theoretical framework.

4.2 Research variables

The research model is used to identify the relationships, similarities and differences between the concepts derived from the theoretical framework and the gathered information from the different sources of evidence in the empirical research.

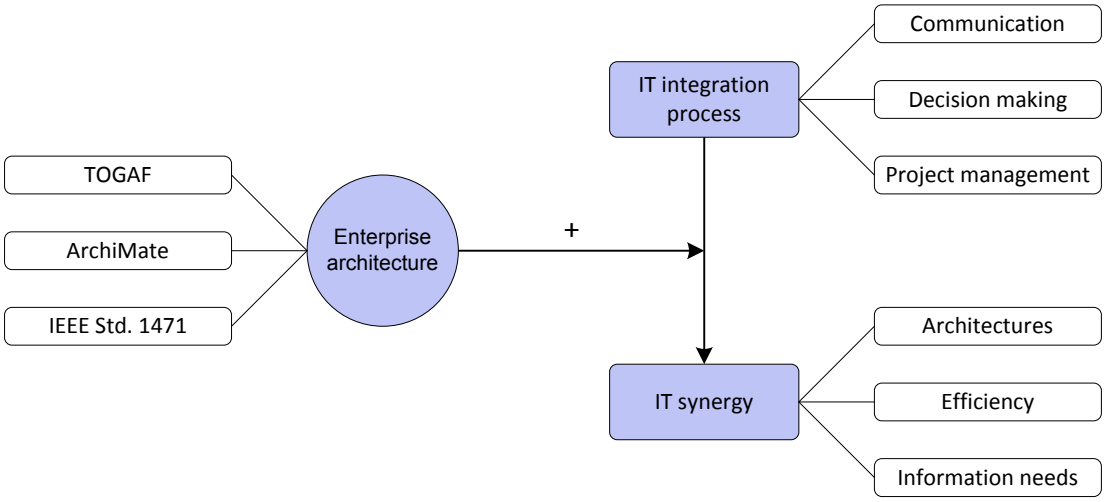

Figure 4.1: Research concepts

In Figure 4.1 the main research concepts from the research question and research objective are related with each other on a schematic way. This research aims at assessing the proposed positively relation of the usage of enterprise architectures in IT integration projects after a merger with an integration objective of realizing IT synergy. The theoretical basis of modeling enterprise architectures of enterprise and IT environments showed that it is a dynamic exercise. During the IT integration project, preliminary results are used to improve or alter the enterprise architecture.
The research concepts are the assessed enterprise architectures (TOGAF, ArchiMate and IEEE Std. 1471), the IT integration process with the three identified aspects (communication, decision making and project management) and the integration objective IT synergy with three levels on which is measured (architectures, efficiency and information needs). The selected enterprise architectures are assessed using the three aspects of the IT integration process and their relevance and usability to realize IT synergy with the use of a conceptual model (section 4.3). With the use of the conceptual model, the IT synergy is measured on the ability of the enterprise architectures to deliver an integrated architecture and the efficiency of the entire process.
The information needs of the different stakeholders in the IT integration process are assessed using the information requirements model (section 4.4).

4.3 Conceptual model

On basis of the theoretical framework, a number of key aspects of the IT integration process are operationalized. Although more aspects play a crucial role in the IT integration process, three aspects have been selected which have a relationship with enterprise architectures. The selected aspects which are influenced by the use of enterprise architectures are communication, decision making and project management (Figure 4.2).
The three described enterprise architecture frameworks; TOGAF, ArchiMate and IEEE Std. 1471-2000 cover together the whole spectrum from enterprise to IT architecture. Each enterprise architecture framework acknowledges concepts and views. These concepts and

views are used to select the criteria on which the information from the case study research is mapped against the aspects of IT integration. The criteria are placed on three different organizational layers; business, application and technology. These are the same levels used by the TOGAF and ArchiMate framework.
The concepts and views from the three enterprise architecture frameworks are generalized to create more abstract concepts for the case study research. It is evident that in different projects, not all aspects and enterprise architecture concepts are addresses by the same name.

Organizational layers		Aspects of the IT integration process		
		Communication	**Decision making**	**Project management**
Business	Business architecture			
	Change management			
	Processes			
	Competences			
Application	Information systems architecture			
	Change management			
	Competences			
Technology	Technology architecture			
	Change management			
	Components			

Figure 4.2: Conceptual model

On each organizational layer a number of concepts are chosen to assess the relevance and usability of the enterprise architectures used in the case study research. For each organizational layer the architecture is an important subject. Creation, usage and relevance of the architecture is the main concept of using enterprise architectures. The three architectures (business, application an technology) are preferably related with each other for maximum usability in realizing synergy in the IT integration process.
The next identified concept is change management. Change management is in this context the ability to change an organization with a specific target situation. Change management is an issue which is present on all organizational layers. The business needs change, processes, functions and roles are changed. On the application layer new applications will be integrated and others will be eliminated. Also the technical infrastructure needs to be adapted to the new situation. Cross-organizational people will have to change, which is one of the most important factors in realizing post merger IT synergy.

On the business layer an extra concept is identified, business processes. Business processes are the basis of the delivered products and services of an organization. Enterprise architectures should be able to assess and model these processes.
The last concepts are competences and components. For the business and application layer the needed competences are assessed in the enterprise architecture. This involve the needed skills and present skills in an organization seen from the, integrated, target organization. On the technology layer the components are assessed, as they are often not included in enterprise architectures. The most software (application) engineering architectures have some support for business processes but lack support for modeling the technical infrastructure.

4.4 Information requirements model

On basis of the identified stakeholders an information requirements model is made (Figure 4.3). On the three different organizational layers different stakeholders exist. These stakeholders have certain information requirements. This information need can be provided by the use of enterprise architectures. The possible views of an enterprise architecture should support and provide this function to have relevance for the organizational-wide selected information requirements. If the information is harsh to identify or is not present due to missing views of the enterprise architecture the usability of that enterprise architecture framework method degrades.
The information requirements model recognizes the different stakeholders on the three organizational layers, their information needs, specifies what information is provided by the use of enterprise architectures and at last what information is missing.

Stakeholders		Information needs	Provided by EA	Missing information
Business	CIO			
	Business manager			
	Project manager			
Application	CIO			
	Project manager			
	Application developer			
	User			
Technology	CIO / CTO			
	Engineer			

Figure 4.3: Information requirements model

4.5 Selected case studies

The research objective of this study forms the context in which the case study research is conducted. Within this context, three cases have been selected to have more units of analysis to be able to generalize common results. The research context for the case study limits the scope to IT intense organizations in the financial area, such as banks and insurance companies. The witnessed event is considered a merger and acquisition, followed by an IT integration project.
The first selected case is the acquisition and merger of Caisse Centrale de Réescompte (CCR) Group by the Swiss bank UBS. The second case is the acquisition of AXA, DBV and Winterthur by SNS REAAL. The integration of IT and operations of AXA and REAAL had already started when the acquisition of DBV and Winterthur was initiated by REAAL. This meant that the current integration process was stopped ad-hoc, and the new plans for integrating the four entities had to be made. The last case is the merger and integration of two insurance companies, Achmea and Interpolis. All three case studies are described in more detail in appendix I, II and III.

For the three selected cases information sources are selected to witness the IT integration process. To enable the possibility of information triangulation for all three cases interviews were held and documentation was gathered (Yin, 2000).

4.5.1 Interview design

Interviews are one of the most valuable sources of information in case study research. Qualitative information is gathered from interviewees who were directly involved in the investigated event. This is also one of the strengths of interviews as an information retrieval method; the gathered data originates from a source that was directly interfered with the observed event. On the other side, the interview method has also a number of weaknesses; it can be greatly biased due to poorly constructed interview questions and by biased responses from interviewees.
Bearing these strengths and weaknesses in mind an interview protocol has been constructed to deal with most of the weaknesses. The interview protocol is used as a guide during the interview sessions. This way, all topics which should be covered are dealt with. The phrased questions are based on the conceptual model which on its turn are derived from the theoretical framework. The questions contain this56
56
way only generalized concepts which are applicable to multiple IT integration projects. The interviewee bias is greatly reduced by the general concepts in the questions. The used interview protocol can be found in appendix V.

For all cases multiple interviews are held to ensure the triangulation possibility and reducing the bias of the results. For every case one employee was interview who was directly involved in the IT integration project, and one external consultant from KPMG who was indirectly involved in the IT integration project. This setup guarantees detailed results from the witnessed merging organizations as well as an unbiased view of the IT integration project.

4.5.2 Documentation

During IT integration projects numerous documents are created and used. These for instance are enterprise architectures of the as-is and the target situation, project planning's and documents such as presentations and brochures for information sharing.
Documentation created and used during projects are a stable source of information. Once the information is stored in a document, it doesn't change over time. It was already existing

before the case study, this means, it is not the result of the case study researcher. The data found in documentation and records hold exact information and details of the event. On the other hand, it can be very difficult to retrieve the documents wanted. They can be restricted from access to externals, or simply by not knowing that the certain documentation is present.

For the case study research on all cases this kind of documentation is gathered to assess and map against the concepts and aspects in the conceptual model. The documents enable further more the triangulation of information gathered from interviews. The type and a description of the used documentation are described in the corresponding appendices to the selected cases.

Results

5 Enterprise architecture in practice

On basis of the results of the theoretical framework the conceptual and the information requirements models are made which are used to assess the gathered data from the empirical research. In this chapter the results from the case study and interviews are analyzed. This analysis show which aspects of enterprise architectures are used and what the usability and relevance is in the IT integration process.

5.1 Case study results

In this chapter the results from the case study are analyzed and placed in the conceptual model. The case study resulted in different sources of information. The cases are described in the appendix (I, II and III).The full interview reports and the gathered documentation from the cases is only available in the confidential version of this thesis. Not all documents are listed or shown in the appendix as the owners of it were not willing to share this private information. All documents are however used to assess the information they hold to place them in the conceptual model, in the case of confidential documents the information is made anonymous or unrecognizable.

5.2 Analysis of results for the conceptual model

In the conceptual model three aspects are identified of the IT integration process during a merger project; communication, decision making and project management. For each of these three aspects is determined how enterprise architectures are contributing to this process. This assessment is done on three organizational layers; business, application and technology. Within the three organizational layers different concepts are derived from the described views of the enterprise architecture frameworks in the theoretical framework. For each of these concepts the results from the case study are examined to determine the contribution of using enterprise architectures.

5.2.1 Communication

Business layer

Business architecture
The defined business architecture is an excellent tool for communication between all stakeholders. In long term integrations such as at Achmea and REAAL (several mergers), people go and come. The business architecture can be used to align everyone, and new employees can be showed the ropes. The level of detail of the business architecture is mostly low, but this enhances the communication possibilities.

Change management
Within the IT integration process, change management is positively influenced by the use of enterprise architectures. The business IT alignment issue showed great benefits of using an architecture in which business and IT are related. This enables the traceability of changes on the business layer, and what possible impact that will have on the application layer.

Processes
Communication plays an important role in the IT integration process. After the deal has taken place the top integration committee starts with setting up an integration plan and integration strategy. The deliverables of the committee are used to form and initiate project teams who will execute the plans. In this process different stakeholders on different organizational levels cooperate with each other, and different stakes come into play. Transparent communication creates awareness and commitment, this is essential as full cooperation is needed in the integration process.

Competences
No information was found in the results of the case study interviews or documentation for this item.

Application layer

Information systems architecture
The information systems architecture made on an application level is most cases used for communication between the involved stakeholders. It is used to discuss the different possibilities after a merger and also to assess the feasibility of existing applications. The transparency of such architectures pay a great deal to the quality of the application landscape. However, it should be noted that the level of detail depends on the reader; different views of the information systems architecture are used for different stakeholders depending on their knowledge.

Change management
The impacts of changes on the application layer during the IT integration process can be checked against the constraints in the enterprise architecture. The enterprise architecture acts in this case as a solid framework. The individual project teams responsible for different tasks can check the constraints and feasibility of their proposed solution.

Competences
No information was found in the results of the case study interviews or documentation for this item.

Technology layer

Technology architecture
In all cases an architecture of the technology architecture (or combined with the application architecture) was made and used for communication purposes. It was useful for having all involved employees the same information from the project teams.

Change management
The business IT alignment issue for aligning the application landscape and infrastructure in such way that it supported and enabled the business found great help with the use of enterprise architectures. However, only in the cases where an integrated view of business, application and technology was made, the best results were visible.

Components
The components in the current situation and target situation were in all cases modeled using an enterprise architecture framework. REAAL used the integrated ArchiMate, Achmea uses a separate method for their technology, and UBS the architect modeled the technical components with an unknown method.

5.2.2 Decision making

Business layer

Business architecture
The business architecture can be modeled with an enterprise architecture. But the decisions made in the design process are not lead by the enterprise architecture. Stakes and the intended strategy from the top management shape the business architecture. The business has to make decisions, if they refuse to do this, the modeled architecture is useless. The IT side of the organization then cannot start with integration projects derived from the enterprise architecture or information plan.

Change management
After the business architecture has been made, it was used to assign project teams to the defined tasks. These project teams implemented the changes needed for the target situation. They used the enterprise architecture for checking their solutions on feasibility and constraints.

Processes
Business processes were in some cases (UBS and REAAL) modeled with a certain architecture framework. These models facilitated the design process of the target situation, it was more clear which business processes were present and the decision making over processes became easier.

Competences
No information was found in the results of the case study interviews or documentation for this item.

Application layer

Information systems architecture
Enterprise architectures are in all cases used to design the application landscape. With this ability, all existing applications in the current situation and the landscape of the target situation can be modeled. On basis of this information it is possible to objectively decide which application and systems are the best to choose. In the case of UBS and CCR it turned out that CCR had a far superior IT environment, so a take-over strategy was the best option.

Change management
In the design process of the application architecture, an enterprise architecture turned out to be a very handy tool in all cases to defend your own stakes. Merging organizations tend to praise their applications in a subjective way. REAAL is facing this problem with their best-of-breed strategy in their acquisitions. This side effect slows down the IT integration process and lowers the usability of enterprise architectures.

Competences
No information was found in the results of the case study interviews or documentation for this item.

Technology layer

Technology architecture
Also on the technical layer an architecture provides the basis information for decision making. The architecture can be setup using the existing enterprise architectures in the different cases. ArchiMate used in the REAAL case is best option for this purpose as it enables to model an integrated view of technology and applications with the business.

Change management
The results gathered for the application layer on the aspect of change management are almost the same for the technology layer on the aspect of change management. Stakeholders defend their stakes by not using the information in the enterprise architecture in an objective way.

Components
The derived technical architecture with its components is useful for communication. But it does not qualify for decision making on component selection. The level of detail of the architecture was in most cases too low. Experts needed to be consulted to have the right amount of information upon decision making.

5.2.3 Project management

Business layer

Business architecture
Enterprise architectures enable the creation of a short and long term vision of where the organization should go. This information can be translated into deadlines, milestones and planning data. This delivers the advantage of having information which can be shared among stakeholders to inform them about the whereabouts of the project. Without this type of information, employees are wary for change, and no clear direction of change is present. In almost all integration cases the integration of IT and realizing synergy meant shrinking down the number of employees. This normally creates lack of commitment and resistance to

change. If this type of information is already shared, the total commitment among all employees will turn out to be higher.

Change management
Enterprise architectures deliver a method for scoping the change process and the needed activities to come to the target situation. But it is not a tool for change management. Organizational transitions on the business level are too complicated and too much stakes are involved to guide this process on a plain objective manner. Enterprise architectures are only the result of the intended strategy and decisions of top management.

Processes
The project management processes were according the interviewees not positively influenced by the use of enterprise architectures. Project management requires a set of soft skills, were enterprise architectures only facilitate the processes requiring hard skills.

Competences
With the use of enterprise architectures it enables the possibility of modeling the business goals and solutions in an integrated way. It can show the relations between business goals and the supportive solutions for it. This delivers valuable input for the project management team in the process of determining their tasks and how it should be done.

Application layer

Information systems architecture
On basis of the enterprise architectures the integration team formed project teams which were responsible for the individual projects. An enterprise architecture made the list of projects for the short and long term clear to everyone. This lead to a number of deliverables assigned to the different project teams.

Change management
In the UBS case a short and long term integration plan was made. This was used to communicate with all involved stakeholders. This greatly reduced the level of resistance to change, as everyone knew what was going around and what would happen with ‘their’ application or job.

Competences
As the different tasks were assigned to individual project teams with the use of the enterprise architecture, the integration team knew which tasks required specific competences. REAAL for instance uses a ‘Marktplaats’ principle to find the right competences for the right job.

Technology layer

Technology architecture
On basis of the enterprise architectures the integration team formed project teams which were responsible for the individual projects. An enterprise architecture made the list of projects for the short and long term clear to everyone. This lead to a number of deliverables assigned to the different project teams.

Change management
The change management on the technology level experienced the same benefits as the change management processes on the application level for project management.

Components
No information was found in the results of the case study interviews or documentation for this item.

5.2.4 Coverage of the conceptual model

In Figure 5.1 the coverage of the conceptual model is graphically shown. Inside the model for every cell a check or cross is placed to indicate whether the results of the case studies show a positive answer on the central research question. If a positive contribution of using enterprise architectures on the studied IT integration processes is found, a check is placed. A negative or no contribution is indicated by a cross in that specific cell. A cell is left blank when no information is found in the case study interviews or documentation.

Organizational layers		Aspects of the IT integration process		
		Communication	Decision making	Project management
Business	Business architecture	✓	✗	✓
	Change management	✓	✓	✗
	Processes	✓	✓	✗
	Competences	-	-	✓
Application	Information systems architecture	✓	✓	✓
	Change management	✓	✗	✓
	Competences	-	-	✓
Technology	Technology architecture	✓	✓	✓
	Change management	✓	✗	✓
	Components	✓	✗	-

Figure 5.1: Coverage of the conceptual model

5.3 Analysis of the results for the information requirements model

The proposed information requirements model lists the identified stakeholders on the business, application and technology layer. Each stakeholder has certain information needs to be able to do their job during the IT integration process. On basis of the results of the case study interviews and documentation the information needs are identified and it is assessed whether an enterprise architecture fulfills in this information requirements or not.

Business

CIO
The CIO in its role on the business level has to know what products and services the organization will be offering, and how these products and services are able deliver when it comes to information system requirements. The enterprise architecture is not used in this process of designing the product portfolio, so the CIO cannot rely on the information in the enterprise architecture. He needs additional information from the business manager who has to specify which information is needed to be able to offer their products and services.

Business manager
The business managers specify the product portfolio of the organization. They decide which products and services are offered, and basis of this information they specify the information systems support requirements. This information is not stored in the enterprise architecture, so the business manager has to consult the CIO or application project manager to find out what the possibilities are.

Project manager
The project manager initiates the projects which are needed during the IT integration process. From the top management, an integration plan is created which specifies what products and services will be offered, and which target IT environment has to be created. The project manager can use this integration plan to initiate and monitor the different projects.

Application

CIO
The CIO in its role on the application level uses the enterprise architecture to specify the application landscape of the merged organizations. The enterprise architecture has the right amount of tools and level of information detail to do this.

Project manager
The project manager on the application level is responsible for initiating and monitoring the different projects used to realize the intended target application landscape. On basis of the target application landscape he decides what actions have to be taken and how the projects must be carried out. The enterprise architecture delivers in this case the right information.

Application developer
The application developer is responsible for developing, migrating or abolishing the used application in the application landscape. On basis of his instructions from the project manager he carries out his job. The enterprise architecture does not deliver the right level of detail for the application developer. The enterprise architecture shows the target application landscape, but does often not show the used interfaces, the information requirements and the chosen technical solution (ERP, SOA, middle-ware, etc.).

Application user
The application user wants to know which application will be used for certain tasks. This involves data dependencies and the characteristics of his job. The enterprise architecture fulfills this information need. In the target application landscape all application are showed which will be used after the IT integration.

Technology

CIO/CTO
The CIO (or CTO on this level) in his role on the technology level needs to know how the applications and hardware are connected. This requires detailed information of the IT infrastructure. The enterprise architecture is able to show the relationships between hardware and application, as well as the chosen technical solutions. This information remains on a fairly high level, but appropriate for the CIO.

Engineer
The engineer has to know the same information as the CIO does, but with a much higher level of detail. The engineer has to build the actual IT infrastructure so detailed information is required. The enterprise architecture lacks on this type of information, the engineer has to consult the application developers for this information.

5.3.1 Coverage of the information requirements model

In Figure 5.2 is showed which information needs from the different stakeholders are provided by an enterprise architecture. On the business level the CIO and the business manager are not fully satisfied with the information from an enterprise architecture, they need additional information. The project manager on the other hand has all information he need for initiating the required projects during the integration.
On the application layer only the application developer needs addition al information. He lacks the same information from the enterprise architecture as the engineer on the technology level does. The enterprise architecture does not deliver the right level of detail; the information is too high level. The CIO/CTO, project manager and application user experience the right level of detail.

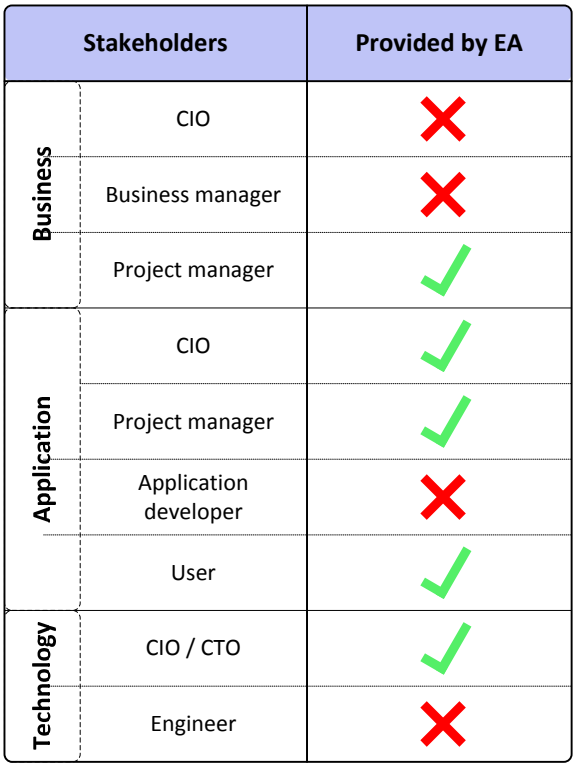

Figure 5.2: Coverage of the information requirements model

5.4 General results from the case studies

The information placed in the conceptual model in the last section covered much of the information gathered from the interviews and documentation of the case studies. But not all results are applicable to fit into the conceptual model. Some results show that enterprise architectures do not only address a single aspect in the conceptual model, but overlaps a much wider spectrum.

All interviewees acknowledged the relevance of using an enterprise architecture during a post merger integration process. They stated that an enterprise architecture is an excellent mean for facilitating the integration process, but that it isn't a goal on itself. This corresponds with the information gathered from the case study interviews, from which a schematic drawing is made in Figure 5.3.

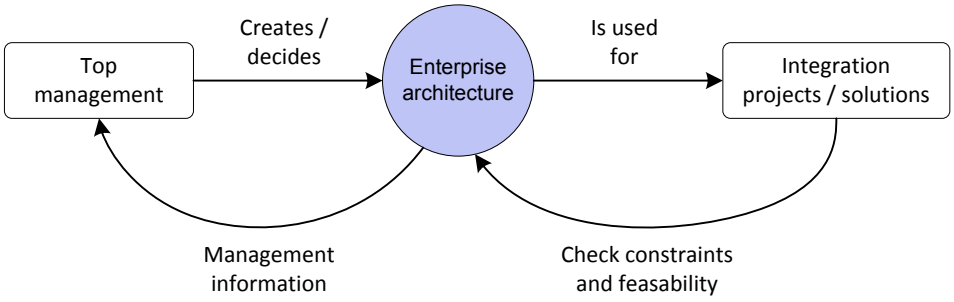

Figure 5.3: Schematic use of enterprise architectures

The figure shows the use of enterprise architectures according the results from the case study interviews. The enterprise architecture stands central in the IT integration process. IT forms a starting point for the integration projects, but the enterprise architecture itself is a result from the top management decisions.
The top management has certain stakes and has to deliver the specified shareholder value from the deal. From this, the top management decides how the new business will look like and decides thus the enterprise architecture on a business level. To support the business, the application and technology levels of the organization must be shaped according the business. So the enterprise architecture forms the starting point for these integration projects. The project teams use the enterprise architecture during their efforts to check whether their proposed solution is feasible according the constraints. The top management on its turn uses the enterprise architecture to gather management information for communication and decision making purposes.

During the post merger IT integration process, most cases show that it is essential to involve all stakeholders in the design process. Achmea lacks this belief and the results show that they have many problems in realizing synergy with their integration operations.
Involving different stakeholders also mean that different views of the enterprise architecture need to be used. Not all stakeholders have the same level of expertise or need that level detail for their work. Different views for the appropriate stakeholder can deal with this problem. In the end it is all about that the stakeholder recognizes his problem and understands how it is coped with.
These different views with different levels of detail have all a different shelf life. More detailed views are made useless by the tiniest change in the integration program. More general views on the other hand suffer less impact upon changes in the integration program.

All previous results show the impact of using enterprise architectures in the post merger IT integration process. In pre-deal phase of a merger, the IT due diligence takes place. Results from the case study show that enterprise architectures are a far too complex method for this purpose. The IT due diligence process takes profit from a small-scaled, fast pace research effort. In this project, IT should be mentioned, but only on a high level, too much detail clutters the decision making process of the integration team. The results from this IT due diligence project are often used for the deal announcement to the press and the employees.

5.5 Chapter summary

The results from the interviews and documentation delivered valuable information to assess the usability and relevance of using enterprise architectures in IT integration projects. These results give answer to the last research questions on the topic of enterprise architecture and IT integration:

- *What roles do enterprise architectures perform in the different phases of the integration process?*
- *Are enterprise architectures useful and relevant in integrating existing architectures? If so, which properties apply and which generic concepts can be used?*
- *Can enterprise architectures be used to increase the managerial process of IT integration?*

Enterprise architectures are a very powerful method in the post merger IT integration process. It can be used in all post-deal phases, and fulfills different aspects of the integration process. For the three identified aspects, the coverage of using enterprise architectures is given in relation with the three organizational layers and their concepts. In all case studies, at least two different start architectures were present. On basis of this information the target situation was modeled. The most important generic concepts have been identified by the conceptual model.
The effectiveness of using an enterprise architecture depends on how it is used in an integration project. Cases in which all stakeholders and organizational layers were involved show much more success in realizing synergy.
The usability and relevance of an enterprise architecture for stakeholders is given as a schematic use and their information needs are identified as well as the coverage of this need by using enterprise architectures.
Top management decides how the business and offered services should look like, and according this information an architecture is built. The enterprise architecture is constructed according the business architecture and is used in different case studies as a starting point for initiating project teams and deriving the tasks to be done in order to comply to the target situation architecture.

6 Discussion and conclusion

The results from the case studies have certain implications for the research area on post merger IT integration. In this chapter the results from the case study interviews and documentation is discussed and conclusions are drawn on basis of the theoretical framework, the conceptual model and the information requirements model. The implications for the academic world as well the business environment are given. This chapter is concluded with open issues and research possibilities for the future.

6.1 Discussion

The goal of this research was to find out what the usability and relevance is of using enterprise architectures in the post merger IT integration process to realize synergy. The central research question described this as how enterprise architectures positively can contribute to this process. In this section the results from the case studies are discussed from this point of view.

In all three case studies (UBS, REAAL and Achmea), the top management opted for synergetic benefits with the merger. This would partly be accomplished by integrating the operations and products, but also by merging the supporting IT environments.
UBS found out in the due diligence course of the deal that CCR had a far superior IT environment, with more sophisticated applications and well trained employees. This resulted in the decision that the IT environment of CCR would become the lead environment in the target situation. This take-over strategy was made a lot easier with the use of an enterprise architecture. They were able to make a short and long term integration planning, consisting of the projects and changes to be done. This greatly reduced the resistance of change and increased the commitment from involved employees. However, the success of this was for a great deal made possible by the thorough knowledge of the IT environment, otherwise the detailed architecture could not be made. Further more, the integration team for OPS/IT observed that some stakeholders defended their job and associated applications by ignoring the results of the enterprise architecture.

The REAAL case study covered more than one acquisition and merger. REAAL's strategy is to grow by taking over. Next to this, they strive for operational excellence. This results in applying the best-of-breed strategy in mergers. Every time REAAL acquires another party, they assess the existing products and IT environment, and create a new target situation with the help of enterprise architectures. They benefit the most from using an enterprise architecture in the way that they are able to model the newly designed business in an integrated fashion. The architecture creates a view from outside in, from the customer to the

CPU's. Such an architecture enables the traceability of the impact of changes anywhere in the model. This makes it a lot easier to keep in control, comply with regulations and execute governance. REAAL acknowledges the fact that the business IT alignment is only helped with an integrated enterprise architecture. Therefore they apply the ArchiMate method, complemented with a business view of products and services. The bank and insurance world consists of products and services which can only be described in abstract concepts, making it very difficult to make them tangible within an architecture.

Achmea uses two different architectures for their integration with Interpolis. One for the business side and one for the IT side. They see architecture as a mean for pinpointing synergy possibilities and business IT alignment. But with their approach this is very hard to accomplish. The business side of the organization make certain decisions, without consulting the IT side, leveraging big problems on IT control and support. A merger can be compared with an organizational reorganization, only it has to be executed faster, and it has more impact on all organizational layers. If the IT is not involved with the business when the target situation is made, the intended synergy is tough to realize.

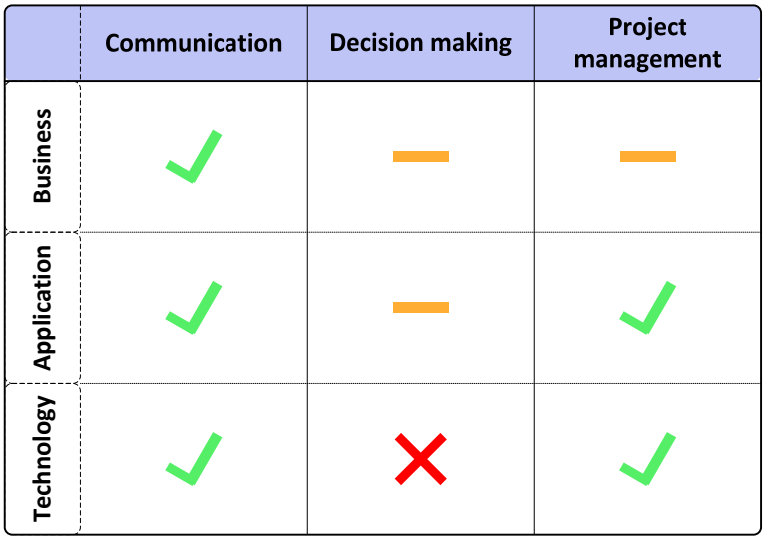

Figure 6.1: Coverage of the conceptual model

The conceptual model in Figure 6.1 shows on which aspects enterprise architectures made a positive contribution and where it didn't. Seen from the identified aspects of the IT integration process, there are some interesting results. On basis of the results it shows that enterprise architectures are perfectly suited for communication purposes. All interviewees and also from the documentation acknowledged the communication aspect. But a remark must be made on the level of detail of the enterprise architecture. For every stakeholder a personalized view has to be made of the architecture, so that he can recognize his problem or point of interest, and how in the target situation will be dealt with this.
On the aspect of decision making the results show a more scattered view. The outcome of a decision turns out to very dependent on the person who is taking the decision. Especially on the business level, business stakes put much more weight into the scale than the objective information from the enterprise architecture. On basis of the vision of top management the business side of the enterprise architecture is created and the rest has to follow this. For the application and technology layer the enterprise architecture has a too low level of detail to use it for decision making. Intrinsic knowledge of applications, interfaces and IT infrastructure is more valuable for this discussion. This however could be a threat to the organization, as this

type of information is stored in the heads of hero's, and not documented or diffused into the organization.
The information requirements coverage from the enterprise architecture for the identified stakeholders seems almost identically to the decision making aspect. This however is not that typical. To be able to make decisions, a stakeholder needs the right amount and level of information. The information requirements model show that although a lot of information is provided by an enterprise architecture (hence the excellent coverage on communication), the level of detail is not always appropriate for the stakeholders.
For project management in the IT integration process, enterprise architectures seem reasonably fit. On the application and technology level the results from all case studies show positive results, but on the business level it tends to show more negative results. This is caused by the fact that change aspect of a merger needs more soft than hard skills. It is about changing the business, aligning the IT and enabling the staff to change with it. A change program with only change projects, tasks and deadlines will work fine as a work list, but won't facilitate the needed people change.

6.2 Conclusion

This research was conducted to find answers to the research questions formulated in section 1.3. In the previous chapters answers were given to the derived sub-question of the central research question. In this section a conclusion is given which answers the central research question:

> *What is the relevance and usability of enterprise architectures in realizing IT synergy after a merger?*

On basis of the theoretical framework and results from the case study interviews and documentation it turns out that enterprise architectures positively contribute to the IT integration process to realize synergy after a merger.
Enterprise architectures lever considerate advantages to the IT integration process on different aspects. Communication between stakeholders and different organizational layers benefit the most of the use of architecture. It is a requisite that all involved parties and stakeholders are participating in the process of creating the target situation, otherwise the supporting power will degrade.
The second aspect of the IT integration process is decision making. On this aspect enterprise architectures show very positive and very negative influences to the IT integration process. The business strategy always shapes the business architecture. Top management stakes are the most important factor in enterprise architecture modeling. This should be supported by the enterprise architecture framework in top down enabled methods. For the more technical intrinsic issues an enterprise architecture is good starting point for the overall view, but it lacks the level of detail to be used for decision making.
The last identified aspect is project management. An enterprise architecture is a very good supportive method during the integration project. It can be used as a roadmap with deliverables and for initiation project teams. The architecture itself is used for constant alignment and checking whether solutions obey the made constraints. For the people change aspect enterprise architecture is a too rigid method. It does not change people or cultures, it should be used as a tool, not a goal.

With the use of enterprise architectures during the IT integration process synergetic benefits can be pinpointed. Some frameworks enable an integrated view of the whole enterprise, leveraging the traceability of changes. Enterprise architectures frameworks without this

capability will not deliver this type of information, and will only be convenient in non-cross organizational projects.
During the whole merger process, from pre-deal due diligence to post-deal IT integration, the level of detail should be adjusted depending on the needs. In the pre-deal phase speed and agility is needed more than high levels of detail. Enterprise architectures are in this phase too complicated and rigid. After the deal has taken place enterprise architectures have the right level of detail to model the current situation, and assess the business needs and possibilities.
For the identified stakeholders the level of detail of the information stored in the enterprise architecture is not always right. An enterprise architecture tends to deliver mainly high level of information, where on the implementation level (application developer and engineer) more detailed information is needed. The usability of enterprise architectures therefore depends on the type of stakeholder, but the relevance of enterprise architectures is clearly shown by the communication, decision making and project management aspects.

6.3 Research implications

This research explored the usability and relevance of existing enterprise architecture frameworks in integration projects in the bank and insurance world. From the views of enterprise architecture frameworks general concepts have been derived to assess the results gathered by the case studies.
The conceptual model is composed of general concepts from enterprise architecture frameworks and three aspects of the IT integration process. The conceptual model shows a high level of coverage on the gathered result, indicating that the proposed issues align with issues in the studied integration projects.

The general concepts in the conceptual model are abstracted from the different views of the studied enterprise architecture frameworks, TOGAF, ArchiMate and the IEEE Std. 1471-2000 framework. During the empirical research not many of these or other enterprise architecture frameworks were found in the documentation of the integration cases. Within the insurance industry the Novius method is the de facto standard. If the more general enterprise archticture frameworks want to get foot into this industry, some adjustments have to be made. First of all, the studied enterprise architectures deliver a footprint for one scenario, on a beforehand chosen level of detail. Only the ArchiMate method is able to relate different layers of an organization. For different stakeholders, different views must be abstracted from the enterprise architecture, resulting into the need for a multi-view option in the enterprise architecture framework.
Secondly, the traceability functionality of ArchiMate adds important value to the use of an enterprise architecture. The TOGAF method lacks this possibility, resulting in less usable impact analyses of changes.
At last, the decision making process in mergers cannot be ignored. Enterprise architecture frameworks should acknowledge this fact and support this phenomenon in their methods. This should further more result in better information on the levels of decision support and management information. From the project level the enterprise architecture frameworks should bear more attention to constraints checking activities from project teams. The enterprise architecture must define the solution boundaries and involve finance parameters (total cost of ownership).

6.4 Practical implications

In this research IT integration projects have been assessed using concepts from the theoretical framework. The conceptual model showed great significance in this effort, resulting in valuable implications for using enterprise architectures in practice.

During post merger IT integration projects, the use of enterprise architectures resulted in a number of positive contributions. However, the possibilities were not always stretched to the limit, meaning that users of enterprise architectures not always acknowledge the potential or ignore the restrictions of it.

From the start of a merger project, the pre-deal IT due diligence cannot ignore the IT environment of an organization. It should be assessed on potential, content, backlog on investments and business value. Enterprise architectures are a too complex tool for this effort, when speed and agility is needed.
After the deal has taken place the post-deal IT integration project starts. In this more complex environment an enterprise architecture delivers a potential positive contribution to the integration process and realizing synergy. The enterprise architecture delivers the most value if it is created in an integrated way, representing the business, application and technology layer of the organization. The integrated view has to be composed on different levels of detail, depending on the stakeholders to which it is communicated. He has to recognize his problem or area of attention and get a grasp of how this is translated into the target situation.
The business architecture is a result of top management decisions. The business architecture should be aligned with IT environment in order to realize the intended synergetic benefits.

6.5 Future work

In this final section we would like to suggest two future research directions on this topic. In this research three enterprise architecture frameworks are studied to create a conceptual model. The results of the multiple case studies are assessed with the use of the conceptual model.

The results show that two aspects of the IT integration process are more complex than supposed by the conceptual model; decision making and project management. Methods and tools of different enterprise architecture frameworks should be analyzed to determine how these two aspects are currently supported, and which improvements could be made in the architectural frameworks and the usage of them in practice.

Secondly, this research scoped on IT intense organizations such as banks, insurance companies and telecom providers. The results from the case studies can be generalized to this kind of organizations, but not without hesitate to other kind of organizations such as non-profit. To validate the external generalization of the results, more case studies using this or an adopted conceptual model in other type of industries should be conducted.

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Appendices

I Merger of UBS and CCR

Case description

In October 2007, UBS initiated the acquisition of Caisse Centrale de Réescompte (CCR) Group for a total of EUR 387 million. In February 2008, UBS receives regulatory approval to complete the transaction (UBS, 2008).
With the acquisition of CCR, UBS wants to expand its Global Asset Management activities across Europe, expand the wealth management activities and also increase its banking activities. For this merger, UBS's intentions are to expand its market share and to increase efficiency, realize cost savings on its operations and IT synergies.

Interview report (Dutch)

Only available in the confidential version of this report, contact the author for details.

II Merger of REAAL, AXA, DBV and Winterthur

Case description

On June 4, 2007, SNS Reaal announces the acquisition of the French AXA Group (AXA, Winterthur and DBV) for a total of EUR 1.75 billion (SNS Reaal, 2008).
With the merger of Reaal and AXA, Reaal doubles it market share in the Netherlands, and with this, in many other countries. Next to increasing it market shares, SNS Reaal expects a cost saving of EUR 50 million pretax due to synergy, realized by integrating its operations and increased efficiency from integrating its IT architectures.

Interview reports (Dutch)

Only available in the confidential version of this report, contact the author for details.

Documentation (Dutch)

Only available in the confidential version of this report, contact the author for details.

III Merger of Achmea and Interpolis

Case description

On the 27th of April 2005, Eureko and the Rabobank Group announced the merger of Achmea and Interpolis. Before that, Achmea was a daughter of Eureko and Interpolis a daughter of the Rabobank Group. Interpolis will be placed within Eureko, and in the future it will be integrated with Achmea. With this transaction, the Rabobank Group receives a 32% stake in Eureko, bringing the total to 37% of the shares.
With this transaction the largest insurance group of the Netherlands is created with more than € 10 billion contribution incomes per year. Eureko and the Rabobank Group started in 2006 with the integration of both organizations with the intention of reorganizing and integrating the operations of both entities. These efforts should result in synergetic benefits after the targeted project duration of three years.

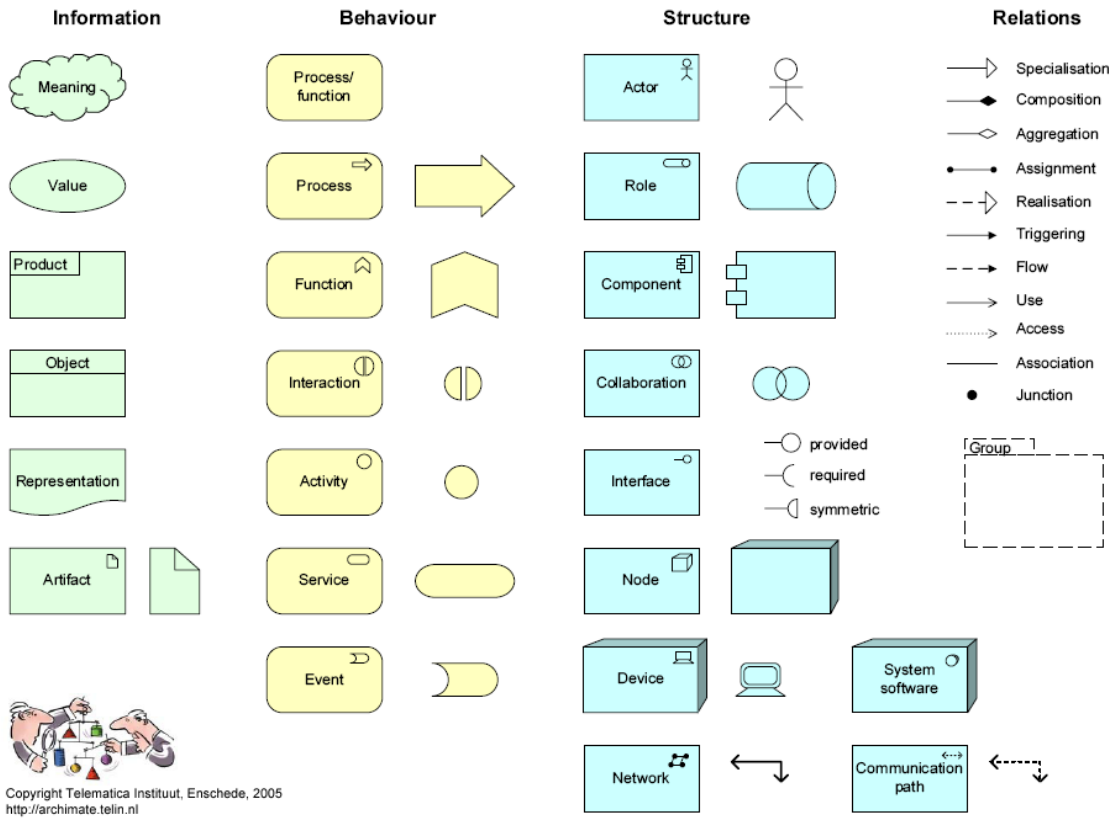
Interview reports (Dutch)

Only available in the confidential version of this report, contact the author for details.

Documentation (Dutch)

Only available in the confidential version of this report, contact the author for details.

IV ArchiMate Quick Reference



V Interview protocol

This appendix shows the used interview protocol (in Dutch) during the interview sessions held with the selected interviewees.

Heeft u er bezwaar tegen dat dit gesprek opgenomen wordt?

1. *Welke IT integratie case betrof het? Wat waren hiervan de doelstellingen? Op strategisch- en IT niveau?*

2. *Wat was uw rol hierin?*

3. *Hoe was de verhouding tussen de business en de IT tijdens het integratieproject? Werd de integratie vanuit de business geïnitieerd en moest de IT volgen?*

4. *Welke methoden en/of technieken werden voor het IT integratieproces gebruikt? Welke frameworks? Zijn hierin alternatieven overwogen?*

5. *Hoe werden enterprise architectures gebruikt? Was het een interessant instrument? Wat viel hierbij op?*

6. *Waren er aan de start al architecturen van de huidige enterprise (business en IT infrastructuur/processen) aanwezig?*

7. *Welke doelen moesten vervuld worden door het gebruik van een enterprise architecture? Zijn die gehaald? Waarom wel of juist niet?*

8. *Voor welke views werd een architectuur of methode gebruikt? (Business, application, technology)*

9. a. *Op het gebied van communicatie, beslissingen maken en projectmanagement / planning, welke rol speelde de enterprise architecturen hierin?*
   b. *Communicatie: Werd het door iedereen begrepen?*
   c. *Beslissingen: Bracht het meer en volledigere informatie?*
   d. *Welke andere gebieden binnen het integratieproject?*

10. a. *Is het gelukt om gebruikmakend van enterprise architecturen tot een doelarchitectuur te komen? Werden hiermee de integratiedoelstellingen behaald?*
    b. *Werd in het integratieproces rekening gehouden met de synergiedoelstellingen?*
    c. *Is door het gebruik van enterprise architecturen de synergiedoelstelling behaald? Had het wellicht feedback op de inzet van architecture frameworks?*

11. *Waren er problemen en/of pijnpunten in het integratieproces? Voor welk doel bleek het gebruik van enterprise architecture frameworks minder geschikt? Wat voor aanpassingen zouden nodig zijn?*

12. *Overige opmerkingen over enterprise architecture modelling? In het algemeen?*

Bedankt voor uw tijd en moeite.