MASTER THESIS

CAPABILITY-BASED PLANNING WITH TOGAF AND ARCHIMATE

Papazoglou Anastasios

BUSINESS INFORMATION TECHNOLOGY
SCHOOL OF MANAGEMENT AND GOVERNANCE

EXAMINATION COMMITTEE
Dr. Maria-Eugenia Iacob
Dr. Maya Daneva
Dr. Dick Quartel

BiZZdesign

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Author
Papazoglou Anastasios
Study Business Information Technology
School of Management and Governance

Graduation committee
Dr. Maria-Eugenia Iacob
Department University of Twente, School of Management and Governance

Dr. Maya Daneva
Department University of Twente, Computer Science

Dr. Dick Quartel
Department BiZZdesign, R&D

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Management Summary

In today's turbulent environments, organizations are dealing more and more with uncertainty. The business capabilities define a stable view of the business, which focuses on what the organization is doing or should be doing in order to successfully fulfill its strategy, rather than how it is or should be doing it. Capability-based planning comes to incorporate the development of the capabilities into the architectural effort following the ADM cycle of TOGAF, and everything that this pertains.

The business has to be able to identify which capabilities are of strategic importance and constitute the focal points of attention. Therefore, a complete method for capability-based planning starts from the business strategy, then goes through the determination of those capabilities, and concludes by guiding the architectural work up to the post-deployment of the business capabilities. This method consists of three phases that respectively address the why, the what and the how of the process.

Since capabilities are not currently addressed by the ArchiMate modeling language, four new concepts are proposed for extension: capability, capability increment, metric, and resource, as those essential for modeling purposes. ArchiMate's syntax is then extended with these concepts, and four new viewpoints are distinguished which focus on different architectural areas.

The proposed method and language extension are showcased by means of an example, using the fictional organization ArchiSurance as a case. Along the way, a number of models are created, most of them including prescriptive elements.

The most important aspects of the above body of work have been validated with four experienced professionals from the areas of Enterprise Architecture and the Business.

Acronyms and Abbreviations

ADF	Australian Defence Force
ADM	Architecture Development Method
CBA	Capability-based Analysis
CBBA	Capability Based Business Architecture
CBP	Capability-based Planning
CSP	Scenario-based Capability Planning
DCA	Dynamic Capabilities Approach
DCV	Dynamic Capabilities View
DISA	Defense Information Systems Agency
DNDAF	(CA) Department of Defence Architecture Framework
DoD	(US) Department of Defense
DoDAF	(US) Department of Defense Architectural Framework
DSRM	Design Science Research Methodology
IEEE	Institute of Electrical and Electronics Engineers
MoD	(UK) Ministry of Defence
MoDAF	(UK) Ministry of Defence Architectural Framework
NAF	Netherlands Architecture Forum
PPBS	(US) Planning, Programming, and Budgeting System
PS	Planning Scenario
RBV	Resource-based View
SBU	Strategic Business Unit
SOA	Service Oriented Architecture
TAFIM	Technical Architecture Framework for Information Management
TAM	Technology Audit Model
TCA	Technological Capability Assessment
TOGAF	The Open Group Architectural Framework
TTCP	The Technical Cooperation Program

About BiZZdesign

BiZZdesign is a company headquartered in the Netherlands, founded in 2001 and has been growing significantly ever since. With offices across Europe (the Netherlands, Germany, Belgium, United Kingdom and recently Slovakia) and America (Canada and Mexico), it has achieved an increasing number of international sales and a Leaders position in the Gartner Magic Quadrant. BiZZdesign's primary goal is to help organizations worldwide to get a firm grip on change in an increasingly complex business reality.

BiZZdesign is a spin-off of a large (multi million) research project. From 1996 to 2001, Dutch Pension Fund APG, The Dutch Internal Revenue Service, IBM, ING Group and Novay (formerly known as the Telematica Instituut) executed the Testbed-project; the development of a virtual model based testing environment for changing business processes.

Being much more than a consulting company, BiZZdesign offers a suite of solutions to its clients, designed to seamlessly fit their business needs in designing and improving their business. The package consists of several tools (Architect, BiZZdesigner, InSite, RiskManager, GripManager, the Decision Modeler), business consultancy (advising, preparing, (re)designing and implementing new business structures, processes, products, services and applications with a starting point in the business strategy and business goals), best practice models and methods (architecture drafting and usage, process analysis and design, improving quality – Lean 6-Sigma, implementation) and trainings (ArchiMate, TOGAF, Business Process Management, Business Model Management).

BiZZdesign is a leader in the domain of Enterprise Architecture (EA) and in particular in EA modeling and management. It also has expertise in the areas of business requirements management, business process design and improvement, business process management, and structured implementation and governance. Additionally, it's one of the primary contributors in ArchiMate, the Open Group standard for EA modeling, which originated from the Netherlands and eventually became the standard that is getting worldwide attention. BiZZdesign was also the first company to develop and market a tool for ArchiMate, named BiZZdesign Architect[1] and accredited by The Open Group[2].

BiZZdesign has been using ArchiMate as a modeling language and TOGAF's Architecture development method (ADM) as a methodology in designing EA for its client organizations. TOGAF is the Open Group Framework for developing an enterprise architecture and BiZZdesign is involved in the work group working towards its next version and its alignment with ArchiMate. With the latest version, the concept of capability-based planning was introduced, but the suggestions and guidelines around it given were quite limited. BiZZdesign has grown interested in ways that capability-based planning can help companies become more successful in the competitive and complex business reality.

[1] http://www.bizzdesign.com/tools/bizzdesign-architect
[2] http://www.opengroup.org/homepage-items/c662.html

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Overview

Capability-based planning focuses on goals and end-states and encourages innovation. It starts by asking questions regarding what the organisation needs to do, rather than how to do it. This level of abstraction and way of thinking in different terms stem from the concept of capability, which to put it broadly, deals with what an organisation is doing, needs or is planning to do.

In Chapter 1 the research goals of this thesis are presented and justified. Three research questions have been identified as instrumental in dealing with the topic of capability-based planning with TOGAF. A more detailed motivation about the research follows in Chapter 2. There, in the problem statement we discuss the significance of business capabilities for organizations and how they act as facilitating instruments in the communication between the business and the IT sides within an organization. It is argued that there is, indeed, a need for further investigation of the concepts of capabilities and capability-based planning and for establishing a method about how to perform the latter in an enterprise architecture-enabled organization. The objectives of a solution are highlighted, i.e. what an artifact should take into account to address the recognized issue. Additionally, in the same chapter, the adopted overall research methodology based on the work of Peffers et al. (2007) is discussed.

Chapter 3 deals with the literature review and the systematic literature review methodology implicitly adopted and appropriately adjusted from Kitchenham (2004). In the four sub-sections that comprise this chapter, we first introduce the reader to the concepts and importance of enterprise architecture, The Open Group Architecture Framework and ArchiMate. Then in the second sub-section we investigate the origins of Capability-based planning and of the closely related theory of the resource-based view and it is followed by a brief discussion on the present state of Enterprise architecture. In the third sub-section, past literature and insights from practitioners will be thoroughly examined for a set of concepts and definitions. Fourteen concepts are put under the microscope, some in relation to the concept of capability and the found definitions will be evaluated. Finally, in 3.4, the last sub-section of this chapter, the results of a survey among enterprise architecture practitioners that was performed online from June until August 2013 are summarized.

Following up, in Chapter 4 a set of definitions for the concepts discussed earlier is given, which according to the author's opinion describe those concepts the best. They will be further used in an extensive ontology domain model, which will aim to bring them all together and illustrate the hierarchy and relationships that characterize them.

In Chapter 5, a complete method suggesting how to perform capability-based planning in conjunction with TOGAF is suggested. The method consists of three phases and nine steps, targeted at organizations at different levels of preparedness. It starts from the business strategy and concludes with the delivery of the necessary strategic capabilities, while it incorporates tested practices from both the enterprise architecture and the national defense domains. It

draws concepts and techniques from the fields of Business (or Strategic) management, Business (and/or) Enterprise Architecture and National defense.

Chapter 6 includes the modeling aspects of the thesis. In 6.1 an introduction to ArchiMate is given briefly presenting and shortly explaining the core language, the extensions and the viewpoints. The section 6.2 deals with the suggestion of the extension to ArchiMate. First, in 6.2.1 we describe a selection of concepts from the ontology domain model and the suggested method that are essential for modeling purposes. This also uncovers the missing language elements, which are included in a metamodel fragment or abstract syntax of the language in section 6.2.2. It aims to fill in the gap in the existing ArchiMate metamodel and to expand it appropriately. The last section of this chapter, section 6.2.3 presents the concrete ArchiMate syntax for the new concepts, as well as four distinguished viewpoints that derive from the metamodel.

Chapter 7 deals with demonstration and validation of the solution, using the ArchiSurance case study, a fictitious example developed to illustrate the use of ArchiMate in the context of the TOGAF framework. Sections 7.1 and 7.2 describe the case, while section 7.3 places the capabilities in the context of a post-merger landscape. Finally, in section 7.4 the proposed method for capability-based planning is applied in the ArchiSurance case from Step A to Step I.

In Chapter 8 the validation of the findings with four practitioners are presented. First the description of the validation method and then the results on three areas: definitions, proposed method and extension to the ArchiMate language. The feedback received was mostly positive, although some aspects did fuel up discussions on the meaning behind some of the concepts.

In Chapter 9 the conclusions of this thesis are summarized. More specifically, the research questions are addressed along with the main results. The implications for research and the implications for practice are also discussed there. Finally, some recommendations for BiZZdesign about how to use the findings (the method and regarding modeling) commercially close the chapter.

Chapter 10 is the final chapter, where limitations of the research method and limitations in practice are discussed. Stemming from these, the path for future work is also suggested, for enforcing the soundness of the method and of the language extension.

1. Research aim

The goal behind this thesis is to contribute to the ongoing discussion about capability-based planning within the Enterprise Architecture field, by suggesting a roadmap for developing and set of concepts for modeling capability-based planning in organizations that have implemented or planning to implement a TOGAF-powered EA. Reformulating this sentence, the main research question that this thesis will attempt to answer is the following:

How can ArchiMate support organizations that have adopted TOGAF to perform capability-based planning?

But in order to do that, first the related concepts need to be clarified appropriately, since there is not a single point of consensus. Therefore, the starting point of this research is formulated as the RQ1, stated as:

RQ1: What are the definitions found in scientific literature and in the practice regarding capability-based planning and other related concepts?

EA practitioners have different views on how the concepts are defined. Moreover, the literature available tends to be contradictive at times, mostly due to the different scientific paradigms dealing with the same topics, but from different points of view. With this research question, an attempt will be made to bring all these aspects together, combine them into a single and solid set of definitions, thus building the foundation for the second and central point of this research: suggesting a method for performing capability-based planning.

Although capability-based planning has been a hype term that many organizations are interested in and was already addressed in the most recent version of TOGAF, unfortunately, there is still no clear picture regarding the individual steps it consists of. Drawing methodologies from academic literature, practitioner literature and military defense reports, the aim will be to select the elements that are applicable to TOGAF and EA, that can create value and facilitate the adoption of capability-based planning in an enterprise and integrate them seamlessly into a complete roadmap, fittingly connected with TOGAF. The proposed method will adhere to the needs of the practitioner community, without losing its scientific vigor. Thus, the second research question is formulated as such:

RQ2: What would constitute a good method for capability-based planning in TOGAF?

Finally, the concepts defined in RQ1 and the proposed capability-based planning method from RQ2 will offer a new set of constructs to be modeled accordingly in a metamodel, which will connect these newly introduced concepts to the existing metamodel of the modeling language. Since this is expressed in ArchiMate, we will follow the same path and use ArchiMate as well. Thus, the third and final research question is the following:

RQ3: How do the new, capability-based planning concepts fit within the existing ArchiMate metamodel?

In summary, the result of this research will be a robust foundation in the form of an ontology domain model of the definitions necessary for capability-based planning, a method to perform capability-based planning from the ground up in an organization and the corresponding theoretical framework expressed in an ArchiMate metamodel. Finally, these results will hopefully be of interest and value to enterprise architecture practitioners, consultants and upper management, because they are closely related to how each group of these stakeholders communicates with the others, aligning their efforts towards a more competitive and effective business.

The “right” solution must accomplish the following objectives:

- Maintain its scientific validity but also address the needs of the practitioner community;
- Provide a solid terminological foundation for capabilities;
- Promoting a common language through semantic interoperability;
- Guide enterprise architecture practitioners in developing and managing the important capabilities of an organization;
- Help bridge the capability gap of an organization;
- Address the needs of organizations in different levels of preparedness;
- Integrate the method metamodel seamlessly with the ArchiMate metamodel; and
- Become a communication and comprehension enabler by fostering business/IT alignment.

2. Problem analysis

In this section the details and characteristics of the recognized problem will be highlighted, justifying the need for this research. It will be argued that although capabilities in the business context are of value, they have not been extensively researched until now. Furthermore, it is also argued that capabilities and capability models have significant recognized advantages and can foster business/IT alignment, but have not been put in the spotlight until recently, with capability-based planning. However, the area of capability-based planning and in particular in combination with enterprise architecture has not been sufficiently covered. Practitioners have been told what can be accomplished with it, but are left to their own devices.

2.1 Problem statement

It has been established that two of the most common issues enterprise architects face are engaging business people and integrating with business strategy. Various recent Gartner reports, for example (Burton et al. 2010; Burton 2009; Robertson 2012), have documented the struggle of enterprise architecture practitioners to overcome the obstacle of initiating a discussion on business outcomes, which business leaders can be engaged in, instead of focusing on technology. As (Scott 2009) describes, most of these conversations are centered on projects, processes and applications, leading to IT-centric discussions, whereas business leaders are focused on business outcomes such as increased output, better quality, lower costs, revenue growth or improved market share. The problem is that processes are too detailed, applications are too technical and projects focus on short term results, usually void of much strategic value. Consequently, EA practitioners find it challenging to articulate organizational changes (regarding business, people, process or technology) which are reflected in the organization's EA, in terms that the business leaders can recognize increase value in. According to that report, one reason this happens is that architects often lack a clear way of depicting what the business "does" and overlaying architectural guidance on "how to support" those decisions. This issue can be shortly referred to as business/IT alignment which as a topic has been much researched and discussed in the past years (leading business architect William Ulrich has defined it as "*[t]he state in which business strategies, capabilities, semantics, processes, rules and governance structures interact in harmony with automated systems and data*"), it still remains a challenge to achieve.

One of the main contributions of capabilities and capability modeling in the business context is that they can help bridge this communication gap characterized by business interests on the one side and IT concerns on the side across. A model based on the concept of a business capability can perfectly handle the complexity of the alignment problem, while thinking and planning in capability terms is a powerful mechanism which provides integrated business and IT planning and management (Wilkes 2011a; Rosen 2010). Describing an organization in terms of its capabilities has the advantage of focusing on what this organization is capable of doing (both in as-is and in to-be situations), without stating or limiting how it is done (Wilkes 2011a; Klinkmüller et al. 2010; Chim et al. 2010; Homann 2006). They encapsulate and they abstract from processes/procedures, resources (e.g. people, technology and information) and other components that are necessary for the capability to exist but may change over time (the 'how'),

thus offering a stable overarching view of the business and what it does in its very core (the 'what'). In other words, well-defined business capabilities rarely change; usually it will take a significant shift in the underlying business model, which might occur through a business transformation initiative or with a new acquisition (Scott 2009). They are a useful abstraction because they represent the next level of detail beneath the business strategy and facilitate performance improvement and redesign analysis, as the purely essential building blocks (Homann 2006). Many organizations in the past 5-6 years have started thinking of the key elements of their business in capability terms and have widely accepted the capability concept as a useful technique to bridge the business perspective and the IT. The concept of the business capability can help them to realign their thinking and address complex issues in highly targeted ways; it can also make the redundancies and inconsistencies of the current state of their IT implementations much more obvious and the transition to the future state much clearer (Ulrich & Rosen 2011a).

There are many different types of capabilities an organization might possess or seek to develop, some of which are reviewed in section 3.3: Collected definitions. For now, it is important to highlight those of their characteristics that enable business/IT transformations and that have aided the emergence and growing popularity of the business capability. Summarizing the benefits of business capabilities, they:

- provide business with a common language;
- enable laser-like business investment focus;
- serve as a baseline for strategic planning, change management, and impact analysis;
- lead directly to business service specification and design, and
- clarify modernization and transformation approaches for IT architectures.

Capability models provide significant advantages towards this end and there are many suggestions, especially in practitioner literature on how to model an organization's capability in a capability map. A gap in scientific literature has been recognized in this area, in the sense that EA practitioners do not have sufficient guidance about how to develop a coherent and complete capability model for their organisation and they often have to discover what works best through trial-and-error. However, best practices in building capability models have long been discussed in the practitioner community, although they appear fragmented and sometimes contradictive, especially when it comes to definitions and naming conventions. However, capability maps begin and end with a modeled representation of what an organization is capable of doing, presented in a structured, hierarchical way. For a business to be viable within the competitive environment of today's markets, it has to have at least one strategic business capability, i.e. something that the company does which differentiates it and can justify its existence. But capability identification is frequently as far as it goes (Wilkes 2011a) and very few organizations are actively involved in the planning and development of their capabilities.

Capability-based planning deals specifically with the planning, engineering and delivery of strategic business capabilities to an organisation (The Open Group 2011) and aims to guide

organizations in obtaining those capabilities that hold strategic value. The concept of capability-based planning was first introduced in TOGAF with the latest version, as a business planning technique focusing on business outcomes, where the definition is given as "*Capability-based planning focuses on the planning, engineering, and delivery of strategic business capabilities to the enterprise*"(The Open Group 2011). Apart from a definition of capabilities mentioned elsewhere in the documentation, which by itself does not make things clearer, the reader is left to figure out on his/her own what a strategic business capability is, since it is never explained. Other capability-related concepts such as capability increments and capability dimensions are well documented in TOGAF, as well as the relationships between capability-based planning, enterprise architecture, and portfolio/project management. Nevertheless, it is not detailed how an organization can go on about designing and performing capability-based planning nor how it fits with their TOGAF-based enterprise architecture.

Since this thesis deals with capability-based planning within the context of enterprise architecture and more specifically The Open Group's architectural framework, the above definition was used as the starting point. The Open Group is the standardization body publishing the widely known The Open Group Architecture Framework (TOGAF) and the ArchiMate modeling language for Enterprise Architecture. In this definition the focal concept is that of the strategic business capability. But in order to comprehend what this concept describes and what it does not, it is essential to consider adjacent concepts too. For example, what is the difference of a strategic business capability and a business capability? Or what is the connection between a strategic business capability and competitive advantage? The statement by (Winter 2000) that there is "*a rather thick terminological haze over the landscape where 'capability' lies*" still holds true today; in fact since that article was published that haze has probably become thicker. This point became even stronger from the answers collected in the online survey performed for the needs of this research (for more about the survey, please refer to section 3.4). Enterprise architecture practitioners are indeed facing a challenge when trying to agree upon semantics and the interrelationships of the capability with other related concepts. Hence, this constitutes a gap in research that needs to be filled before we discuss capability-based planning and it is one of the goals of this thesis, as stated above. Of course, attempting to provide definitions for every single related concept can very easily culminate into a big and perhaps unnecessary undertaking. Consequently, a selection was made based on the terms recognized as relevant (presented in section 3.3).

Even in cases where capability-based planning was applied to domains other than the defense domain (like the public safety and security domains in the United Sates and the Netherlands) most of the thinking, lessons learned, experience and best practices still rely heavily on it. The main idea as well as the relevant concepts were born within this domain, which has been evolving for at least a decade and adopted by others, like the EA domain for example. And since this transfusion has taken place in the past and initiated the discussion around capability-based planning, it makes sense to explore this topic in the defense context further for concepts, ideas

and methodologies that can be properly adjusted and added to the enterprise architect's tool belt.

2.2 Research methodology

For this research project, the design science research methodology (DSRM) suggested by (Peffers et al. 2007) was implicitly adopted, mainly because it is a highly cited piece of information systems research (Web of Science gives 63, ACM 78 and Google Scholar 536 citations). This process proposes six consecutive steps where the output of each is treated as input in the next one and with some iterative activity as shown in Figure 1 below.

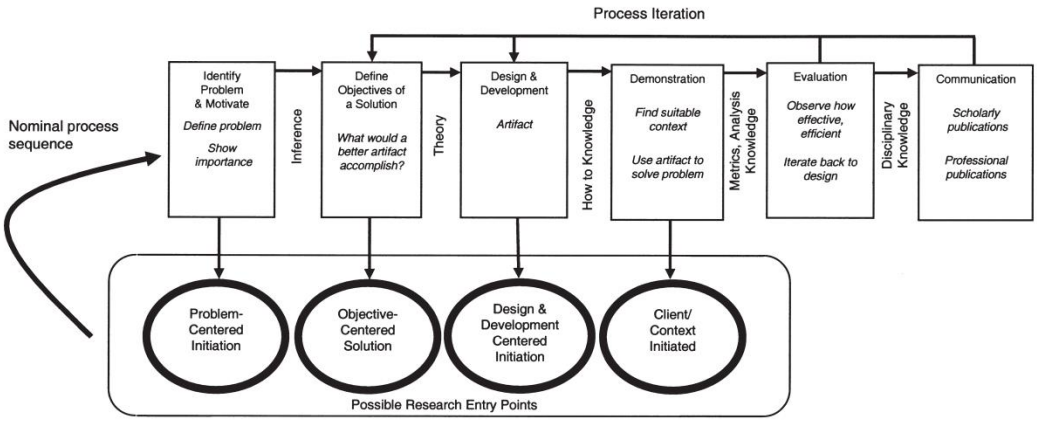


Figure 1: The DSRM Process Model by Peffers et al. (2007)

The first step is the problem identification and motivation, where the specific research problem is defined and the value of the solution is justified. The second step is the definition of the objectives for a solution, during which the objectives of the solution are deducted from the problem definition in the previous step and from what is feasible. During the third activity of design and development the actual artifact is created an in the fourth one, demonstration, the use of the artifact to solve one or more instances is demonstrated. Evaluation of the artifact is the fifth step with observation and measurement of how well the designed artifact supports a solution to the problem. In the final step communication takes place about the problem and its importance, the artifact and its quality characteristics (utility, novelty, design rigor and effectiveness).

3. Literature review

The purpose of the conducted literature review is, on one hand, to create an exhaustive collection of papers and articles that contain one or more of the specified set of definitions from the domains of Business (or Strategic) management, Business (and/or) Enterprise Architecture and National defense; and on the other hand to investigate the body of work regarding capability-based planning methodologies and practices. An explorative research in articles indexed by Google Scholar showed that scientific literature on this topic is scarce and does not address the problem sufficiently and in its entirety. Due to this realization it was deemed necessary first to perform a more extensive literature review and to also look at the practitioner literature and body of knowledge. By doing so, it became possible to tap into the different thinking streams within the practitioner community and furthermore to cover the gray area of the developing topic of capability-based planning. This resulted in two different methods of literature investigation that took place successively; first a systematic literature review for academic research was performed as proposed by (Kitchenham 2004), followed by a research for insights from practitioners. However, the method was not followed in its entirety and some steps were excluded, namely the creation of an explicit research protocol and the participation of two researchers who would validate each other's work as well as the search and selection criteria used. When enough material was selected and indexed with both methods, it was treated uniformly, regardless of its nature (be it academic or practitioner).

The systematic literature review consisted of three phases in order to assemble the paper collection, using three different search strings while searching in the scientific databases. Five electronic scientific databases were selected as appropriate to be used in the research: i) Scopus (http://www.scopus.com/home.url), ii) ACM Digital Library (http://dl.acm.org/), iii) Emerald (http://www.emeraldinsight.com/), vi) IEEE (http://ieeexplore.ieee.org/) and v) ScienceDirect (http://www.sciencedirect.com/). All three search strings were used consistently over the five databases, giving several tens of thousands of results; to give an idea, they are presented in Table 1 below.

Table 1: Number of returned search results

	Database	String 1	String 2	String 3
1	Scopus	7106	1547	12070
2	ACM Digital Library	12256	1853	363
3	Emerald	24504	22188	40106
4	IEEE	2833	25	1
5	ScienceDirect	4605	3127	7836
	Total	**51304**	**28740**	**60376**

Within each one of the three phases, first the research string was used as input. In most cases, the papers were decreasingly relevant after the second page of returned results. As mentioned earlier, the purpose of both types of literature research at this point was to create an inventory of definitions and investigate all business capability related methodologies and practices; therefore the papers were read with these selection criteria in mind. After repeating the same

process for the other four databases, duplicate papers were exempted and newly found and unique ones were added to the list of papers to be considered. With every new search string entered into the databases more papers were discovered, but as expected, there was also significant overlap. Hence, the results from the each subsequent search string were treated in an accumulative manner in relation to prior results. Additionally, the reference lists of the mist relevant papers were scoured for papers not previously discovered during the database searches. To keep track of all the sources found and to facilitate the check for duplicates, a software tool called Mendeley[3] was used.

On the other side, to look for non-academic literature an elaborate search using Google Search (https://www.google.nl/) and Google Scholar (http://scholar.google.nl/) was executed. A limited number of articles were provided by three BiZZdesign consultants and they were reviewed in this stage alongside the ones discovered through the research. Finally, the database of Gartner was searched for reports from EA consultants related to the topic. This entire process resulted in a large number of blog posts, magazine articles and white papers written by the EA practitioner community, as well as military and technical reports (e.g. from RAND Corporation).

When the search was concluded, the final compilation of papers, reports, posts and articles amounted to 90 items. Regarding the definitions encountered in them, many were citing and quoting the same source and were considered identical. All definitions and methodologies/practices were considered and evaluated, but not all of them were adopted. A schematic overview of the entire process is depicted in Figure 2 below.

[3] http://www.mendeley.com/

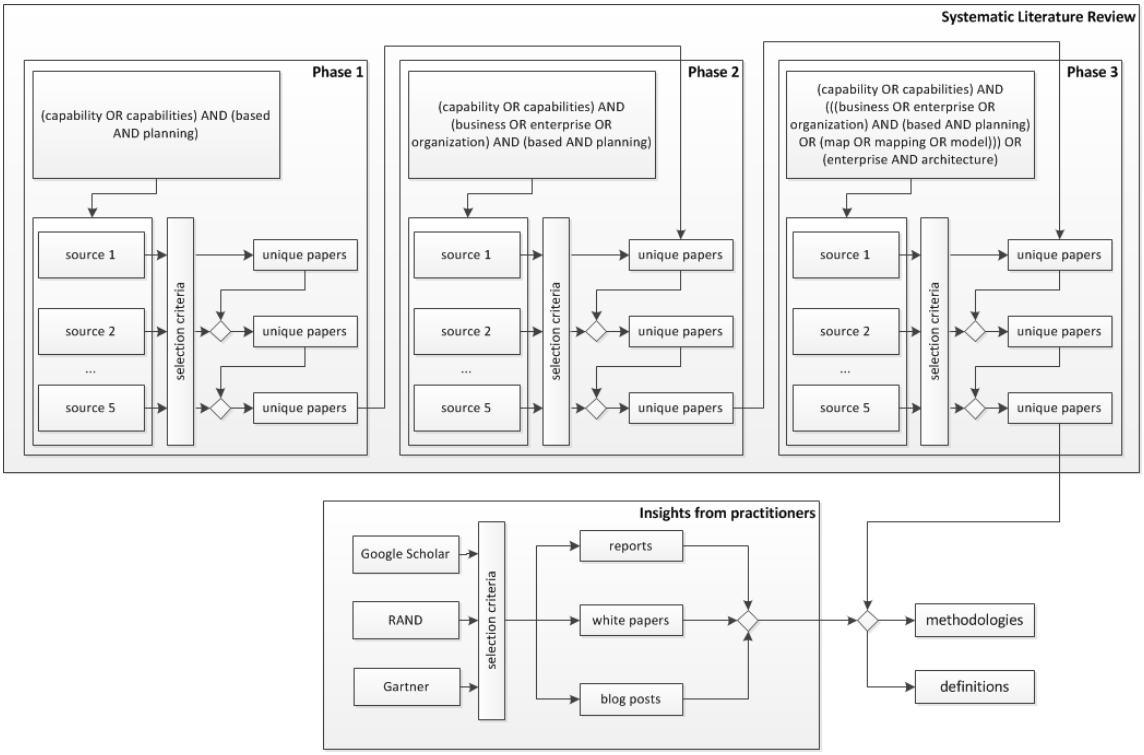


Figure 2: Literature review method

3.1 Defining Enterprise Architecture

Enterprise Architecture (EA) has become a necessity for organizations especially in the last two decades. As (Zachman 2001) points out, without EA an organization cannot achieve i) business and IT alignment, ii) alignment of data, messages and rules across the stakeholders, iii) change with minimum time, disruption and cost, and iv) production of custom, on demand implementation with significantly reduced time-to-market. Organizations can use EA to move from what Len Fehskens of The Open Group called Level 1 of IT to Levels 2 and 3. In Level 1, where most IT departments are stuck today, the IT staff is engaged in a struggle to even make technology work. In Level 2 the IT department attempts to get the technology do the right thing for the business. And in Level 3 technology is adapted, so that the process of doing the right thing is optimized. Without an explicit description of how IT supports their business, organizations are in high risk of being stuck in Level 1 (Woods 2011).

There is widespread attention on enterprise architecture and every enterprise has a definition of their own EA which is a bit different than the definitions of other enterprises. This happens mainly because an EA program that delivers business value is customized to the culture, strategic maturity and strategy of the enterprise (Lapkin et al. 2008). As a result, there are numerous definitions of EA in literature as well, varying on the level of explicitness and inclusiveness. (Ross et al. 2006) define EA as “the organizing logic for business processes and IT infrastructure reflecting the integration and standardization requirements of the company’s operating model”. (Bernard 2012) talks again about integration but also puts strategy into the mix and emphasis in the gap between the present and the future; according to him, EA is “the

analysis and documentation of an enterprise in its current and future states from an integrated strategy, business, and technology perspective". The defining characteristic of EA is that it crosses internal organizational boundaries and provides coordinated views of the entire enterprise, acting as a single source of reference and thus efficiently supporting management planning and decision making (Bernard 2012; Bredemeyer et al. 2003).

In a Gartner report from 2008, EA is given a rather extensive definition as "the process of translating business vision and strategy into effective enterprise change by creating, communicating and improving the key requirements, principles and models that describe the enterprise's future state and enable its evolution". This definition is extended by stating that the EA scope is to include "the people, processes, information and technology of the enterprise, and their relationships to one another and to the external environment". Furthermore, "[e]nterprise architects compose holistic solutions that address the business challenges of the enterprise and support the governance needed to implement them" (Lapkin et al. 2008). However, it is explicitly stated that the above definition should be used as the basis for developing an enterprise-specific definition that will supply EA's value within that particular enterprise.

More organizations, foundations and legislative texts have offered their own definitions for architecture, enterprise architecture and IT architecture, like the Netherlands Architecture Forum (NAF), Capgemini, the Institute of Electrical and Electronics Engineers (IEEE) and the Clinger–Cohen Act. Exploring this area is a research in its own merit, therefore mentioning the ones above is deemed sufficient for this thesis. What is noteworthy though is that the variety in all these definitions seems to indicate that the field is still in its infancy. Moreover, it is obvious from the attention that it is receiving that enterprises do feel a profound need to steer the development of their business and IT portfolio with the contribution of EA (Op't Land et al. 2009).

For the purposes of this research, the definitions of The Open Group for 'enterprise' and 'architecture' are adopted, as presented in The Open Group Architecture Framework (TOGAF) specification. The Open Group Architecture Framework (TOGAF) is The Open Group's framework for enterprise architecture which provides a comprehensive approach for designing, planning, implementing, and governing an enterprise information architecture. It is developed and maintained by The Open Group Architecture Forum, which comprises of more than 200 enterprises and publishes successive versions at regular intervals. The first version of TOGAF was published in 1995 and the latest one is version 9.1, launched on 1 December 2011. According to the data from the web site of The Open Group, the 223 organizations that use TOGAF span across 29 market sectors such as academia, aerospace, IT and retail worldwide[4].

As stated in the specification, enterprise is "[t]he highest level (typically) of description of an organization and typically covers all missions and functions. An enterprise will often span multiple organizations". Furthermore, TOGAF embraces but does not strictly adhere to ISO/IEC

[4] http://www.opengroup.org/togaf/users-by-market-sector (accessed 30/05/2013)

42010:2007 terminology about architecture ("[t]he 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"). In TOGAF the definition of architecture has two meanings, depending upon its contextual usage. It may be specified as either a "formal description of a system, or a detailed plan of the system at component level to guide its implementation", or as "the structure of components, their interrelationships, and the principles and guidelines governing their design and evolution over time" (The Open Group 2011).

Enterprise Architecture began as an IT discipline; initially as Technology Architecture, then as Enterprise-wide IT Architecture and finally it evolved to the present form which combines the latter with Business Architecture. Its scope has also evolved and broadened since then; from reducing IT complexity and costs, to increasing enterprise agility and enhancing IT alignment with business strategy. Similarly, while TOGAF has strong roots in Technology Architecture, in recent releases it has evolved out of IT and into a more strategic position between IT and the business, offering higher potential value. In other words, TOGAF is now a tool not just for architecture, but also a tool for aligning IT and business goals (Bredemeyer et al. 2003).

There are four interrelated architecture domains that are commonly accepted as subsets of an overall enterprise architecture, all of which TOGAF is designed to support (The Open Group 2011):

- The **Business Architecture** defines the business strategy, governance, organization, and key business processes.
- The **Data Architecture** describes the structure of an organization's logical and physical data assets and data management resources.
- The **Application Architecture** provides a blueprint for the individual applications to be deployed, their interactions, and their relationships to the core business processes of the organization.
- The **Technology Architecture** describes the logical software and hardware capabilities that are required to support the deployment of business, data, and application services. This includes IT infrastructure, middleware, networks, communications, processing, standards, etc.

The focus of this research will be on the first subset, the Business Architecture, whether we are talking about TOGAF or EA in general. The main reason behind this is that business capabilities are the top layer of the Business Architecture; they belong to the business domain and are governed by the business principles of the organization[5].

For describing enterprise architectures in diagram form and representing them consistently, an enterprise architecture modeling language called ArchiMate which is managed by The Open Group (The Open Group 2013) and which is at the moment the leading Enterprise Architecture

[5] http://www.enterprise-architecture.org/business-architecture-tutorials/162-businesscapabilitymodelling

description language. ArchiMate is a graphical description language for higher level architectures in all architectural domains – the UML for Enterprise Architecture. It is meant as a common language that allows Enterprise Architects to develop one consistent picture of the present or future reality together with specialists from different fields. As an international standard, it is also explicitly meant to facilitate the evolution of Enterprise Architecture best practice across organizations. Apart from the representation of enterprise architectures over time, ArchiMate also supports the representation of their motivation and rationale, especially with the motivation extension and the implementation and migration extension (Iacob, Quartel, et al. 2012). ArchiMate is now an Open Group Standard and with its latest version being 2.0, it is fully aligned with TOGAF and follows the same definitions.

3.2 Background

In this section, we investigate how capability-based planning came to the forefront in defense planning, considering also the related origins of TOGAF and the ADM cycle, which are placed in the Technical Architecture Framework for Information Management (TAFIM) of the US Department of Defense. We also look into The Technical Cooperation Program (TTCP) which is the starting point of all capability-based planning discussions. Finally, a mapping between the elements of the TTCP and the phases of the ADM cycle is made.

3.2.1 The origin of Capability-based planning

Over the past decade, Capability-based planning or capability-based planning has become something of a 'gold standard' in defense planning throughout the NATO alliance (De Spiegeleire 2011) and has been widely adopted by the Defense community led by Australia, Canada, the United States and the United Kingdom (Hales & Chouinard 2011). One of the earliest and clearest definitions of capability-based planning was provided by Paul K. Davis, an analyst at RAND's National Defense Research Institute, who described it as "*planning, under uncertainty, to provide capabilities suitable for a wide range of modern-day challenges and circumstances while working within an economic framework that necessitates choice*" (Davis 2002). This term has been used to address the paradigm shift from 'threat-based models' to 'capabilities-based models', which occurred because of the increased uncertainty of future environments in which a country's next opponent could not be easily predicted (Asiedu 2010). Additionally, military operations until then constituted of planning for large single conventional wars, which often left militaries ill-equipped to respond to smaller concurrent operations that might include operations other than war. In other words, the emphasis was placed on "*delivering capability packages as the core element in a more systemic defense-planning approach to address a wide range of threats to a nation's security, rather than on delivering a capability to defeat a specific adversary*".

Interestingly, Walker posits that the shift to capabilities-based planning was not really a revolutionary change, like most of its supporters believed (Walker 2005). Quoting Davis, "capabilities-based planning is not new at all, to either the Department of Defense or elsewhere"(Davis 2002). The shift to a top-down capabilities-based planning system that is focused on outputs rather than inputs is a return to the basic principles of the Planning,

Programming, and Budgeting System (PPBS) implemented by Secretary of U.S. Defense McNamara in 1961. Its intention was to "facilitate analyses of capabilities by assembling complements and substitutes into mutually exclusive, collectively exhaustive sets." When those programs were introduced it was the first time in defence that groupings of resources were made by defined capability groups and by function rather than budget account.

The central components in capability-based planning in the defense sector are the Planning Scenarios (PSs) which describe a representative spectrum of possible needed operations. Challenges arise when there is a requirement for multiple scenarios to be met, especially in concurrent operations. In this case, the operations are executed sequentially with respect to the level of capabilities needed to meet the requirements.

It is not surprising that capability-based planning in TOGAF originates from the defense sector where it had been incubating for some years. After all, TOGAF was originally based on the US DoD Technical Architecture Framework for Information Management (TAFIM). The US Defense Information Systems Agency (DISA) contributed extensively to the development of TOGAF and as a result they both share a very similar high-level reference model. The core of TOGAF, the Architecture Development Method (ADM) was originally based on parts of TAFIM (a side-by-side comparison is given in Figure 3 for reference purposes; ADM is covered in more detail later in section 3.2.2). TAFIM was officially canceled by the DoD in early 2000.

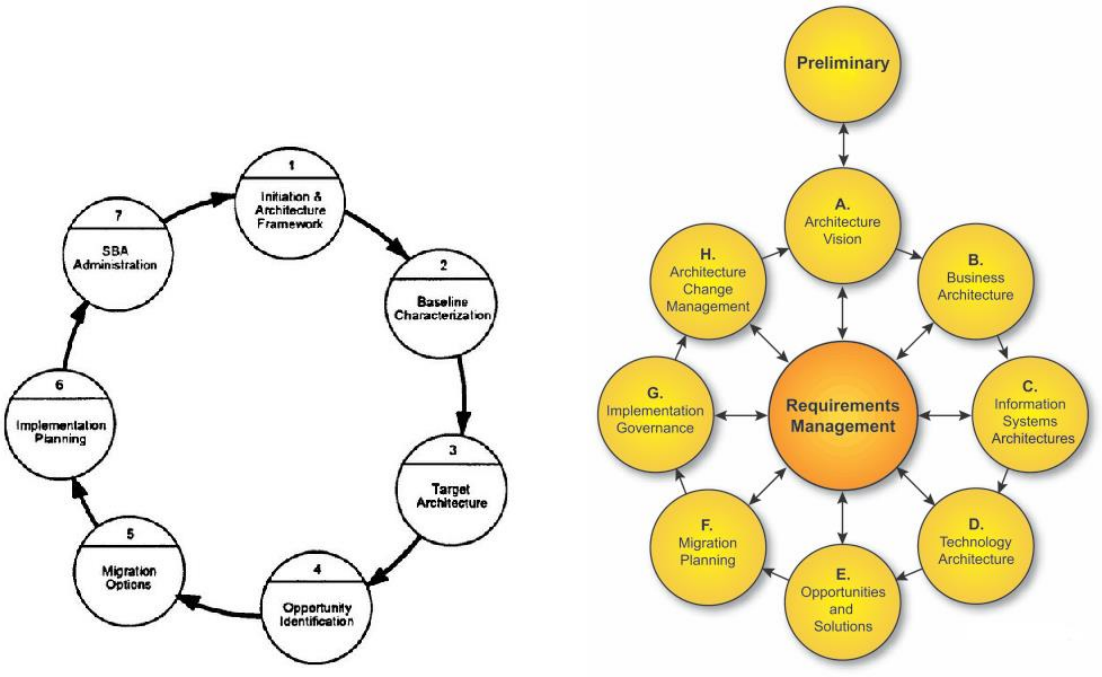


Figure 3: The DoD Standards-Based Architecture Planning Process in TAFIM (left) and The ADM cycle in TOGAF (right)

During the 1990s, ideas concerning the role of resources and capabilities as the principal basis for firm strategy and the primary source of profitability coalesced into what has become known

as the resource-based view of the firm (Grant 2008). The resource-based model of competitive advantage by Barney suggests that sources of sustained competitive advantage are firm resources that are valuable, rare, imperfectly imitable and non-substitutable, in a paper that is widely regarded as the first formalization of the then-fragmented resource-based literature into a comprehensive (and thus empirically testable) theoretical framework (Barney 1991). Although Barney and other proponents of the resource-based view generally tend to define firm resources broadly, to include assets, knowledge, information, firm attributes, capabilities, and organizational processes, (Grant 1991) distinguishes between resources and capabilities and provides a classification of resources into tangible, intangible, and personnel-based resources (Bharadwaj 2000). Competitive advantage is gained by assembling, integrating, and deploying resources that work together in combination or in co-presence.

3.2.2 Influencing Methodologies and Frameworks

In the defense sector capability-based planning was the subject of The Technical Cooperation Program (TTCP), a program established by the United States, the United Kingdom, Canada, Australia, and New Zealand to foster technical collaboration between the defense communities of these countries (Walker 2005). TTCP adopted the definition by Paul K. Davis for capability-based planning and went further by outlining a generic planning process for it, which starts with overarching guidance, identifies capability gaps, explores options, and ends with an affordable investment plan (Figure 4).

The process model is comprised of two stages; the top part takes a strategic, top down perspective in understanding the demands of the operating environment, the expectations of government, and the way the defense force should operate and apply its capabilities, while the bottom part assesses the performance of the current system with respect to capability goals, to inform decisions for remedial action (Chim et al. 2010). It is interesting that the first stage of the process has an outward-looking perspective by looking at the environment and only after, in the second stage, it takes an introspective view of the organization itself. This ensures that all decisions regarding the organizations are well-informed on what is happening outside it.

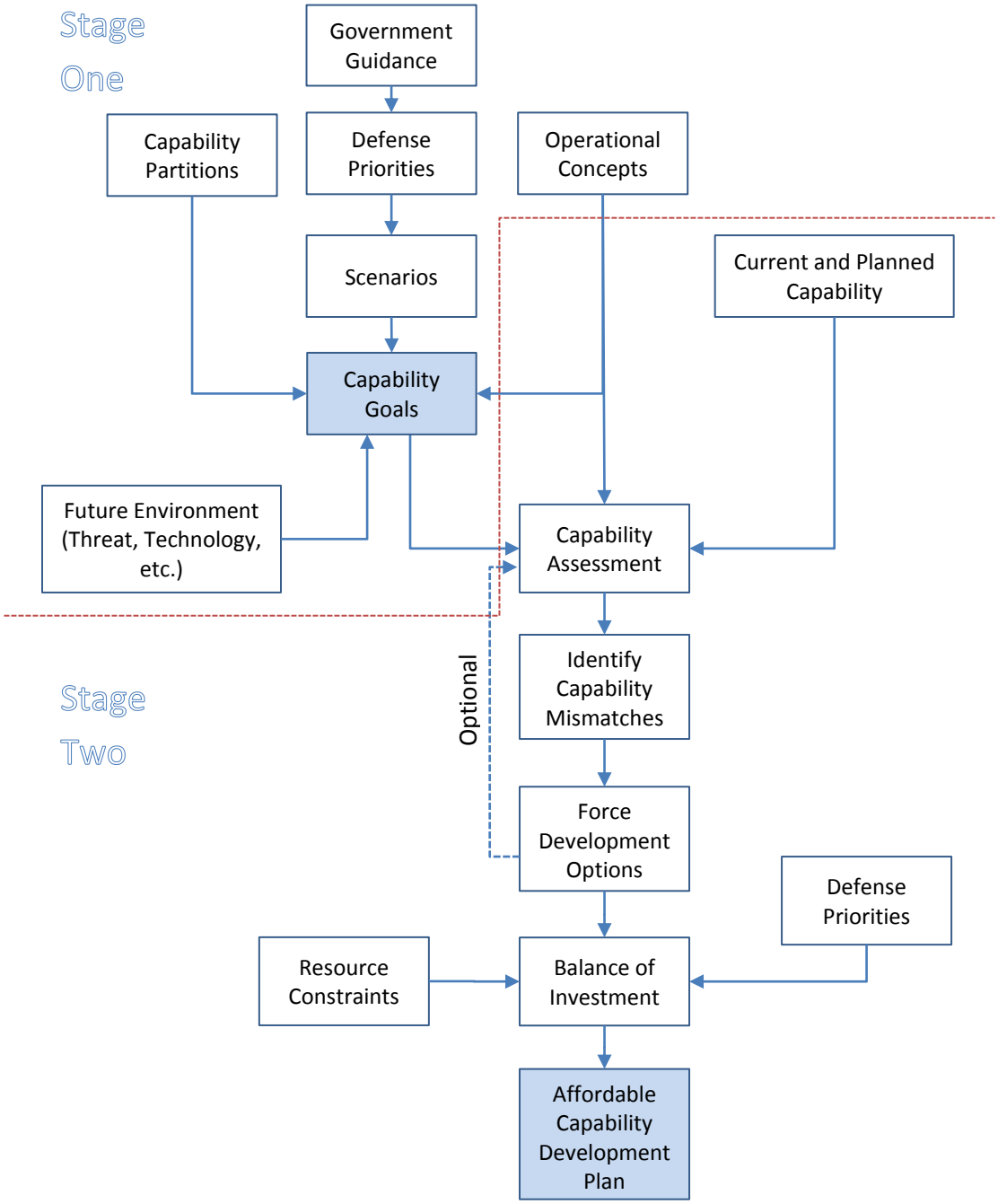


Figure 4: TTCP Capability-based Planning process model (Walker 2005)

Looking into the process model closer, we see that the priorities are recognized and set early on, driven by an overarching guidance from the government. These priorities are placed within a context of a wide range of scenarios that represent future possibilities in regards to the environment and the technology projections. Thus, capabilities can be assessed in a way that addresses not only present situations, but also uncertainty about the future. TTCP grouped similar capabilities into what they called '*capability partitions*' which makes the analysis more manageable and able to yield capability goals for each capability partition. These goals are then

assessed considering operational concepts, current and already planned capabilities, and feedback from previous development efforts to identify areas where there is a mismatch or a gap between capabilities (as-is) and capability goals (to-be). This gap can highlight possible areas for investment or disinvestment if a capability is non-existent or underdeveloped or if a capability is redundant or overdeveloped. This leads into the development of certain alternative options and by taking into account the limited economic framework and, once again, the defense priorities, an affordable and realistic plan for developing the desired capabilities can be devised.

The Architecture Development Method (ADM) cycle (shown in Figure 5 below) is the core of TOGAF and one of its main parts (the others being the Enterprise Continuum and the TOGAF Resource Base). It describes a method for developing an enterprise architecture and is the result of continuous contributions from a large number of architecture practitioners. The ADM cycle is thoroughly covered in Part II of the TOGAF 9.1 specification document (The Open Group 2011) and here an overview of the nine phases and of their objectives will be presented. As described in the specification document, architecture development is a "*continuous, cyclical process, and in executing the ADM repeatedly over time, the architect gradually adds more and more content to the organization's Architecture Repository*". The ADM is iterative, over the whole process, between phases, and within phases. For each iteration of the ADM a fresh set of decisions must be taken (e.g. regarding the breadth of coverage and the level of detail).

First and foremost the ADM cycle begins with the Preliminary Phase for an organization that is about to do architecture work with TOGAF and tailor the framework to its needs. The organization is preparing for the architecture initiative by identifying its scope and its architecture footprint on the organization, and by also identifying the sponsors and other stakeholders. This Preliminary Phase defines the Architecture Principles that will form part of the constraints on any architecture work undertaken in the enterprise and also defines alignment with other frameworks and methodologies.

Next, the objective of Phase A is to develop a shared vision within the organization of where it needs to go, and to obtain approval to move ahead. Phases B, C and D cover the development of the baseline and target architectures for the three architectural domains (namely business, information systems and technology) and the performing of gap analyses between the two states of each domain. The next phase, Phase E, is based on the work done in these three phases by dealing with the consolidation and integration of the gap analysis results and the consideration of the physical delivery of the solutions. Newly created or already existing high level requirements that must be met to achieve the business goals and strategies shape the Architecture Building Blocks (ABBs). The ABBs are then decomposed into low level functional and non-functional requirements to be delivered by the solutions, in the form of Solution Building Blocks (SBBs).

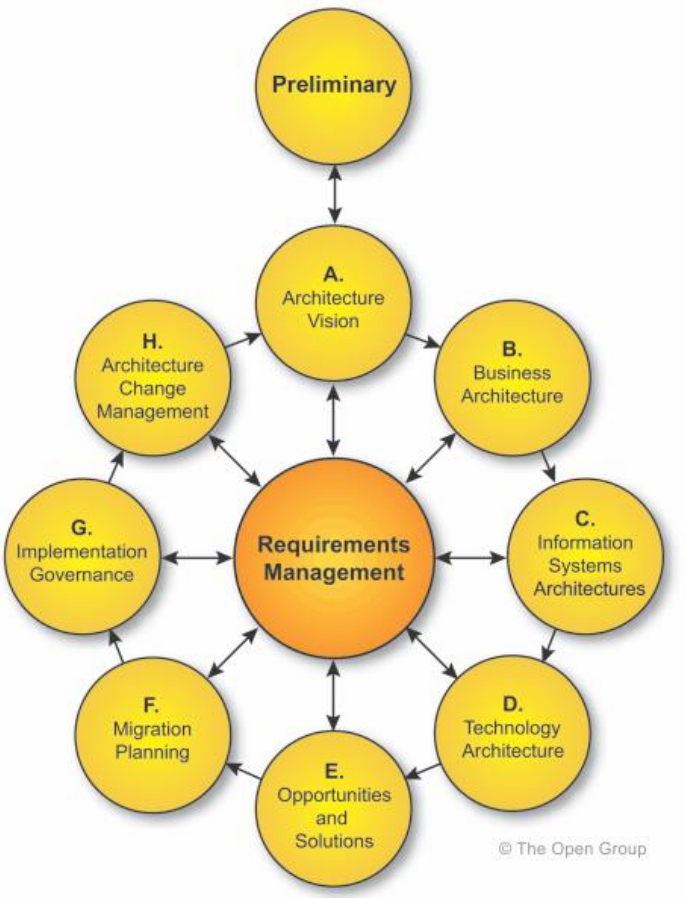


Figure 5: The ADM Cycle of TOGAF

Continuing further with the phases of the ADM cycle, the objective of Phase F is the creation of an Implementation and Migration Plan in co-operation with the portfolio and project managers. The plan must be aligned with other management and governance frameworks in the organization (e.g. for Corporate Business Planning, Enterprise Architecture and Portfolio, Program, Project Management). Next, in Phase G the Implementation Governance of the organization is established; it ensures that the implementation projects conform to the Target Architecture through oversight of individual projects and adoption of levels of conformance (irrelevant, consistent, compliant, conformant, fully conformant and non-conformant). The last phase of the cycle, Phase H, is not a typical phase but a rather continuous activity of monitoring technology and business change that could impact the (new) Baseline Architecture which also establishes a change management process for it. Finally, in the center of the ADM is the Requirements Management Phase, with which all other phases interact and which enables the managing of the architecture requirements throughout the ADM. It being in the center of the cycle means that the requirements are not static, but are constantly being identified, stored and fed into and out of the relevant ADM phases and also between cycles of the ADM, making it a dynamic process.

Placing the capability-based planning process model by TTCP and the ADM by The Open Group side by side we can observe some conceptual relationships. Most of the steps of the process model can be mapped onto phases of the ADM (shown in Table 2), although the cyclical and iterative nature of the ADM creates phases that are not translated into the linear TTCP model (i.e. the Implementation Governance and Requirements Management phases). The Preliminary Phase and the Migration Planning Phase of the ADM are not applicable to the process model and similarly the steps of Scenarios, Operational Concepts, Force Development Options and Affordable Capability Development Plan of the process model cannot me mapped to ADM phases.

Table 2: Mapping the steps of TTCP onto the phases of the ADM

ADM Phases	TTCP Model Steps
Preliminary	-
A. Architecture Vision	Government Guidance Defense Priorities
B. Business Architecture	Current and Planned Capability Capability Assessment Identify Capability Mismatches
C. Information Systems Architectures	
D. Technology Architecture	
E. Opportunities and Solutions	Capability Partitions Capability Goals Balance of Investment Resource Constraints
F. Migration Planning	-
G. Implementation Governance	-
H. Architecture Change Management	Future Environment (Threat, Technology, etc.)
Requirements Management	-
-	Scenarios Operational Concepts Force Development Options Affordable Capability Development Plan

3.3 Collected definitions

The literature review undertaken for the study suggested the presence of a well-developed body of knowledge on the dynamic capability-based view of competitive strategy and a fragmented body of literature on capability-based planning in terms of definitions and methodologies. The concept of ‘capability’ applies to many different domains and is adapted to different theories, resulting in numerous specializations; from business capability to IT capability, they all have the same starting point, but express a wide range of classifications. However, there should be no strict rule governing which capability is of which type, as this should be left to the business to decide. Also, capabilities owned by an organization are not governed by exclusivity; for instance, an IT capability could very well be a strategic business capability at the same time for a certain organization. In addition, when talking about the concept of capability, one must consider its relationship to connected concepts that complement it, such as ‘competence’, ‘process’, ‘activity’ and ‘service’, to name a few. Therefore, this chapter will aim, on one hand, to provide

clear definitions for capability and the some of the most common specializations of capability and, on the other hand, provide clear definition for the associated terms and attempt to clarify their relationships with the capabilities. The terms in Table 3 were recognized as relevant from the literature.

Table 3: List of terms defined

Term	Section
Capability	3.3.1
Business capability	3.3.2
Strategic business capability	3.3.3
Technological capability	3.3.4
Strategic technological capability	3.3.5
Organizational capability	3.3.6
IT capability	3.3.7
Dynamic capability	3.3.8
Competence	3.3.9
Core competence	3.3.9
Resource	3.3.10
Service	3.3.11
Process	3.3.12
Function	3.3.13
Capability-based planning	3.3.14

The goal is to collect those definitions that the author either agrees with or finds that they encapsulate key elements of the examined concepts and should be taken into account. This is necessary in order to construct a set of definitions as complete as possible and that best reflect their meaning within the EA context. Later in chapter 4, one of the main contributions of this thesis is introduced; an ontology domain model that will bring those definitions together and will help clarify the meaning of these ambiguous terms further, as well as the relationships between them.

3.3.1 Capability

When discussing capabilities, many different definitions come into light. It is not uncommon that this term is used interchangeably with others, such as business capability, technological/IT capability or organizational capability (e.g. in (Winter 2000)), but the intended meaning depends on the context in which the term is being used. This means that different authors use the same term for describing somewhat different things, which can be confusing. This section tries to clarify the concept of capabilities and highlight their meaning in the business context.

From the national defense angle, the US Department of Defense (DoD) officially defines a capability as '*the ability to achieve a desired effect under specified standards and conditions through combinations of means and ways to perform a set of tasks*', linking capability-based planning to outcomes and metrics (Department of Defense 2008; Department of Defense 2009). Within the domain of security and defense sector more definitions of the term capability were

found. One of the most prominent ones is found in the "National Preparedness Guidelines" published by the US Department of Homeland Security in 2007, where capabilities are defined as providing the means to accomplish a mission or function and achieve desired outcomes by performing critical tasks, under specified conditions, to target levels of performance. In this document capabilities are characterised by their capacity (i.e. how many are needed) and their proficiency (i.e. how well must they be able to perform) (Department of Homeland Security 2007; Moore et al. 2010) and it is accompanied by the "Target Capabilities List" document published in the same year and which describes the core capabilities required to perform critical tasks. Attached to this concept is the work by (Cheng et al. 2011) and by (Tagarev 2009) who defines capability as "*the capacity provided by a set of resources and abilities, to achieve a measurable result in performing a task under specified conditions and to specific performance standards*".

Similarly, from the practitioner world, Scott and Ulrich & Rosen define a capability as the fundamental element that provides an organization's capacity to achieve a desired outcome (Scott 2009; Ulrich & Rosen 2011a). Scott states that the set of an organization's capabilities can be regarded as its potential and that they represent the functional abilities needed to be executed, in order for the organization to fulfill its mission. This perspective of capability as capacity originates again from the resource-based theory by (Grant 1991).

Taking a step back, and abstracting from the idea of a capability owned by an organization, the Merriam-Webster online dictionary generally defines a capability[6] as:

> 1: *the quality or state of being capable*; also: ability
> 2: *a feature or faculty capable of development*: potentiality
> 3: *the facility or potential for an indicated use or deployment* <the capability of a metal to be fused> <nuclear capability>.

This threefold definition highlights the different aspects of capabilities, especially the first two; in other words possessing a capability means meeting the requirements that put their owner in a position of being able to perform something or obtain a characteristic, if the situation or the conditions ordain the owner to do so.

In TOGAF a capability is defined as "*an ability that an organization, person or system possesses. Capabilities are typically expressed in general and high-level terms and typically require a combination of organization, people, processes, and technology to achieve. For example, marketing, customer contact, or outbound telemarketing*" (The Open Group 2011). There are three important elements here: i) a capability can be owned not only by a person or an organization, but also by a system, ii) a capability is a high-level concept and iii) a capability is considered to be a composite object and not atomic; several components have to come together to yield a capability that has quality characteristics. Overall this definition comes very close to precisely describing what a capability is, although it would be more concrete if it included the notion of potentiality. Therefore, the definition proposed here is slightly altered, to

[6] http://www.merriam-webster.com/dictionary/capability (accessed 21/06/2013)

include capacity and potentiality and to group together organization, people and processes under 'assets':

> A capability is an ability, capacity or potential that an organization, person or system possesses. Capabilities are typically expressed in general and high-level terms and typically require a combination of organization and different assets (e.g. people, processes, and technology) to be achieved and thus realize their goal.

With this high-level definition, a capability can be considered as a super class of all other sub-types of capabilities, or a generalization to put it differently, with a hierarchical structure. Consequently, those specialization sub-types inherit the characteristics of a capability and the definition for each one of them builds on top of the definition of a capability. While in the TOGAF ® definition there is no explicit connection of a capability with a goal, it is included in this one so that it makes the definition a bit more precise. It is true that all types of capabilities aim to achieve a desired effect or a goal, which in turn is connected to some kind of value; otherwise there is no point in having that capability. This connection of capability to a goal is also inherited in its subtypes, which we are going to discuss next. It should be noted here that the differentiating factor of each type of capability is the different goal each one serves. In the definition above the goal is intentionally not strictly specified, since capability itself is a high level concept. Later, for all the subtypes of capability, the goals are more precisely stated.

3.3.2 Business capability

If the idea of value creation and delivery within an organization is injected into the notion of capabilities, we are then talking about business capabilities (Wilkes 2011b; van Dijk 2012; Ulrich & Rosen 2011a; Rosen 2010; Greski 2009b). Furthermore, (van Dijk 2012; Rosen 2010) follow the same logic for business capabilities as (Tagarev 2009) for capabilities in the security sector, describing them as the means to define the organization's capacity to successfully perform a unique business activity and that deliver measurable value.

A Gartner report from 2010 considers the following definitions of a business capability, all of which illustrate what a business does to deliver value (Burton et al. 2010):

- "An ability of capacity for a company to deliver value, either to customers or shareholders."[7]
- "A capability models what a business function does - its externally visible behavior (versus how it does it, its internal behavior) - and the expected level of performance."[8]
- "The business capability is 'what' the organization does, the business processes are 'how' the organization executes its capabilities."[9]

[7] "Business Capability Modeling", Leonard Greski, Architecture and Governance Magazine, 2009 (Volume 5, Issue 7)
[8] http://msdn.microsoft.com/en-us/library/aa479368.aspx
[9] Wikipedia.org

The authors of that report chose to adopt the definition by Balasubramanian, Kulatilaka and Storck from the Boston University School of Management, which states that "*a business capability is similar to the notion of a value discipline, which Treacy and Wiersema (1995) define as the way in which companies combine systems, processes, and their environment to deliver value to their customers*". The focus of this definition lies on the delivery of value to the customers, with "customer" being described in the broader sense to include both internal and external stakeholders of an organization.

A few years later, one of the authors came back to the definition of business capability and expanded it to put emphasis on the "what" character of capabilities: "*Business capabilities are the ways in which enterprises combine resources, competences, information, processes and their environments to deliver consistent value to customers. They describe what the business does and what it will need to do differently in response to strategic challenges and opportunities*" (Burton 2013). This definition reflects best the concept of the business capability, although the mention of 'strategic challenges' makes the definition more restrictive than it should, and hints towards the strategic business capability, which in this paper is considered a specialization of the business capability and explained in the next part (sub-chapter 3.3.3). Although a concrete definition of value is important, it is difficult to be found in the vast amount of related literature and attempting to extricate it is beyond the scope of this thesis. For the sake of completeness and comparison, some additional found definitions of business capability are presented next.

The plethora of definitions of business capabilities include the ones by (Freitag et al. 2011), (Wilkes 2011a), (Klinkmüller et al. 2010) and the one by (Homann 2006) who posits that a business capability is "*a particular ability or capacity that a business may possess or exchange to achieve a specific purpose or outcome. A capability describes what the business does (outcomes and service levels) that creates value for customers; for example, pay employee or ship product".* Alike capabilities, business capabilities as a specialization sub-type are also non-atomic; according to (Pandza et al. 2003) individual skills, implicit forms of knowledge and social relations that are embedded in a firm's routines, managerial processes, forms of communication and culture, when collaboratively combined, can offer a capability. Pandza et al. (2003) follow the real options valuation approach (ROV) to managing resources and capabilities and mention that capability development is somewhat aligned with the application of the real options heuristic to strategy, through which a firm's resources, capabilities and knowledge create options for future exploitation (Brits et al. 2006). Compared to Burton's (2013) definition, parallels are found regarding the combination of different assets for making decisions under uncertainty, but the value offering angle is missing.

Another similar definition comes from Bredemeyer Consulting[10]: business capabilities are "a combination of business processes, people (organization, knowledge and skills, culture), technology solutions, and assets (facilities, funds, etc.) aligned by strategic performance objectives" (Bredemeyer et al. 2003). Additionally, in this definition the business capabilities are

[10] http://www.bredemeyer.com/

considered the building blocks of the enterprise and they have relationships to each other and to the environment. They mention that these three elements along with performance management are the quality characteristics that are “important in driving the capability design process”. Something that differentiates this definition from the one by Burton (2013) is the explicit mention of the external and internal relationships of the capabilities; they are not independent and autonomous. Burton mentions that business capabilities are related to the business’ external environment, but not to each other. On the other hand, Jeff Scott of Forrester Research has a different opinion, that business capabilities are unique and independent from each other. Bridging the two, we could say that they represent discrete ways to generate measurable value, but at the same time they are hierarchically connected to each other (Greski 2009b) and are governed by a stimulus-response relationship with the organization’s environment. This aspect of the business capabilities could be added to the Burton’s definition (2013) to make it more descriptive.

Concluding, a good definition for the business capability can be the following:

> Business capabilities are the ways in which enterprises combine resources, competences, information, processes and their environments to deliver consistent value to customers. They describe what the business does and what it will need to do differently in response to strategic challenges and opportunities. They can be synthesized by or connected to other capabilities, business or otherwise.

The first two parts are taken from Burton’s definition and the last part aims to explicitly include the internal or external relationships that they can have, a point made in (Bredemeyer et al. 2003)

3.3.3 Strategic business capability

Business capabilities can be divided into two sub-types; on one hand, the basic business capabilities owned by an organization enable it to perform activities and run its business and on the other hand, the strategic business capabilities that offer a competitive advantage to the organization and have a bilateral relationship to its business strategy. As (Teece & Pisano 1994) indicate, one way to make the distinction is to first identify what isn’t strategic; for a capability to be strategic, they remark, it must be “honed” to a user need, unique and difficult to replicate. Likewise, according to the conceptual framework for modeling business capabilities by (Brits et al. 2006) two of the distinctive characteristics of strategic business capabilities are that they are better than those owned by the organization’s competitors and that they are difficult to imitate or replicate. In other words, all organizations possess some basic capabilities in order to function, but strategic business capabilities are above and beyond them. The authors also list a third one; that it should be of value to the customer, which overlaps with the definition of business capabilities in general, as described previously.

Over two decades ago, when the discussion on business processes had just started evolving, (Stalk et al. 1992) examined the theory of capability-based competition on the basis of business

processes, according to which strategic capabilities are those "*that consistently provide superior value to the customer*". Although they primarily deal with business processes, the core idea behind their theory is the same: offering value in a way that the customer (in this case external) assesses as higher than the others offered by competitors. As they mention, although every organization does something to deliver value to the customer, few think of the offering as the primary object of strategy and really attend to it.

Using different terminology but describing the same thing as strategic business capabilities, (Kay 1993) talks about distinctive capabilities, as a source of competitive advantage and defines one as "*the features of a firm's position or organization which cannot readily be reproduced by competitors [and are] generally based on architecture*[11]*, innovation, reputation, or the ownership of strategic assets*", areas that are linked to relationships between an organization and its stakeholders, as well as other collaborating organizations in its network. These relationships allow and organization's resources to provide it with the distinctive capabilities through the conduit of its architecture, reputation and innovation (Henry 2011). According to Kay, all organizations, both large and small, possess some kind of distinctive capability; otherwise they would not be able to survive. He poses that the point behind distinctive capabilities is that the deliberate act of creating them is rarely achieved. Furthermore, the distinctiveness of a unique characteristic of a distinctive capability is not enough, but it also has to be sustainable (persistent over time) and appropriable (beneficial primarily for the organization rather than its employees, customers or competitors).

The idea of business capabilities connected to the business strategy of an organization is tied to the dynamic capabilities approach (DCA) and to the concept of core competence which we will discuss later (in sub-chapters 3.3.8 and 3.3.9 respectively). In the Resource-based View (Barney 1991; Grant 1991; Prahalad & Hamel 1990; Kamoche 1996) an organization's strategic capability is synonym to a core competence and is defined as a '*cluster of attributes that an organization possesses which in turn allows it to achieve competitive advantage*' (Henry 2011).

Finally, based on the aforementioned highlights in the found definitions, the following definition that includes the necessary ideas is suggested:

> Strategic business capabilities are the business capabilities that offer a competitive advantage to the organization by being better than those owned by the organization's competitors and by being difficult to imitate or replicate and that also contribute in shaping and realizing the organization's business strategy.

The first and third part describing competitive advantage and strategy originate from the work of (Henry 2011), even indirectly, and the second part about differentiation from the competitors originates from the work of (Brits et al. 2006).

[11] An organization's architecture comprises the system of relational contracts which exist inside and outside the organization (Henry 2011).

3.3.4 Technological capability

The concept of technological capability is tied more than anything else to the industrial sector and is included here for the sake of completeness. It refers to the ability of an organization to make use of technological know-how (through identification, appraisal, utilization and development). To put it simply, it defines what an organization can do with a certain technology. Technological capabilities are comprised of three other capabilities: production capability (required to operate and maintain production facilities), investment capability (required for establishing new production facilities and expanding capacity and innovation capability (required to create and carry new technological possibilities through to economic practice (Kim 1999; Acha 2000).

For measuring technological capabilities, patent information is used as a proxy measure and further patent analysis can be used in technical decision-making, to measure competitors' technology strengths and weaknesses and to plan technology development activities. It is therefore seen as a suitable methodology for analyzing business opportunities based on technological capabilities. Various models have been proposed that deal with evaluating the capabilities which make a company capable in a specific technology or recognizing technologies required for firm's internal processes, called Technological Capability Assessment (TCA) models.

The conceptions of (Kim 1999) and (Acha 2000) about technological capabilities contribute equally to the definition adopted here:

> Technological capability is the ability of an organization to make use of technological know-how through identification, appraisal, utilization and development.

Both of these articles complement each other, while Acha's definition provides an extra level of detail by stating that '*[t]echnological capabilities are defined [..] as the knowledge and skills required to identify, appraise, utilise and develop technologies and techniques*'.

3.3.5 Strategic technological capability

A strategic technological capability is the major determinant of competitiveness; the prerequisite for gaining competitive advantage through independent technological developments and successful technology transfer. In their theory of capabilities as one of the components of core competences (investigated in section 3.3.9), (Torkkeli & Tuominen 2002) mention that technological capabilities are not sufficient on their own (the other three being organizational structure, dynamic scale economies and market knowledge). One facet of technological capabilities is the IT capabilities discussed in 3.3.7. Regarding capabilities in technology-driven environments, (Lee et al. 2009) focus on how organizations can find new business opportunities based on their technological capabilities in response to the needs of business . They propose a technology-driven road-mapping process that starts from capability analysis for technology planning and ends with business opportunity analysis for market planning and thus linking technology to strategy.

(Alizadeh 2012) looked into the literature of technology management and other fields such as intellectual capital, organization maturity models and knowledge management. He aimed to assess a number of these models, like Porter's Value Chain Model and Garcia-Arreola's Technology Audit Model (TAM) and to create a taxonomy. Alizadeh notes that the terms encountered in the literature do not have a consistent definition; however they define strategic technological capability as

> *'[T]he generic knowledge intensive ability to jointly mobilize different scientific and technical resources which enables a firm to successfully develop its innovative products and/or productive processes, by implementing competitive strategy and creating value in a given environment*'.

This definition complies with the other definitions presented earlier for capability, business capability, strategic business capability and technological capability and it makes sense to adopt it unchanged.

3.3.6 Organizational capability

Capabilities can also be classified as organizational when expressed in terms of the organization's resources. In an early article by (Ulrich & Lake 1991), organizational capability was defined as *"the firm's ability to manage people to gain competitive advantage".* According to them, organizational capability can act as the connecting bridge between the other types of capabilities, namely economic/financial capability, strategic/marketing capability and technological capability. Around the same time Grant made a distinction between resources and capabilities and provided a classification of resources into tangible, intangible and personnel-based resources (Grant 1991; Bharadwaj 2000) (see also section 3.3.10). This distinction helped the field of resource analysis to make a shift to consider all kinds of an organization's resources as sources of competitive advantage: human resources, physical and material resources, financial resources, information resources and/or intellectual resources. In examining the relationship between capabilities and strategic direction and performance (O'Regan & Ghobadian 2004) looked into the literature and found several definitions for organizational capabilities; for example, Chandler (1990) defined them as "*a firm's collective physical facilities and skills of employees, and in particular, the abilities and expertise of the top management layer*s".

Another definition stems from the work of (Grant 1991; Teece et al. 1997; Amit & Schoemaker 1993): organizational capabilities are defined as *"a firm's capacity to deploy its assets, tangible or intangible, to perform a task or activity to improve performance"*. But the definition that stands out according to (O'Regan & Ghobadian 2004) and they chose to adopt comes from a book by Helfat (2003): *"[a]n organizational capability refers to the organizational ability to perform a co-ordinated task, utilizing organizational resources, for the purpose of achieving a particular end result"*. Examples of organizational capabilities include leadership development,

lean operations and project or talent management, the building of which was found to be top-three priority for 60% of respondents in a recent global survey by McKinsey [12].

Bringing together the above, a definition can be synthesized that is mostly based on the one by (Helfat et al. 2007) and is enhanced with elements from (O'Regan & Ghobadian 2004) about the three types of organizational resources and from (Grant 1991; Teece et al. 1997; Amit & Schoemaker 1993) about the impact on performance. Thereafter, an organizational capability is henceforth defined as the one that:

> Refers to the organizational ability to perform a co-ordinated task, utilizing organizational resources (tangible, intangible and personnel-based), for the purpose of achieving a particular end result in order to improve performance.

3.3.7 IT capability

It should be clear by now that capabilities do not just consist of the IT system part of the organization's activities and that in many cases there are capabilities which might not be automated by IT at all as (Keller 2010) also points out. Such capabilities can be the ones supported by the common office support solutions and that do not necessarily require a dedicated and specialized software solution. In the literature review performed by (Zhang et al. 2008)it was concluded that until then IT capability has been conceptualized in two separate ways; either in terms of managerial capabilities or in terms of technological capabilities.

Contrariwise, with the work of (Bharadwaj et al. 1999) a conceptualization of IT capability suggested that it is instead a complex construct composed of six underlying dimensions: i) IT-business partnerships, ii) external IT linkages, iii) business IT strategic thinking, iv) IT business process integration, v) IT management and vi) IT infrastructure. The next year, Bharadwaj built on top of his previous work and provided a RBV-informed definition of technological capability as "*[a firm's] ability to mobilize and deploy IT-based resources in combination or copresent (sic)with other resources or capabilities"* (Bharadwaj 2000). Similarly, (Stoel & Muhanna 2009) defined (organizational) IT capabilities as "*complex bundles of IT-related resources, skills and knowledge, exercised through business processes, that enable firms to coordinate activities and make use of the IT assets to provide desired results*" and further distinguished between externally and internally focused IT capabilities, taking into account the primary business process area that they support.

There are several points that have the largest significance; from the definition by (Bharadwaj 2000) we should keep that technological capabilities are the ability to mobilize and deploy IT-related resources and that they are combined or co-present with other resources and capabilities. And from the definition by (Stoel & Muhanna 2009) the statement that they enable

[12] http://www.mckinsey.com/insights/organization/building_organizational_capabilities_mckinsey_global_survey_results (accessed 08/08/2013)

the coordination of activities towards an end goal. With these in mind we have the following definition:

> Technological capabilities represent an organization's ability to mobilize and deploy IT-related resources, skills and knowledge in combination or co-presence with other resources or capabilities. They enable an organization to coordinate activities and make use of its IT assets to provide desired results.

3.3.8 Dynamic capability

At the turning of the century and as growth and innovation was increasingly shifting towards new dynamic and complex markets, scholars started looking beyond the resource-based view. The rationale was that it was inadequate to explain why some organizations gain competitive advantage and others do not in these dynamic environments of rapid and unpredictable change (Salunke et al. 2011; Teece et al. 1997; Eisenhardt & Martin 2000). Their work expanded the resource-based view of an organization with the dynamic capabilities view (DCV).

In his effort to attempt to investigate how firms achieve and sustain competitive advantage in environments of rapid technological change David J. Teece, collectively with a group of scholars, introduced the dynamic capabilities approach aiming to provide a coherent framework in a series of highly cited and praised articles (Teece et al. 1997; Teece & Pisano 1994; Teece 2009). Along the way, they first introduced the term of dynamic capabilities into the literature and defined them as *"the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments"* and added that they *"reflect an organization's ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions"*. Building on top of this work (Eisenhardt & Martin 2000) similarly defined dynamic capabilities as "*[t]he firm's processes that use resources-specifically the processes to integrate, reconfigure, gain and release resources-to match and even create market change. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die"*. Apart from these two definitions, scholars mostly agree on how a dynamic capability should be conceptualized and defined although the term adopted might differ, like for example "combinative capabilities", "architectural competence" or just simply "capabilities" (Eisenhardt & Martin 2000; Alizadeh 2012; Chen & Fong 2012).

Especially for strategic knowledge-based resources (Chen & Fong 2012) mention that they need to be renewed through knowledge management (KM), which deals with the development of a special type of dynamic capability, called knowledge management capability (KMC) for managing a firm's knowledge base over time and to produce superior business performance over time. Finally, as (Salunke et al. 2011) point out, the DCV assigns a prominent role to an organization's strategic leadership in the development of dynamic capabilities, unlike its predecessor, the resource-based view.

Teece's work still holds relevance today and the definition he and his collaborators created can be used as it is and still fit with the other definitions presented here. The following interpretation is somewhat more detailed to address the points by (Eisenhardt & Martin 2000; Alizadeh 2012; Chen & Fong 2012) but shares the same core:

> Dynamic capability is an organization's ability to continuously create, extend, upgrade, reconfigure, protect, and keep relevant its asset base (resources, competences, information and processes) to match and even create environmental change through its organizational and strategic routines.

3.3.9 Capability, competence and core competence

There are numerous published definitions in literature regarding competences and (Markus et al. 2005) have grouped them into three distinct approaches: educational standards, behavioral repertoires, and organizational competences. The first approach, which draws from the educational discipline, describes a competence in terms of development of skills, achievement of standards and award of credentials defined narrowly as an action, behavior or outcome. The second approach is based on the identification of personal competences as success factors that can be identified in "*star performers*" and taught to others; thus, competences can be developed[13]. It defines a competence as "*a generic body of knowledge, motives, traits, self-images, social roles, and skills that are causally related to superior or effective performance in the job*" and as a set of "*related but different sets of behavior organized around an underlying construct*", called the "*intent*" (Boyatzis 2008; McClelland & Boyatzis 1980). Finally, the third approach which handles competences in the business context looks into the business strategy and is the one being dealt with here. With the work of (Prahalad & Hamel 1990; Barney 1991) the concept of a company's core competences as collective knowledge fostering competitive advantage was adopted.

This concept was later extended by (Teece et al. 1997) with the inclusion of the (dynamic) capabilities (see 3.3.8). According to them, core competences can be considered the ones that shape a firm's fundamental business and they suggest that they must be derived by looking across the range of a firm's (and its competitors) products and services. Adding to this, (Torkkeli & Tuominen 2002) support that core competences are collections of competences that cross strategic business units (SBUs) and are therefore widespread in the organization. The degree to which a core competence is distinctive depends on how well endowed the firm is relative to its competitors, and on how difficult it is for competitors to replicate its competences.

Competence and core competence are terms that are sometimes used interchangeably with variations of capabilities in scientific literature (Grant 2008; Jussupova-Mariethoz & Probst 2007; Boyatzis 2008) and elsewhere[14], creating misconceptions. As (Henry 2011) points out, authors

[13] http://www.enterprisegovernance.com.au/blog/competencies-core-competence-capabilities-and-dynamic-capabilities (accessed 11/06/2013)

[14] For example in the Merriam-Webster dictionary they are considered synonyms http://www.merriam-webster.com/dictionary/competence (accessed 29/06/2013)

use both terms (core competences and distinctive capabilities or strategic business capabilities as they are referred to in this research) to describe activities that foster the achievement of competitive advantage. Additionally, (Tampoe 1994) mentions that among the twelve criteria a core competence must meet is that it has to be "*a capability which the organization can sustain over time".* Also, in an article by Kamoche from 1996 which investigates strategic human resource management within a resource-capability view of the firm, capabilities are more narrowly described as the '*organizational routines and human resource policies and practices*' which generate competences when combined with the resources (stock of knowledge, skills and expertise) (Kamoche 1996). In other words, he suggests that capabilities and competences are not the same, at least in the human resources domain; instead capabilities are one of the components needed for competences to be realized.

The relationship of the capabilities to the competences and core competences of an organisation were illustrated by means of a hierarchy by (Torkkeli & Tuominen 2002), as shown in Figure 6 below, in a similar manner as Kamoche describes the relationship between resources, capabilities and competences. However, they consider only technological capabilities, which were discussed here earlier (in 3.3.5). In the lower level of the hierarchy are the resources which the capabilities in the next level consist of, as building blocks. Capabilities refer to the combination and exploitation of these resources as (Grant 1991) posited a decade before. On the next level, a cross-functional integration and co-ordination of capabilities results in competences in different Strategic Business Units (SBUs) of the organization. Finally, on the fourth level lie the SBU-crossing core competences, as mentioned earlier. They also point out that as we move from the lowest to the highest levels of the hierarchy the resulting capabilities, competences and core competences become more valuable but also more difficult to obtain.

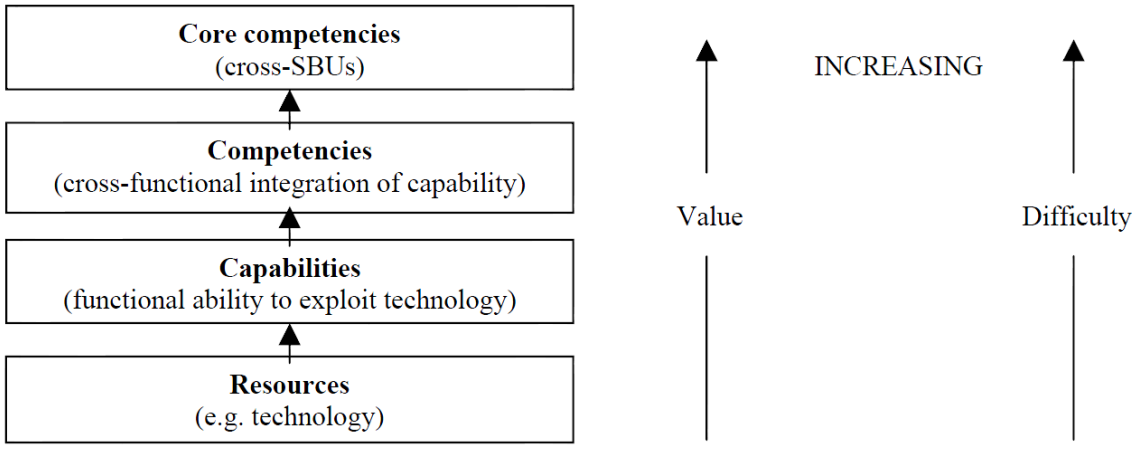


Figure 6: Hierarchy of competences (Torkkeli & Tuominen, 2002)

Comparing these two approaches, some similarities and some differences arise; both of them consider some sort of linear relationship (procedural or combinative) between capabilities, resources and competences and they both place resources at the bottom of the hierarchy.

However, Kamoche puts the capabilities in the same level as the resources, while (Torkkeli & Tuominen 2002) place capabilities one level higher. They also both posit that core competences arise from the '*mutually reinforcing interaction*' between capabilities and resources, although each presents a slightly different view of the terms. The fundamental difference comes from the scope of each article: one is dealing with human resource management and the other with strategic management. Finally, for the sake of comparison, it should be noted that (Tampoe 1994) considers as building blocks of a core competence the skills, resources and processes of an organization.

More precisely, competences pertain more to the Human Resource Development theory originating from the work of the Scottish moral philosopher Adam Smith. Accordingly, a competence has been defined as the "*knowledge, skill, ability, or characteristic associated with high performance on a job, such as problem solving, analytical thinking, or leadership. Some definitions of a competence include motives, beliefs, and values*" (Mirabile 1997). It is sufficient to say that this term describes a concept that applies to the individual level, or to a specific domain of knowledge owned by a group of individuals within an organization, like for example IT competence (Tippins & Sohi 2003); this is also evident from Kamoche's definition. The U.S. Office of Personnel Management states that it represents a whole-person approach to assessing individuals, since a competence should be measurable[15]. In accordance to the definition of a business capability given in section 3.3.2, we define a competence as a skill owned by an individual or a group within the organization (which can be as large as the entire organization), that when is successfully combined (with the contribution of a business capability) with other elements, such as resources, information, processes and their environments, value can be created. Concluding with competence, we will define it here as:

> A knowledge, skill, ability, or characteristic owned by a person or a group within the organization and associated with high performance.

The above definition is the same as the one by (Mirabile 1997), although slightly rephrased. It should be noted that when a competence is successfully combined through a business capability with other elements, such as resources, information, processes and their environments, value can be created.

On the other hand, when discussing core competences, the relevant scope is somewhat narrower and includes the organization as a whole. Prahalad and Hamel advocated in the late 1980s – early 1990s the idea that a core competence can lead to achieving higher organizational performance and to obtaining competitive advantage (Prahalad & Hamel 1990). According to the theory they postulated, an organization's set of core competences are the ones that it has strategically chosen to leverage to compete[16]. They defined core competences as "*the collective learning in the organization, especially how to coordinate diverse production skills and integrate*

[15] http://apps.opm.gov/ADT/Content.aspx?page=1-03&JScript=1 (accessed 02/08/2013)
[16] http://www.enterprisegovernance.com.au/blog/competencies-core-competence-capabilities-and-dynamic-capabilities (accessed 11/06/2013)

multiple streams of technologies" that deals with the harmonization of the technology streams, the organization of work and the delivery of value within an organization.

Their theory supports that a core competence must fulfil three key criteria: i) it should be difficult for competitors to imitate, ii) it should be reused widely for many products and provide access to a wide variety of markets and iii) it should make a significant contribution to perceived customer benefits. The analogy to the definitions of the different types of capabilities given earlier (especially in the sections 3.3.2 to 3.3.7) is undeniable; the first characteristic also typifies strategic business capabilities, the second the business capabilities and the third the business capabilities and the strategic technological capabilities. Besides, (Brits et al. 2006) follow the same path when enumerating the characteristics of the strategic capabilities (see also section 3.3.3). For (Prahalad & Hamel 1990) the concepts of capabilities and core competences are not dissimilar; they are even used interchangeably (p. 231). A recent attempt to make a distinction between the two came from (Alizadeh & Khormaei 2012), adapting the work of (Forsythe & Khormaei 2011). As the authors describe, an organization's capabilities are merely one of the three components that when fused successfully, core competences might arise (Figure 7).

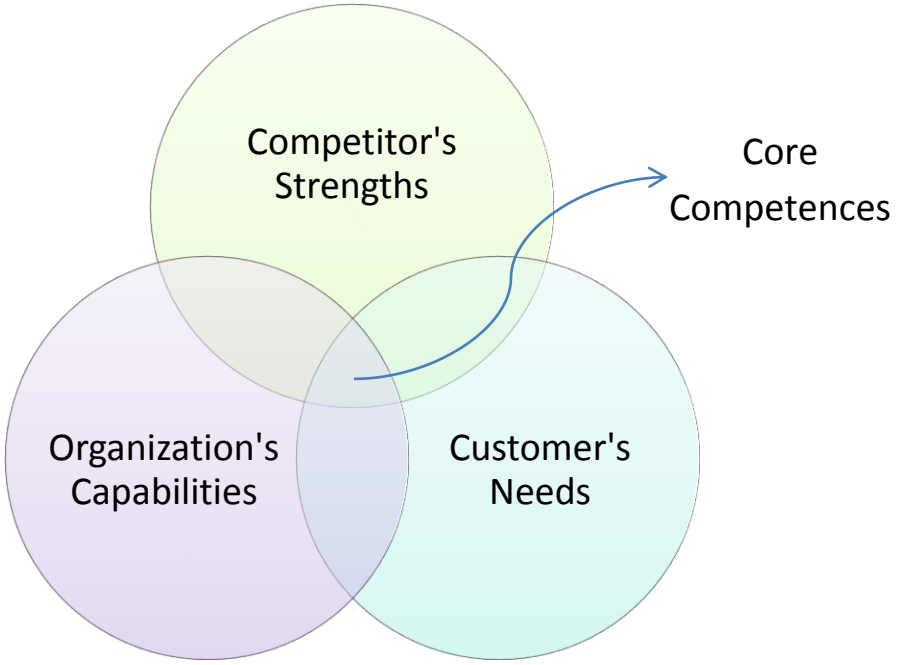


Figure 7: Core competences and capabilities (Alizadeh & Khormaei 2012; Forsythe & Khormaei 2011)

Furthermore, to counter the confusion created by the aforementioned theory by (Prahalad & Hamel 1990) among practitioners who rushed to adopt it and treat everything as a potential core competence, (Coyne et al. 1997) suggested a more closed definition. According to them, a core competence should be defined as "*a combination of complementary skills and knowledge bases embedded in a group or team that results in the ability to execute one or more critical processes to a world-class standard*".

In conclusion, this section has attempted to examine -among other things- the relationship between the concepts of core competence and capability. Based on the previous formulated definitions for the different types of capabilities, advocating that core competence and strategic business capability are describing different things would create major inconsistencies. It seems that the two terms are tautological and will be used interchangeably throughout the remainder of this thesis (although the term strategic business capability will be preferred).

3.3.10 Capability and resource

With the resource-based view of the firm more than twenty years ago, scholars started putting the organization's resources at the epicenter of the business and corporate strategy. Theoretical interest in economies of scope and transaction costs and exploration of the relationships between resources, competition and profitability highlighted the significance of organizational resources (Grant 1991). Grant adopted the idea of the six major categories of resources (financial, physical, human, technological, organizational resources and reputation) and he further constructed a classification of the resources into three categories, namely tangible, intangible and personnel-based resources. Tangible resources include the financial capital and the physical assets of the organization such as plant, equipment, and stocks of raw materials. Intangible resources encompass assets such as reputation, brand image, and product quality, while personnel-based resources include technical know-how and other knowledge assets including dimensions such as organizational culture, employee training, loyalty, etc. (Bharadwaj 2000). More classifications have been put forward, like for example the one by (Searle 2013) in a recent Gartner report, which broadly divides organizational resources into three types: monetary, physical and intangible (e.g. human resources, relational resources and structural resources).

In his article Grant clearly distinguishes between resources and capabilities of an organization on the basis that resources are the inputs into the production process, while capabilities are the capacity of a group of resources coming together to perform some task or activity. In other words, resources are the source of the capabilities of an organization, but capabilities are the main source of the organization's competitive advantage, as the organization's ability to assemble resources that work together (also in (Grant 2008)). Finally, he states that as they both define a business in terms of what it is capable of doing, they are a more durable basis for the organization's business strategy rather than external parameters.

On the contrary, another landmark article by (Barney 1991) on the resource-based view supports that resources should be more broadly defined to also include capabilities apart from assets, knowledge, information, firm attributes, and organizational processes controlled by an organization. He also adopts a different resource classification schema into physical capital resources (physical technology used, buildings and equipment, geographic location, and the organization's access to raw materials), human capital resources (training, experience, judgment, intelligence, relationships, and insight of individual managers and employees) and organizational capital resources (an organization's formal reporting structure, its formal and informal planning, controlling, and coordinating systems, as well as informal internal and

external relationships). However, Barney mentions that a capability of an organization is what it employs to exploit the resources, which shares common ground with Grant's approach.

Another definition comes from (Teece et al. 1997) who consider resources to be only the ones that are difficult if not impossible to imitate (e.g. trade secrets and engineering experience). They posit that assets like these are not easily transferrable between firms due to high transaction and transfer costs and because they may contain tacit knowledge. While it is true that if a resource is difficult or impossible to imitate, then it is not easily transferrable, the definition of a resource is rather problematic. It is a lot more closed, as it excludes all other productive assets an organization possesses (as defined by (Grant 2008)); besides not all resources in an organization's portfolio are necessarily of strategic importance.

It is well established by now that resources are the building blocks of the capabilities and serve as the basic units of analysis (Bharadwaj 2000; Klinkmüller et al. 2010; Tagarev 2009; Cheng et al. 2011; Eisenhardt & Martin 2000; Jianping 2011; Chen & Fong 2012; Salunke et al. 2011; Amit & Schoemaker 1993). (Brits et al. 2006) have supported the same idea by saying that resources can represent a cluster of elements that constitute a capability. In the previous section this was again mentioned; (Torkkeli & Tuominen 2002) consider resources to be the building blocks of the capabilities (shown in Figure 6). Finally, as was mentioned in section 2.1, the concept of capabilities encapsulates and abstracts from resources into the essential building blocks needed for performance analysis and improvement.

But the question remains whether a capability is a resource or not, as (Barney 1991) and (Grant 1991) support respectively. The answer is probably somewhere in between. We could agree with (Makadok 2001) who put forward the idea that apart from a combination of resources, a capability is a special type of resource itself, whose function is to improve the productivity of the other resources. This kind of circular logic that everything can be a resource has been noted by scholars (for example by (Priem & Butler 2001)).

Considering all the above, a proposed definition of the resource is that:

> A resource owned by an organization is the tangible, intangible or human assets, and many resources together can represent a cluster of elements that constitute a capability, while a capability can itself be a resource that improves the productivity of the other resources in that cluster.

This definition brings together three points; Grant's classification of resources (Grant 1991), the idea that a capability is a cluster of resources by (Brits et al. 2006) and the position that capability is itself a type of resource (Barney 1991; Makadok 2001).

3.3.11 Capability and service

A (business) service provides well encapsulated, hiding the complexity of the implementations from its consumers or potential consumers. This functionality that a service provides is well defined, self-contained and loosely coupled from other functionality/services (Ang et al. 2006).

As the definition given by The Open Group states (The Open Group 2011), which is the one that we will adopt here, a service is:

> *A logical representation of a repeatable business activity that has a specified outcome. A service is self-contained, may be composed of other services, and is a "black box" to its consumers. Examples are "check customer credit", "provide weather data", and "consolidate drilling reports".*

The relationship between capabilities and resources is a somewhat complex matter and has been since the conception of the term in enterprise architecture. Scholars have shied away from this issue and practitioners are still struggling to agree which relationship fits best. A characteristic case that reflects this state is a recent discussion on the networking website for professionals. In March 2013, a discussion was initiated on the group 'The Enterprise Architecture Network', where the author was asking other group members what is the difference between a business capability, a business function, a business process and a service. More than 600 comments later (at the time of writing) and there are as many opinions as commenters. From the practitioner literature, a Gartner report states that defining, developing, delivering and managing of business services depends on the development of capabilities in an organization (Smith 2012).

The performed survey offered some useful insights from enterprise architecture practitioners around the world and some are reflected in the ontology domain model presented in chapter 4. We will more extensively discuss the findings of the survey in section 3.4.

3.3.12 Capability and process

A classic definition of a business process comes from (Davenport 1993): "a process is simply a structured, measured set of activities designed to produce a specific output for a particular customer or market. It implies a strong emphasis on *how* work is done within an organization, in contrast to a product focus's emphasis on *what*". Put differently, it is a series of logically related activities or tasks that need to be performed together to produce a defined set of outputs that is of value to the customer, internal or external. The notion of value is also noted by (Hanschke 2010) as a key characteristic of a business process. This output is a compound or aggregate service and in that sense the scope of a process is narrower than the scope of a service. The 'activities' mentioned by Davenport can be substituted by 'services', we could therefore posit that a process comes as a result of a configuration of interconnected of services, that can recursively deliver another service[17].

In a business process engineering handbook published by BiZZdesign, the definition used for a process is that "*a process is a set of activities that occur between the request for a product or a service and the delivery thereof*" (Matthijsen 2012). It is also mentioned that a process has a specific business objective and that it runs from customer (trigger) to customer (result).

[17] On this we will have to agree with Tom Graves' comment on http://www.linkedin.com/groups/Whats-defference-between-Business-Capability-36781.S.219917184 (accessed 20/07/2013)

Similarly, according to (Hanschke 2010) each process has a defined starts and end is as a rule recurring.

The above definition by Davenport follows the same direction as the one in this thesis; as business capabilities describe what an organization does, business processes define how it does it. Thereafter, the suggested definition for a process can be formulated as such:

> A process is a series of logically related activities or tasks that need to be performed together to produce a defined set of outputs that is of value to the customer. A process comes as a result of a configuration of interconnected of services, that can recursively deliver another service.

In other words, capabilities are not processes. In technology-enabled processes, capabilities may be produced to create more efficient and effective processes or to foster innovation by doing things better. Processes are one of the four necessary components of capability delivery, the other three being people, technology and assets (e.g. facilities and resources), as mentioned before and we will consider them assets an organizations possesses.

3.3.13 Capability and function

The terms of business capability and business function has been closely connected, so much that they are frequently used interchangeably. Sometimes it is difficult to distinguish between a capability and a high-level business function. As (Berrisford 2011) characteristically notes, TOGAF has inherited the concept of business function from Information Engineering and, but the concept of capability from capability-based planning, and the lack of integration has created semantic confusion. According to (Hanschke 2010), a business function is "*a distinct, cohesive set of business functionality such as 'customer relationship management'. The enterprise's capabilities are expressed in terms of the business functions it carries out. Business functions can be organised into sub-functions and have defined relationships with the other building blocks of the business landscape model*".

Indeed, the capabilities of an organization are expressed in terms of its business functions; however the key difference is the lack of the notion of potentiality from a business function, because it focuses on existing behaviour in the present. Hanschke also suggests that business functions should be used if the organization is going frequently through changes, suggesting that they are not as stable as the business capabilities. Nonetheless, this is not really the case; they both express the 'what' a business unit (for functions) or an organization (for capabilities) is doing, which should only change under special circumstances. Perhaps in very special cases of organizations that undergo such radical changes in such extreme frequency, it would be better if they adopted the more flexible how, i.e. their processes. Furthermore, one other important

difference is that while functions describe behaviours of specific business units, capabilities are about what the entire organization is doing.[18]

In TOGAF a business function is defined as the behaviour that "[d]elivers business capabilities closely aligned to an organization, but not necessarily explicitly governed by the organization" (The Open Group 2011). In conclusion, a capability lies in a higher level of abstraction than a function and has a wider scope (the entire organization versus a business unit within it). Complementing Hanschke's definition with the one by The Open Group, we can support that:

> A function describes a specific and distinct behavior of a department or organization / business unit at a certain point in time and can deliver business capabilities to the organization.

3.3.14 Capability-based planning

The definition of capability-based planning from the documentation of TOGAF Version 9.1 (The Open Group 2011) was taken as the starting point for this entire thesis and was adopted as-is:

> *Capability-based planning focuses on the planning, engineering, and delivery of strategic business capabilities to the enterprise*.

Although the definition is not very descriptive, it includes two important elements. First, it is stated that capability-based planning deals only with the strategic business capabilities of an organization. As mentioned before in 3.3 which capabilities are of strategic significance should be left to the business to decide, so we can say that Capability-based planning is about developing or improving those capabilities. Second, it prescribes what it should do, namely the planning engineering and delivery of these capabilities, or to put it differently the entire process of obtaining them. (Poole 2012) further explained the concept as a planning discipline, in which enterprise change is defined, sequenced, coordinated and managed in terms of capability increments, thus highlighting that capability-based planning has the power to affect and complement enterprise architecture. This comes in addition to projects and deliverables within the frame of enterprise architecture and can therefore support project portfolio management as well.

In the national defense sector it was previously defined as "*planning, under uncertainty, to provide capabilities suitable for a wide range of modern-day challenges and circumstances while working within an economic framework that necessitates choice*" (Davis 2002) and has been highly influential in other sectors as well. In this context, capability-based planning has been defined as the mere set of resources needed for a capability (Snyder et al. 2009), rather wrongfully; and this because obtaining the resources necessary does not guarantee the actual acquisition of the desired capability. (Chim et al. 2010) emphasize that these obtained capabilities should be able to deal effectively, not just with the currently obvious problems, but

[18] http://enterprisestewards.ning.com/forum/topics/differences-between-a-business-function-and-a-business-capability (accessed 12/07/2013)

with a host of potential challenges and circumstances. This resonates well with organizations dealing with uncertainty in today's turbulent environments, suggesting them to examine different possible scenarios and circumstances and to abstract from less important changing distractions.

Organizations need to take into account changes in their environment as well as what they are capable of doing themselves. (Moore et al. 2010) characteristically say that capability-based planning is an iterative, dynamic, interdependent and ongoing process to "to assess current capabilities, determine capabilities gaps, make investment decisions, and reassess capabilities levels" and even though their discussion is about operational military planning and national preparedness, these attributes hold true for every capability-based planning discipline.

3.4 The online survey

An online survey was developed and distributed online from June until August of 2013. It was shared in EA-focused discussion groups within the social media platform LinkedIn[19], as well as with targeted practitioners and scholars and with members of The Architecture Forum of The Open Grup via emails and mailing lists. This resulted in collecting opinions from individuals and facts about organizations located in different countries across the globe, through 22 responses. The respondents hold a variety of roles within academia and within organizations in the industry, for example President, CEO, Lead Enterprise Architect, Head of Business Architecture and Consultant, to name a few.

The questions from the survey can be found in Appendix A: Survey Questionnaire and can be grouped under three broad categories. The first one aimed to fuel thinking about the difference between fundamental concepts that are sometimes used in literature and in practice instead of capabilities, e.g. a process, a function, a resource and a service. These five open questions received many different answers which often contradicted each other, as expected. This only made stronger the point that the field is still lacking consensus on its footing, as advocated in the problem statement earlier (in section 2.1). These questions were not mandatory fields on purpose, since not providing an answer in an open question may indicate that the participant does not have a ready answer and several respondents left them empty (especially question 1). Contrariwise, if the concepts were clear and obvious, more answers would have been given.

The second category of questions intended to collect information about how organizations are dealing with capabilities and capability-based planning. The responses showed the following about the participants and their organizations:

- 9 out of 20 organizations have already modeled their capabilities using capability maps, 5 out of 20 have not and 5 out of 20 have not yet, but are considering to do so;

[19] Some of these groups were: ArchiMate (http://www.linkedin.com/groups/ArchiMate-50758), TOGAF (http://www.linkedin.com/groups?gid=60545), Business Architecture Community (http://www.linkedin.com/groups?gid=84758) and The Enterprise Architecture Network (http://www.linkedin.com/groups/Enterprise-Architecture-Network-36781).

- 4 out of 20 find capability models simple and only 1 of them does not find the models entirely clear;
- 6 out of 20 find capability models complex, however only 2 think there are completely comprehendible;
- Only 4 of the respondents' organizations are currently measuring their capabilities.

In addition to the last point, the surveyed professionals were also asked how the organizations are actually measuring the performance of their capabilities or why they are not measuring them at all. Within the responses received some give the impression that most organizations have only recently started thinking in terms of capabilities and have not reached that point of maturity yet, in capability development and monitoring or on a wider scale. For example, some of the reasons given were: "*Still maturing the concepts and enterprise sequencing approach*" (Business Architect in the banking sector), "*No topic at the moment*" (Enterprise Architect in a medium sized telecom) and "*Architecture Maturity is still not appropriate*" (undefined role in a non-profit organization in the health sector). Others invoke lack of time, budget or governance, for instance: "*Cost/time*" (Principal Consultant in a consulting firm) and "*Not enough time, lack of governance and too busy building / identifying new capabilities*" (undefined role in local government institution within an ICT change function). Also, one respondent stated that their organization is taking steps towards measuring their capabilities, e.g. "*Just learning to do it in pilot*" (Lead Enterprise Architect in a bank) and another one (CEO in a small consortium) mentioned that their organization is following the usual monitoring technique within capability mapping, the coloring in red green and amber, each one symbolizing a capability's status.

Lastly, the goal of the questions in the third category was to poll on expectations from capability-based planning as a method and on the support they think is needed regarding the method, the modeling and the tools. In general, practitioners expressed the need for agreed definitions and a standard framework, and as one stated "*You need a well-defined performance framework (of value drivers and measures) so that value is consistently defined across all planned business/technology changes*". Most of the respondents expect capability-based planning to improve ROI by improving the focus of the investments, by providing business/IT alignment, and additionally by aligning production and logistics technologies.

4. An ontology domain for capabilities

In this chapter we are putting together the findings from sub-chapter 3.3 and, based on this, a model is created which depicts the definitions along with the interrelationships. After having systematically researched the academic literature and the insights from practitioners, an inventory with the ones that the author supports was created. In some cases one definition was found which is believed to perfectly describe the concept and was therefore kept unchanged. But in most cases not one single superior definition than the others was found; thus a new definition was created or synthesized using components and ideas from a variety of other definitions. The fourteen researched concepts are listed in Table 4 and Table 5 below.

Table 4: Set of definitions (I)

Term	Definition	Source(s)
Capability	A capability is an ability, capacity or potential that an organization, person or system possesses. Capabilities are typically expressed in general and high-level terms and typically require a combination of organization and different assets (e.g. people, processes, and technology) to be achieved and thus realize their goal.	(The Open Group 2011); (Tagarev 2009)
Business capability	Business capabilities are the ways in which enterprises combine resources, competences, information, processes and their environments to deliver consistent value to customers. They describe what the business does and what it will need to do differently in response to strategic challenges and opportunities. They can be synthesized by or connected to other capabilities, business or otherwise.	(Burton 2013); (Bredemeyer et al. 2003)
Strategic business capability	Strategic business capabilities are the business capabilities that offer a competitive advantage to the organization by being better than those owned by the organization's competitors and by being difficult to imitate or replicate and that also contribute in shaping and realizing the organization's business strategy.	(Brits et al. 2006); (Henry 2011)
Technological capability	Technological capability is the ability of an organization to make use of technological know-how through identification, appraisal, utilization and development.	(Acha 2000); (Kim 1999)
Strategic technological capability	Strategic technological capability is the generic knowledge-intensive ability to jointly mobilize different scientific and technical resources which enables a firm to successfully develop its innovative products and/or productive processes, by implementing competitive strategy and creating value in a given environment.	(Alizadeh 2012)
Organizational capability	An organizational capability refers to the organizational ability to perform a co-ordinated task, utilizing organizational resources (tangible, intangible and personnel-based), for the purpose of achieving a particular end result in order to improve performance.	(Helfat 2003); (O'Regan & Ghobadian 2004); (Grant 1991); (Teece et al. 1997); (Amit & Schoemaker 1993)

IT Capability	Technological capabilities represent an organization's ability to mobilize and deploy IT-related resources, skills and knowledge in combination or co-presence with other resources or capabilities. They enable an organization to coordinate activities and make use of its IT assets to provide desired results.	(Bharadwaj 2000); (Stoel & Muhanna 2009)
Dynamic capability	Dynamic capability is an organization's ability to continuously create, extend, upgrade, reconfigure, protect, and keep relevant its asset base (resources, competences, information and processes) to match and even create environmental change through its organizational and strategic routines.	(Teece et al. 1997); (Eisenhardt & Martin 2000); (Teece 2009); (Alizadeh 2012); (Chen & Fong 2012)

Table 5: Set of definitions (II)

Term	**Definition**	**Source(s)**
Competence	A competence is a knowledge, skill, ability, or characteristic owned by a person or a group within the organization and associated with high performance.	(Kamoche 1996); (Mirabile 1997)
Core competence	See 'Strategic technological capability'.	
Resource	A resource owned by an organization is the tangible, intangible or human assets, and many resources together can represent a cluster of elements that constitute a capability, while a capability can itself be a resource that improves the productivity of the other resources in that cluster.	(Grant 1991); (Grant 2008); (Barney 1991); (Brits et al. 2006); (Makadok 2001)
Service	A service is a logical representation of a repeatable business activity that has a specified outcome. A service is self-contained, may be composed of other services, and is a "black box" to its consumers. Examples are "check customer credit", "provide weather data", and "consolidate drilling reports".	(The Open Group 2011)
Process	A process is a series of logically related activities or tasks that need to be performed together to produce a defined set of outputs that is of value to the customer. A process comes as a result of a configuration of interconnected of services, that can recursively deliver another service.	(Davenport 1993); (Matthijsen 2012)
Function	A function describes a specific and distinct behavior of a department or organization/business unit at a certain point in time and can deliver business capabilities to the organization.	(The Open Group 2011); (Hanschke 2010)
Capability-based planning	Capability-based planning focuses on the planning, engineering, and delivery of strategic business capabilities to the enterprise.	(The Open Group 2011)

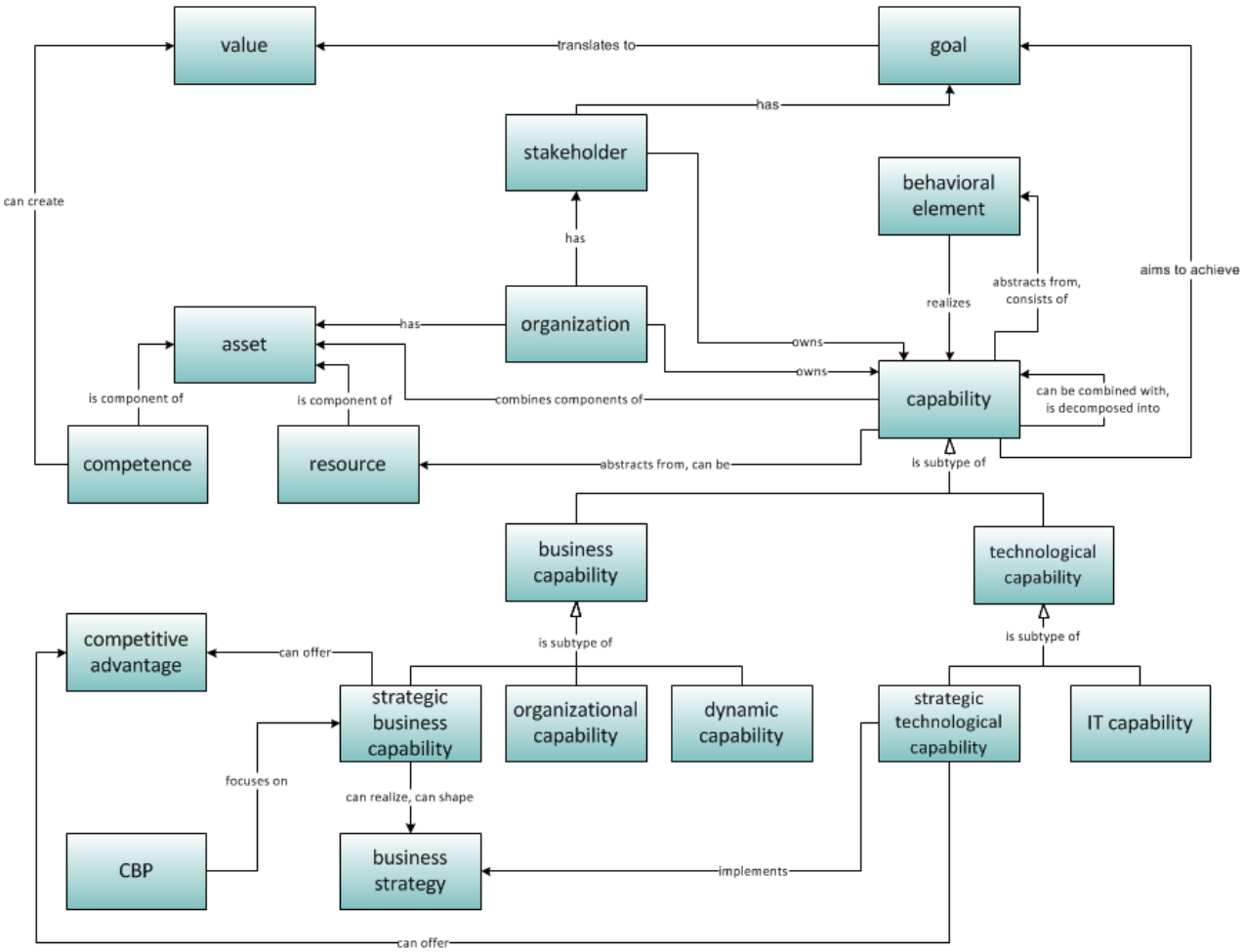


Figure 8: The capability ontology domain

In Figure 8 the proposed ontology domain is shown. Central to this model is the concept of the capability, which is modeled as supertype/generalization of all other capability types. On the second level of hierarchy there are the business capability and the technological capability, which both include further subtypes/specializations on the third level. Three subtypes of the business capability are the strategic business capability, the organizational capability and the dynamic capability, while the strategic technological capability and the IT capability are modeled as subtypes of the technological capability. Out of these concepts in the lowest level of hierarchy, the two strategic capabilities, i.e. the strategic business capability and the strategic technological capability are the ones associated to the organization's business strategy and the competitive advantage it can achieve with the contribution of such capabilities. While both these strategic capabilities can realize or implement the business strategy, only the strategic business capability can shape it based on the definition provided earlier. In the model it is also shown that capability-based planning deals with the strategic business capabilities of an organization according to the definition by The Open Group in the TOGAF specification.

Looking further into the relationships of the capability construct with the other constructs in the model, eight more associations can be found. Between the capability and the behavioral element there are two oppositely directed associations. While a capability is a more abstract way of expressing an aggregation of behavior-related concepts (i.e. functions, processes and services) it also realized by the behavior; the behavioral element construct encloses all that is necessary to be combined from the lower decomposition levels in order to have a capability. Similarly, a high level capability can be decomposed into lower level capabilities that in combination can deliver it and each capability requires a combination of the various assets (tangible, intangible and personnel-based) that a company owns. These two relationships are represented in the model by the self-association of the capability and the association of the capability with the asset respectively. Later, in Chapter 5 and section 5.2.D which describes the proposed capability-based planning method, the above associations are represented by means of levels of a capability map. On Level 1 sit the highest level capabilities and each consists of a number of Level 2 capabilities, which in turn consist of Level 3 capabilities. If we look further down, each Level 3 capability is decomposed into processes, functions and/or services. Overall, the realization of a capability occurs from the bottom up, with the contribution of organizational assets and behavior.

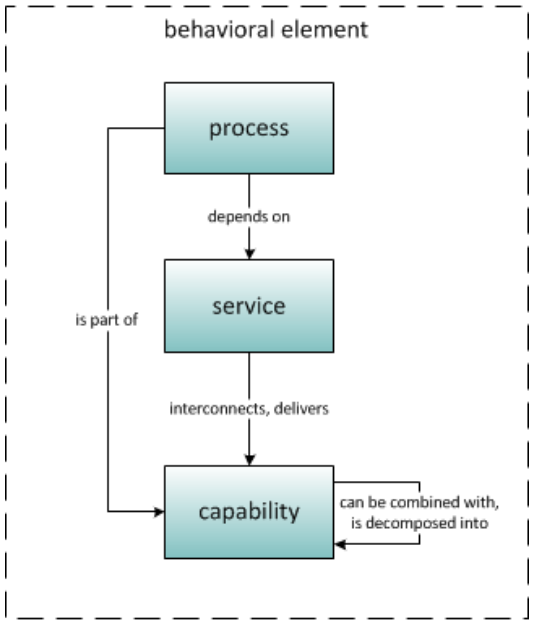


Figure 9: Decomposition of the behavioral elements

The reason we have modeled business function, business process and business service as one composite entity named *behavioral element* is to make the model simpler; in ArchiMate these three concepts (along with that of business interaction, not examined here) are all elements

used to model behavior[20] (Iacob, Jonkers, et al. 2012). Figure 9 above shows the relationships between these three elements that can be concluded from their definitions, but they will not be examined further and are not explicitly included in the ontology domain.

Like a capability abstracts from the organizational behavior, it also abstracts from a resource, because the concept of the resource is not as appropriate as that of the capability when analyzing or designing a strategic plan of a business. Furthermore, a capability can itself be a resource, like for example when assuming the view of the highest level decision makers within an organization that see capabilities as something that the organization owns and that can be 'used' and combined as needed, depending on the circumstances.

Finally, there are two 'owns' associations between a capability and the organization or the stakeholder within the organizations that owns it. In the definition of a capability provided in Table 4 it is stated that it is an ability that an organization, person or system possesses (system is not included in the model because it does not add value to it). This means that a capability can be owned by different entities, depending on the type of the capability. Usually, capabilities of the highest supertype can be owned by people in the organization, whereas business and technological capabilities are owned by organizations. Here, the concept of a person possessing a capability has been embodied in the stakeholder concept, although not all persons are stakeholders. Although this was done for the sake of simplicity, having separate person and stakeholder concepts would be a valid modeling choice alternative. Moreover, a stakeholder belongs to a certain organization, which is depicted in the model by the 'has' association between them.

Above all a capability is tied to a goal, whether it is an organizational or a personal goal; every capability is developed or enhanced in order to have a desired effect achieved. This relationship is represented by the 'aims to achieve' arrow in the upper right of the diagram. Additionally, every goal is connected to a stakeholder who is responsible for it or desires to achieve it for its benefit to the organization. In other words, a goal cannot exist freely within an organization without a stakeholder catering for reaching it and steering the process.

A resource is a component of the organization's assets, along with any existing competences within the organization. This is shown in the model by the two 'is component of' associations between asset and competence and asset and resource. Perhaps there are more components of the organization's assets than the aforementioned two, but these are the ones that came up during the research and that have been included in the related definitions. In general resources are the means and competences are the ways which foster a capability achieving a certain goal.

An asset is naturally owned by an organization (expressed by the 'has' relationship between them), which depending on the type can be developed, bought or transferred. For example, a

[20] In the transition from version 1.0 to version 2.0 of ArchiMate the biggest change in the Business Layer metamodel was to completely abstract from these behavioral elements and model them as one metamodel concept, indicated by yellow color and named 'Business Process / Function / Interaction'.

competence cannot be bought or transferred, because it is inherent in the organization and embedded into its structure and methods; however, resources can be developed, bought or transferred. Additionally, an asset that holds significance for an organization can create value for the organization, whether it is considered a strategic asset or not. This relationship is shown in the upper left of the model in Figure 8. It should be noted that although the concepts of value and asset are mentioned above in relation to only some of the other concepts, in this research we are using the terms flexibly. Many attempts to define what value is have been made in the past by scholars, but it is rather difficult to isolate and adopt one.

Finally, a goal is connected to value, in the sense that a goal that holds no potential value should not exist. After all, gaining value is what drives the creation of a goal in all kinds of environments, including the organizational. This relationship is shown by the 'translates to' association on the upper center of the diagram.

It should also be noted that it is assumed that a capability is connected to a role model, because it is offered by a provider and consumed by one or more customers (i.e. departments or persons, internal or external to an organization). However these roles are not included in the model for the sake of complexity and because they do not necessarily improve the comprehension of the model.

5. A capability-based planning method

The way capability-based planning is defined in TOGAF dictates that it deals with the planning, execution and delivery of the target strategic business capabilities. It is important to provide guidelines to organizations about how to actually obtain the capabilities identified as strategically important, which would close the gap between them and the capabilities currently owned. However, not all organizations are that well prepared and informed in regards to what capabilities exist in their portfolio, how well they perform, which ones are important and which ones are not, or which ones they should pursue obtaining or prioritize. Additionally, not every organization has the same needs in regards to their strategic objectives. Thus, a complete capability-based planning method should address these issues to service companies that are in different models of readiness.

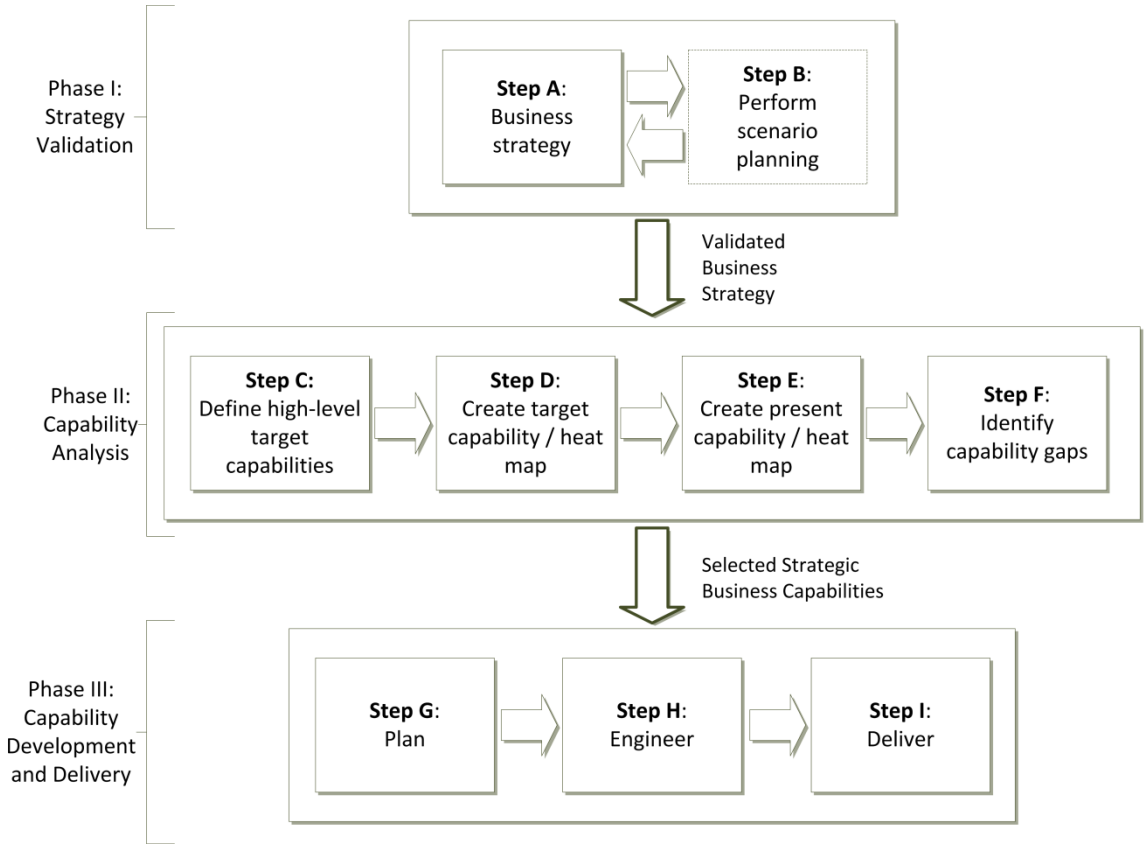


Figure 10: The capability-based planning method

The method consists of three consecutive phases in a logical order that implies sequential traversal from the first step to the last. Although iterations are not explicitly included, it is obvious that if, at any point in time and at any step of the method, if the situation changes inadvertently or advertently (e.g. changes in the market or in the budget) or if mistakes have been made in a certain step, it is implied that the organization can go back and redo whatever is needed to be redone. Even though the method is sequential it is constructed so that it can be used in different ways, serve different purposes and assist organizations with different needs.

The method acts as a suggestion and does not restrict business on how to use it, since many parts can be optional, depending on what they are aiming for. For example, an organization unsure about whether its business strategy sufficiently addresses scenarios and forces which will or may impact it and its environment should begin with Phase I, in order to make its strategy more resilient with scenario planning and then continue with Phases II and III. Another organization that has validated its business strategy and already developed the scenario planning or is not interested in performing scenario planning at all can jump into Step C of Phase II. The three other steps in this phase aim to provide guidance in determining the important and obsolete business capabilities that serve its business strategy, through modeling and gap analysis. If only modeling and not developing or abandoning capabilities is what the goal is, the organization can stop there; otherwise it can afterwards proceed in Phase III. Finally, an organization that has completed capability analysis and has finalized the set of business capabilities sought after, will find value in Phase III, which includes the steps necessary for obtaining these capabilities. The capabilities to be developed can solely derive from the organization's business strategy as well, if budget and time do not allow the organization to perform scenario planning -in that case step B can be omitted. This optional step is represented by dotted border in Figure 10 above which gives an overview of the proposed method. It brings together concepts and tools from strategic planning and management, business modeling and national defense planning and adds a layer of explicitness which, although necessary, was missing from the field.

Overall, the three phases comprising the method (named Strategy Validation, Capability Analysis and Capability Development and delivery) are sequenced in such a way that extends the TOGAF definition of capability-based planning backwards, offering a complete roadmap. Each phase consists of a number of steps and the relationship between them is usually linear (with the exception of the steps of Phase I). For each step a set of activities and a set of techniques are indicatively proposed. The output of each phase is used as input for the next one, so in that sense the model resembles the classic waterfall model with some iteration; this also applies to neighboring steps across consecutive phases. Assuming an overarching view of the method, it uses as primary input the mission, vision and core values of an organization and the produces a set of realized strategic business capabilities as output. In the following sections, each phase is presented and analyzed.

5.1 Phase I: Strategy Validation

The first thing an organization should do before even starting to think about developing capabilities is to ensure that its business strategy is well described, communicated and understood and that it is also resilient. In the end of this phase, the organization should be feeling confident that its business strategy sufficiently addresses scenarios and forces which will or may impact it and its environment. Thus, the organization will be able to validate or redefine its strategic priorities. The two steps within this phase act iteratively, in the sense that scenarios mostly (but not exclusively) derive from the business strategy but strategic decision making based on scenario planning might reshape the business strategy. Step B: Perform Scenario

Planning is optional but highly advised. The outcome of this phase is a clear and validated business strategy, optionally along with a set of strategically important scenarios.

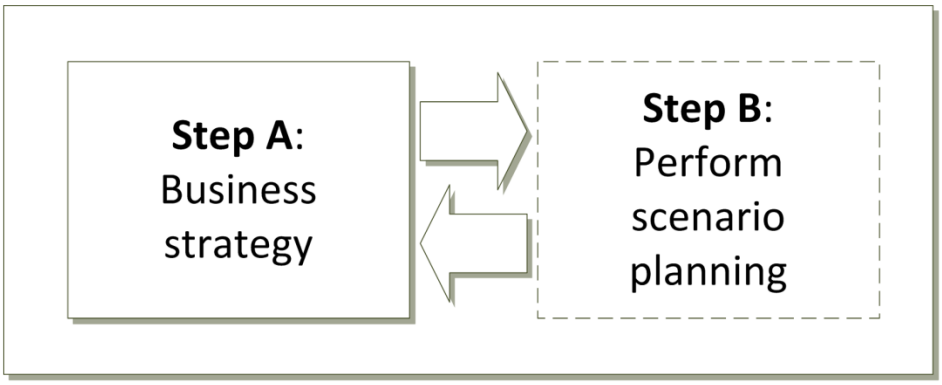


Figure 11: The steps of Phase I

A. Start with the Business Strategy

An organization's business strategy aims to clarify what are the important strategic business outcomes and furthermore explain how they will be achieved. A critical success factor for leveraging business capabilities to foster and drive these outcomes is to understand which ones support the execution of the business strategy. To put it simpler, to know which strategic business capabilities an organization needs, it must first look at its business strategy. Problems arise when the business strategy is not well-documented, understood or communicated across the organization. This makes the identification of the strategic business outcomes, which are important to the organization, difficult.

It is necessary to consider the organization's capabilities when thinking of its business strategy, as well as the bilateral relationship between the two, because capabilities help translate the real business value of the resources an organization owns. On one hand, the business strategy dictates which capabilities are deemed necessary in achieving outcomes of strategic importance and should therefore be developed or prioritized and which capabilities are tight to legacy objectives and are no longer relevant. On the other, strategic business capabilities owned or sought out but not yet owned by the organization can uncover hidden aspects of its business strategy and dictate its rethinking and redesigning. These capability gaps between strategy and execution can be highlighted by appropriately modeling the capabilities and can furthermore focus management attention on correcting the misalignment.

Defining an organization's business strategy is no simple undertaking. However, it is beyond this thesis' goal to provide guidelines on how to go about completing such a task; for the purposes of this thesis, we start with the assumption that there is a business strategy in place. Besides, it is a topic already covered extensively in academic and practitioner literature. In (Aldea 2013) the author describes a methodology with many techniques and steps to follow in order to choose and define a business strategy. She does this by combining eleven strategy models, enterprise

architecture, and a business case. The first five sections of this method, with the help of the included strategy models, are tailored to guide organizations in formulating and choosing an appropriate strategy. Here they are included as activities of Step A and are briefly presented in Table 6 below, along with the accompanying techniques and the other attributes of the step. The remaining parts of the strategy model-based method deal with defining appropriate metrics and realizing and evaluating a strategy. The diagram of the entire proposed strategy model-based approach can be found in Appendix B: The strategy model-based approach.

Table 6: Attributes of step A

Step A: Start with the Business Strategy	
Goal	To help an organization choose a well-defined business strategy
Activities	• Review vision • Analyze environment • Develop strategic options • Choose strategy • Elaborate strategy
Input	• Core values • Vision • Mission
Techniques	• SWOT analysis • Six Paths framework • Confrontation Matrix • Blue Ocean Strategy Canvas • QSPM • Four Actions Framework (Blue Ocean Strategy) • Strategy map • Value creation map
Result	A clear and well-defined business strategy

Similarly, a recent report from Gartner suggests that, with tools that aid visualization of key aspects of the organization, like for example the strategy map along with the value creation map, and KPIs that measure strategic business outcomes, its business strategy can be uncovered, adjusted or validated (Searle 2013). The strategy map, suggested also by (Aldea 2013), is based upon the balanced scorecard tool, designed by Robert S. Kaplan and David P. Norton in the 1990s and can provide a visual representation of how the organization will leverage its resources and processes to achieve strategic business outcomes (i.e. the objectives of the organization, the planned actions for achieving the objectives and the means by which the achievement will be measured). Together with the value creation map, which considers the entire stakeholder value proposition and the organization's entire value proposition and various interdependencies, they can illustrate how the greatest business value can be achieved. Furthermore, the KPIS or plain metrics defined in the strategy map and which represent target performance can be later linked to capabilities in Phase II.

It should be noted that the discussion in literature regarding capabilities is revolving around a *business* rather than an *enterprise* or an *organization*, as it is thought that the content of this term is broader in a way that also includes relationships with the environment, which affect or are affected by the business capabilities. This holds true also for the scenario planning phase that follows, since the organization's environment has to be considered as well. For this reason, for the remainder of Chapter 5, we will be adopting this fine distinction between the two terms (business and organization).

B. Perform scenario planning

Scenario planning was initially conceived as a long-term strategic planning tool at RAND in the 1950s by Herman Kahn and it was introduced in the business world by Royal Dutch Shell in the 1970s (Romani 2005; De Spiegeleire 2011). This technique can and has been used effectively in situations where decision making under uncertainty in the business environment requires an evaluation of long-term business what-ifs. This evaluation supports the what-if scenarios which describe possible futures; not necessarily the most probable ones, but plausible, coherent and substantially different ones (Schulte & Mesaglio 2012). They are different from forecasts, which are usually constructed on the fundamentally different assumption that tomorrow's world will not be significantly different than today's. This is far from the truth, since the increasingly volatile and turbulent future constantly presents new risks and opportunities. In this sense, scenario planning is about making informed decisions based on the understanding the logical implications of known current choices and not about making decisions based on forecasted future trends. Romani has graphically depicted their difference in a diagram which can be found in

Appendix C: Forecasts vs. Scenarios.

The inclusion of scenario planning for strategic choice was suggested in the evaluation section of (Aldea 2013), which was referenced earlier. There, in interviews with strategists from different organizations, scenario planning as a strategy model which enhances the rigor of strategic choices came up more than once. Additionally, although the concepts of scenarios and scenario space have been quite prominent in the defense literature in the past decades, recently the idea that scenarios may be necessary but not sufficient on their own has been put forth. Nowadays capabilities and capability-based planning have been placed at the forefront and scenario planning has been given a supportive role instead; however the two are still tightly linked (Hales & Chouinard 2011; Department of Defense 2009). On the other hand, when discussing capability-based planning in Enterprise Architecture, this connection is not well-developed yet; the method suggested in this research aims to amend that by incorporating it in capability-based planning. What exists in TOGAF 9.1 is the definition of business scenarios and business goals, as a method for deriving business requirements for architecture and the implied technical requirements. The process of creating a business scenario is well-documented in the specification. According to it, a business scenario is developed over a number of iterative phases of Gathering, Analyzing, and Reviewing the information in the business scenario and an extra refinement step (The Open Group 2011).

Scenario planning is more of a disciplined way of thinking and as such there is not one single formal and strictly constructed methodology for it. The theoretical background has been built by different scholars (e.g. by (Schartz 1998; Walsh 2005; Bradfield et al. 2005; Peterson et al. 2003)) and several approaches have been suggested (e.g. by (Huss & Honton 1987), (Schoemaker 1995) and (Ringland 1998)). The one chosen to be adopted here comes from the practitioner side and was published last year by Gartner (Schulte & Mesaglio 2012). It does not stray far from the previous suggestions regarding the individual steps, of which it has five (the last one concerned with monitoring how the future actually unfolds), all of them included in Table 7 as activities of Step B. The original table from Gartner can be found in Appendix D: Five Steps of Scenario-Based Planning.

Table 7: Attributes of step B

Step B: Perform scenario planning	
Goal	To explore could-be scenarios
Activities	• Define key issue and scope • Analyze driving force • Create and script scenario • Assign risk and criticality values • Select scenarios • Communication of scenarios to stakeholders • Identify and monitor signposts
Input	• Business strategy • Results of SWOT analysis

Techniques	• Facilitated workshops • Outside-the-box thinking • Representation of forces or drivers in an axis each, that create 2D or 3D grids which in turn define quadrants • Distinction between elements of the core strategy and scenario-specific elements • Identification and monitoring of leading indicators for each scenario • Risk assessment (probability * impact) • 2-axis grid to plot scenario creation results
Result	A subset of the scenario space, consisting of multiple scenarios

This approach starts with the business strategy, but it may also redefine it if the results indicate that some aspects or factors have not been taken into account. Therefore, the resulting scenarios stem from both the business strategy and the scenario planning and they comprise a broad "scenario space"[21]. Following this step is recommended, but is kept optional; organizations that are confident in their current strategy or that are not in the position to deploy the necessary resources can skip it.

The core technique within this step for creating scenarios is the construction of quadrants, like in the example by Gartner shown in Figure 12 where two influencing forces (speed of economic recovery and intensity of merger and acquisition [M&A] activity) could generate four possible futures. Each quadrant created by the two or three spectrums or influencing forces represents a scenario, which should be described as a compelling narrative or story. By organizing a workshop towards scenario creation, at least two scenarios should be constructed as a result, and of course combinations of different forces guide towards the creation of different scenarios.

[21] Scenario space has been defined differently in the past, e.g. as a subset of the alternative scenarios in the Trend-Impact Analysis by (Huss & Honton 1987). The selection in the method presented here does not happen at the scenario level, but later at the capability group level in Step C.

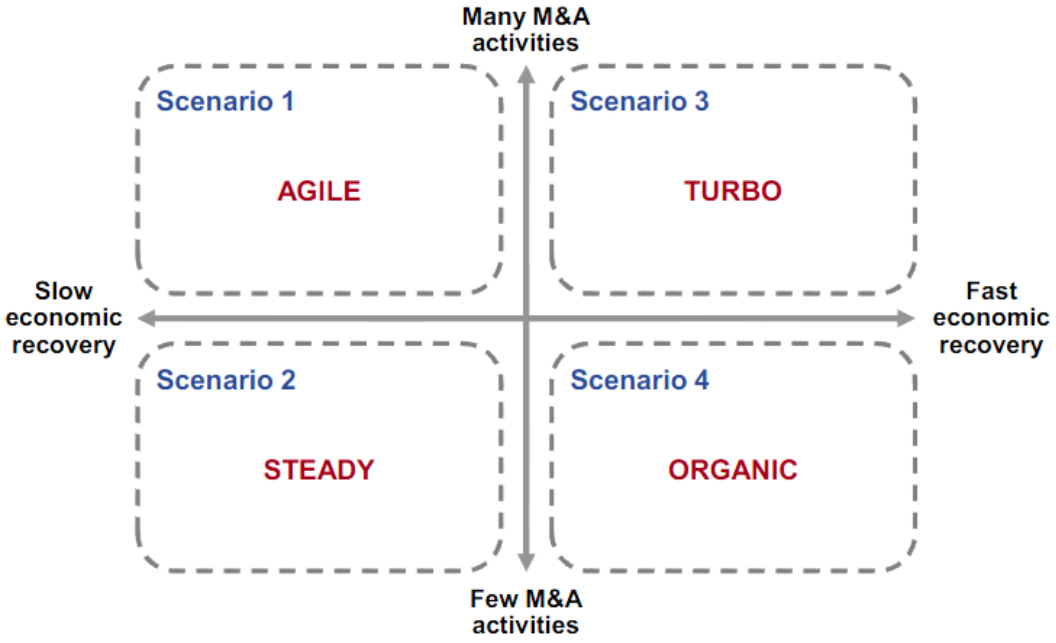


Figure 12: Scenario creation (source: Gartner (July 2012))

Ideally, a complete capability portfolio of an organization should address all scenarios in the scenario space and each capability group within the portfolio should accordingly address a specific scenario. However, since having all possible scenarios covered by business capabilities is not very realistic or necessary, before proceeding to the next step, a choice of a set of scenarios from the scenario space must be made, dictated by the organization's economic framework. In other words, by performing an analysis on the scenarios the organization should be able to decide which ones are grounded to reality and offer the optimal trade-offs. We could consider the total of scenarios (i.e. the entire scenario space) as the outputs of Step B and Phase I and as the input for Step C (the first step of Phase II), because in this way, the organization could freely explore the potentiality of their business, which would facilitate the envisionment of target capabilities. However, this could prove to be a long and resource-heavy process with uneven outcomes. Thus, a selection of scenarios is preferred to be conducted before moving on to the next phase where the corresponding capabilities will be defined.

The results of the scenario creation can be plotted on a two-axis grid, considering their potential risks and their strategic criticality. For this purpose, first each scenario is assigned one value for how critical the scenario is for the realization of the business strategy. Then, another value that expresses the probability and the impact of any risks the scenario might entail. Then the scenarios are evaluated by placing them on the grid, like in Figure 13 below and a selection can be made about which ones will be followed through later on.

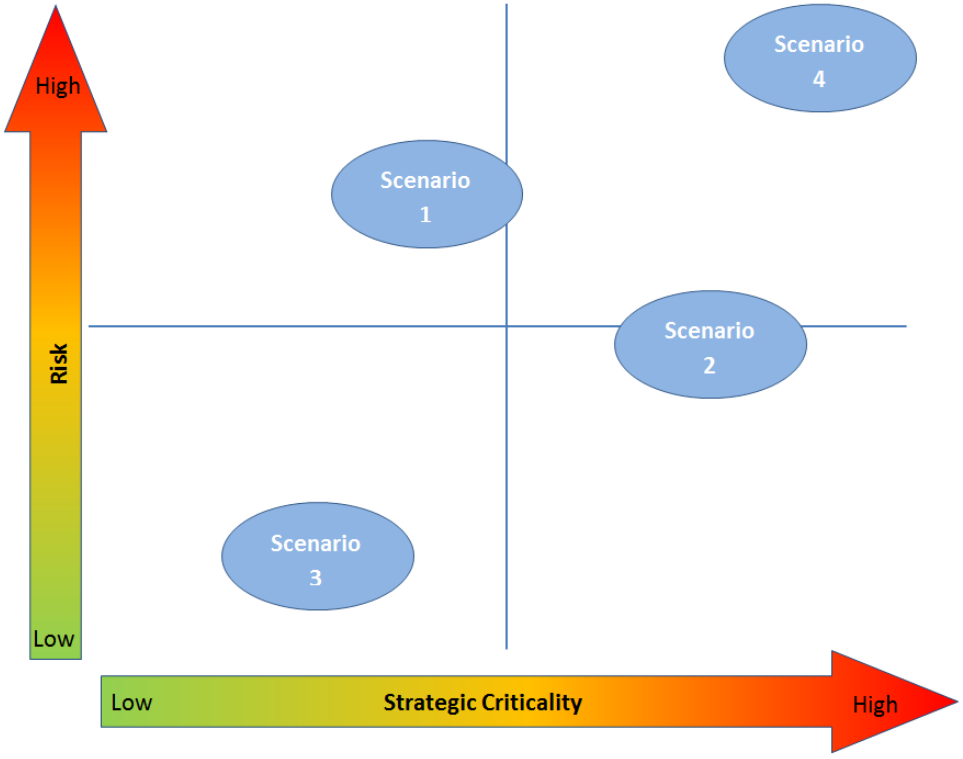


Figure 13: Scenario evaluation

5.2 Phase II: Capability Analysis

In the second phase of the method, the focus is placed on the capabilities a business needs to have and the capabilities the business currently has, culminating into a gap analysis. Starting with the validated business strategy and the subset of the scenario space produced at the end of Phase I, first the definition of the corresponding foundation (or Level 1) capabilities must take place. Then, this is used as input for the further analysis and detailing of the business capabilities and afterwards in the creation of an anchor model in the form of a capability map, which starts with the future state but takes into account the current state as well. A fully developed capability map of an enterprise can represent a business capability portfolio both the as-is and the to-be states. By analyzing, combining and comparing what the business wants or needs to be doing with what it is doing at the present (i.e. by performing a maturity gap assessment or gap analysis), improvement areas will be revealed. Furthermore, with the application of color coding a capability map can be transformed into a heat map, although this assessment can be portrayed in various other ways (e.g. in a traditional value chain model). This way the areas of future investment focus are revealed. In the method suggested here this is done in three incremental phases: i) the creation of the capability map for the target capabilities. Along with target maturity assessment and heat-mapping in Step D, ii) the maturity assessment of the currently owned capabilities in the capability portfolio in Step E and the projection onto the heat map, and finally selection of the capabilities that need imminent attention in Step F.

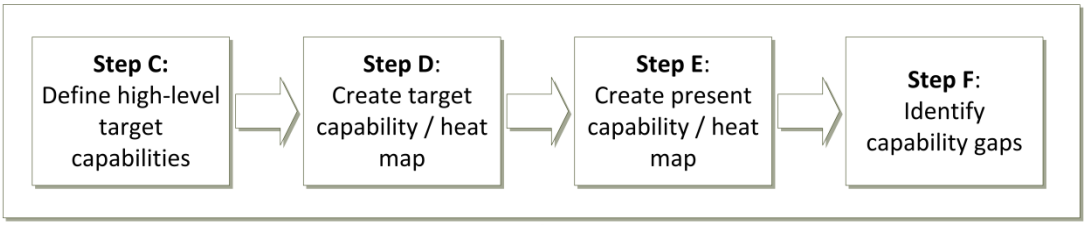


Figure 14: The steps of Phase II

C. Define high-level target capabilities

With the validated strategy and the subset of assessed scenarios as input from Phase I, there should be a good understanding within the organization of what it should be doing in order to achieve the strategic goals and to deal with the long-term business what-ifs. This 'what' can be translated into the highest-level target business capabilities of the organization without much effort. If that is not the case and there is confusion surrounding the organization's 'whats', it is possible that the strategy is not clear, well-defined or well-communicated across stakeholders involved in the process. In any case, the effort needs to be collective and to consider input from stakeholders from all sides, ensuring both polyphony and exhaustivity.

Table 8: Best practices for specifying capabilities

Specifying a capability
→ Define capabilities in business and not in technical terms
→ Use nouns to name capabilities and not verbs (as when naming processes)
→ Do not repeat the same capability
→ A capability is usually internally or temporally dependent upon another, but:
→ When possible, define them as autonomous (but synergistic)
→ Develop common semantics for operational terms across the business
→ Take time to reflect

The result of this step would be a relatively small set of high-level target capabilities that the business desires or needs to have. These 'primary' or 'foundation' capabilities (Ulrich & Rosen 2011b) will be used as input in the next step of the method, where they will be further decomposed and placed on a capability map. When specifying capabilities at any level it is useful to take into account a set of best practices that have emerged from practice. The most basic ones are enlisted on Table 8.

Most capability categories at this level are common within a specific industry, so if the organization can get hold of examples, or consultancy-supplied capability portfolios, they should be incorporated in the process and serve as its starting point. These can include the corresponding capability maps as well, and they can be reused later in step D of the method. Furthermore, there should be involvement of the senior management in this and the follow-up steps of defining the capability portfolio; some analysts propose to be handled exclusively by the business and validated with the business leaders. After all, as it has been mentioned before, business professionals, from the front lines to the executive suite, should be able to look at one

or more capabilities and immediately understand what they mean in terms of their unique business environment (Ulrich & Rosen 2011b).

Table 9: Attributes of step C

Step C: Define high-level target capabilities	
Goal	To build the foundation for the target capability portfolio
Activities	• Obtain an industry capability portfolio if possible • Involve senior business leaders
Input	• Business strategy • Subset of scenario space • Information asset definitions • Enterprise-specific examples from leading practice
Techniques	• Facilitated workshops • Iterations • Business validation
Result	The Level 1 business capabilities

The inputs for this step include, besides the business strategy and the scenarios from Phase I, examples from the leading practice within the industry to get a good grasp of what capabilities have been defined there and also the necessary information to populate the attribute of the capabilities. An overview of all the above is presented in Table 9.

D. Create target capability/heat map

A capability map is a hierarchical topology of what the business does in unambiguous, business terms and is purely business focused, and it contains only capabilities and uses no arrows; it is where the capabilities 'live'. Capability maps have been hailed for creating a 'Rosetta Stone'[22] that provides the translation between business and IT concerns and for consequently pushing the business/IT alignment forward by helping IT understand the business and the business understand IT. Thus, the capability map becomes the baseline for developing roadmaps, business/IT alignment and transformation and strategic budgeting and roadmap creation. One of these roadmaps that can result from a capability map is for the planning, engineering and delivery of the strategic business capabilities (i.e. capability-based planning) by highlighting those that the enterprise is missing or has undeveloped and should therefore focus on. This happens through a gap analysis between the to-be and the as-is situations, which can also guide management to quickly identify areas of improvement in general (including redundancies and obsolescence of capabilities, resources etc.). The aforementioned creation of a roadmap is addressed in Phase III of this method and the gap analysis is the last step of Phase II.

Before anything, capability-based planning is a change initiative, whose outcomes need to be defined early on; this happens during Phase A: Architecture Vision of the ADM cycle. These outcomes are defined in terms of the target state of the business capabilities.

[22] http://www.ancientegypt.co.uk/writing/rosetta.html (accessed 05/10/2013)

Either we are interested on the network of capabilities that a business currently has or on the network of capabilities a business needs to have in order to meet the strategic goals of the organization, a business capability map can be created to represent both. In this thesis, the suggestion is to create a single capability map, which first addresses future-state capabilities and is later compared against current-state capabilities, which will be defined in Step E. According to Gartner, when starting an enterprise architecture or building a capability map that are addressing both as-is and to-be situations, the future state should always be considered first as a way of freely thinking of the potentialities of the organization (Allega 2009; Weldon & Burton 2011). In the present method this is achieved by means of the scenario planning in Step B and building a future-state capability map first. However, similar results can be achieved via other ways (e.g. by combining the business strategy and the future vision). Regardless of the method that the business chooses to adopt, the important thing is there should be a common understanding of what the future might look like.

Table 10: Capability mapping principles

Building a capability map
→ Build only one capability map for a business/organization
→ Depict each capability only once
→ Avoid a long, drawn-out process (do it in weeks rather than in months)
→ Act iteratively (see Appendix E: Iterations in building a capability map)
→ Document the relationships between the capabilities
→ Make it a team effort
→ Keep the model simple
→ Don't be a perfectionist
→ Engage the business
→ Communicate early on and throughout the process

Defining and mapping business capabilities can be a major undertaking and many different approaches have been suggested by consultants and analysts (e.g. from Gartner and Cutter Consortium: (Ulrich & Rosen 2011b; Weldon & Burton 2011; Burton 2010; Greski 2009a; Greski 2009b)). In Table 10 a set of basic principles or best practices is enlisted, which are drawn from practice and are approach independent. Overall, for building a capability map, the method suggested by (Ulrich & Rosen 2011b) provides a clear and structured way of building a capability map with Level 1, Level 2, and Level 3 capabilities, where each level is a decomposition of one or more capabilities at a higher level. It describes the process in 10 consecutive steps, but can be further expanded to accommodate more levels, depending on the complexity of the business, although that might make the model less stable. The steps of that method have been included in the attributes of Step D in Table 12, as some of the activities performed during the step.

In accordance with the definition in section 3.3.1 a capability requires a combination of different assets (most commonly people, processes, and technology) to be achieved, which means that these can be considered the basic attribute descriptors of any capability. Jeff Scott provides a prescriptive example that includes these three attributes, plus the capability description, and information and operational metrics (Scott 2010a). According to his example (shown in Table 11

below), capability details that can enhance understanding and add business value consist of the following:

i. a short description of what the capability is about and what differentiates it from others;
ii. the supporting human resources described by skill or function;
iii. the high-level processes that support the capability expressed in business terms;
iv. the supporting information technologies at a functional level;
v. the supporting information described by type of data employed and
vi. operational metrics that may or may not be currently measured and indicate the level at which a capability is functioning.

Table 11: Attribute descriptors of an example capability *(Source: (Scott 2010a), Forrester Research, Inc.)*

Marketing

Description: The marketing capability includes all aspects of identifying new markets to enter, sales approaches, competitive positioning, and brand management. It also includes the development and management of the company's overall marketing and sales approach.		
Supporting human resources: • Market strategists • Market analysts • Statisticians • Creative content developers • Media buyers	**High-level processes:** • Market segmentation • Market targeting • Competitive analysis • Brand management • Contract management	**Supporting technologies:** • Market survey tools • Analytical tools • Social media • Traditional media
Supporting information: • External market research data • Current client profiles • Consumer trend reports • Competitor data	**Operational metrics:** • New customer acquisition rates • Percent of wallet growth • Current customer loss rates	

It should be noted that since a capability describes a more stable view of the business, it should not include items that change over short periods of time, like costs or maturity level. Of course, this is up to the business to decide. Additionally, an organization could have already created the map for Level 1 capabilities in the previous step. However, in this proposed method, all capability mapping activities have been kept within the same step.

Table 12: Attributes of step D

Step D: Create target capability/heat map	
Goal	To model the target capabilities in a color-coded hierarchical topology
Activities	1. Draft an organization-specific Level 1 target capability map 2. Finalize Level 1 capability map 3. Publish the Level 1 capability map 4. Establish Level 2 capability decomposition priorities 5. Decompose Level 2 capabilities 6. Establish Level 3 capability decomposition priorities 7. Decompose Level 3 capabilities 8. Socialize and refine the capability map 9. Assign target maturity level to each capability 10. Color code the map 11. Publish the heat map • Obtain an industry capability template if possible • Involve senior business leaders • Describe the capability with proper attributes
Input	• Sector/market benchmarks • Industry template of capability map • The target capability portfolio • IT demand portfolio
Techniques	• Facilitated workshops • Layering • Maturity assessment • Color coding • Interviews with business stakeholders • Business validation
Result	The target capability heat map

For a capability model to be effective, it has to adhere to three basic principles (Scott 2009): i) it has to create meaning for the business leaders, in a way that resonates with their thinking process so that it can capture their interest, ii) it should inherit the stability of the residing capabilities, and iii) the mapping has to link the capabilities to lower level concepts, such as resources and activities, the same way as capabilities provide the "*connective tissue among strategy, processes and resources".* For the first point, this is ensured by the nature of a capability map; it is a high-level tool of representing what the business does, but in business and not in technical terms. To ensure the involvement of the business executive management, it is suggested to hand them over the ownership from the start and have enterprise architects act more like facilitators instead. For example, in modeling the business capabilities, CIOs should work with their stakeholders and use the expertise of their enterprise architects (Weldon & Burton 2011). The second point comes naturally if the business has correctly defined the set of capabilities in a way that it does not include other elements, such as processes. This is also ensured when the capabilities are expressed using nouns and not verbs, which are usually used for naming business processes. Finally, the third point describes a mapping of the capabilities to lower level elements, like for example business processes and supporting technologies. We

earlier defined these elements as some of the attribute descriptors of a capability (in Table 11). (Ulrich & Rosen 2011b) support that a map of Level 1 capabilities map to a value stream and subsequently a low-level capability (i.e. of Level 3) can be mapped to a stage of that value stream, which is nothing more than a business process[23].

There are different organizing models which can be adopted to group, structure and present the level 1 (and subsequent level) capabilities on a capability map. They can be grouped by function, value stream, department, capability type, business sector or anything else that the organization finds fitting to its specific needs. Jeff Scott for Forrester Research recognizes the three most common models, each addressing the needs of different organizations: i) *Organizational Structure* for companies with simple organizational structure, ii) *Value Streams* for companies with complex organizational structure or operating models that are also highly process focused, and iii) *Services to Clients* for companies that organize capabilities around their framework of service delivery (e.g. government agencies) (Scott 2010a). An example of the second organizing model for Level 1 capabilities is shown in Figure 15.

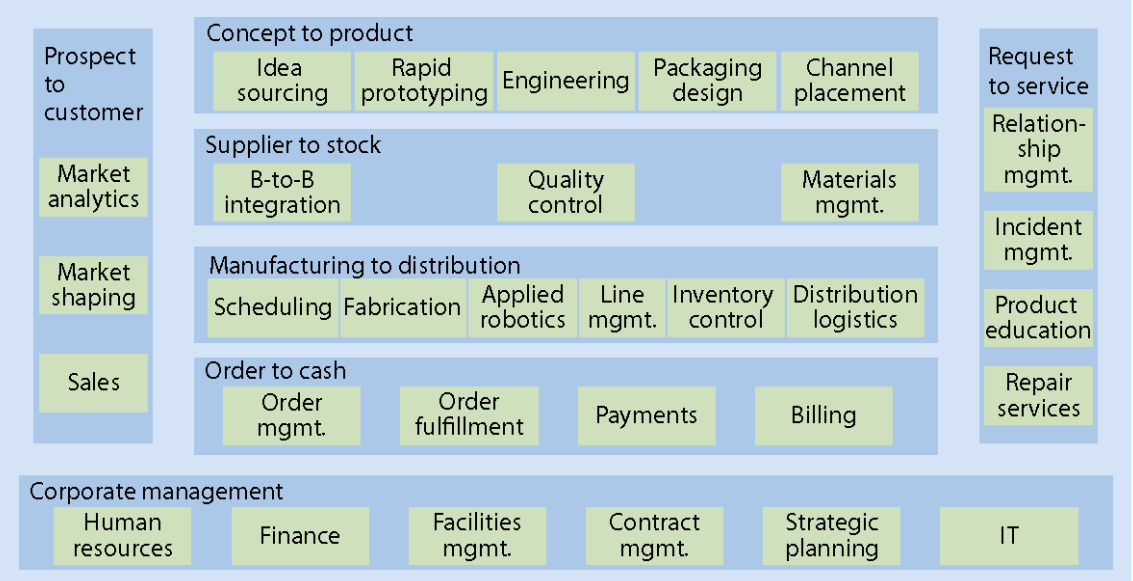


Figure 15: Level 1 capability map organized by value streams *(Source: (Scott 2010a), Forrester Research, Inc.)*

There are many other examples featured in practitioner literature of which we will briefly refer to three. The first example where each layer is organized by consumer or benefactor of a value streams is the one developed by (Whittle 2012), with the following layers from top to bottom: Stakeholders, Customers, Internal Business Users and Employees. A second example of Level 1 and Level 2 capability maps for a travel loyalty management company can be found in Appendix F: Example of Level 1 and Level 2 capability maps (Figure 47 & Figure 48). This one does not use any kind of layering of the business capabilities, but it applies a coloring scheme to facilitate

[23] (Whittle 2012) on the other hand maps a value stream to one Level 1 capability instead of the entire map, a value stream stage to a Level 2 capability and business processes to Level 3 capabilities.

communication. Finally, in a third example, another organizing model used is the three-layer classification by function suggested by (Ulrich & Rosen 2011b) for Level 1 capabilities of a services organization. What the authors did was to position each capability in one of the three layers (or rows): Strategic, Value-Add and Support, with each layer representing a set of capabilities as they relate to the viability of the business and the bottom line (Figure 46 in Appendix F). For instance, we could say that the strategic business capabilities and strategic technological capabilities like we defined them here earlier (in sections 3.3.3 and 3.3.5) would be placed on the top layer.

To assess a capability, different approaches can be followed. One is the adoption of SMART criteria (specific, measurable, attainable, relevant and time-bound) and their application to all capabilities, using the same discipline in the specification of objectives as in business scenarios (The Open Group 2011). The performance of all capabilities – including the highest-level ones– is expected to reach certain predefined levels of quality. For this reason, every capability could be defined by the aforementioned SMART criteria as much as possible, though this might be somewhat restricted by the use of primarily qualitative criteria for the assessment of capabilities[24]. These metrics might already be in the organization's disposition from the strategy map as previously mentioned in section 5.1.A, and if not, they should be defined here.

Another approach – and the one that is followed in this thesis – is the assessment of a capability according to its maturity level. A maturity level describes how well the behaviors, practices and processes of an organization can reliably and sustainably produce required outcomes (CMMI Product Team 2006). They are commonly used to express the maturity of business processes in an organization, but they can also be applied to business capabilities. A maturity model includes five maturity levels, numbered 1 through 5:

1. *Initial* (processes are usually ad hoc and chaotic);
2. *Managed* (processes are planned and executed in accordance with policy);
3. *Defined* (processes are well characterized and understood, and are described in standards, procedures, tools, and methods);
4. *Quantitatively Managed* (quantitative objectives for quality and process performance have been established and are used as criteria in managing processes), and
5. *Optimizing* (continuous improvement of processes based on a quantitative understanding of the common causes of variation inherent in processes).

The first listed input in Table 12 is used to assess the maturity level of the target business capabilities. By knowing what the market benchmark for a specific capability is, the business can define its own target. Each maturity level can be associated to a specific color, which can then be applied to the capability map to create an overview model, called a heat map. Although capability maps are widely used as input to strategic business analysis and planning, this is even truer when they are viewed as color-coded heat maps. At the end of this step, the organization

[24] The two approaches (qualitative and quantitative) to assess the state of capabilities are elaborated in section 10.1.2.

should have a heat map for the capabilities that were prioritized for decomposition, which should then be published in all appropriate communication channels of the organization.

E. Create present capability/heat map

If a business has just started adopting a business capabilities view, it is highly likely that it does not have a complete view of what capabilities it currently owns and what their performance level is. It could also be the case that they have not yet been evaluated against the target state, which also takes into account the leading practice state and level of the business capabilities. In order to be able to make comparisons between present and future states, the capabilities must adhere to the same criteria and follow the same level of decomposition.

Table 13: Attributes of step E

Step E: Create present capability/heat map	
Goal	To model the present capabilities in a color-coded hierarchical topology
Activities	1. Draft an organization-specific Level 1 present capability map 2. Finalize Level 1 capability map 3. Publish the Level 1 capability map 4. Establish Level 2 capability decomposition priorities 5. Decompose Level 2 capabilities 6. Establish Level 3 capability decomposition priorities 7. Decompose Level 3 capabilities 8. Socialize and refine the capability map 9. Assign present maturity level to each capability 10. Color code the map 11. Publish the heat map • Obtain an industry capability template if possible • Involve senior business leaders • Describe the capability with proper attributes
Input	• Business functions, processes or capabilities • Financial reports • Organization models or charts • Additional high-level business views
Techniques	• Facilitated workshops • Layering • Maturity assessment • Color coding • Interviews with business stakeholders • Business validation
Result	The present capability heat map

For defining the current capabilities, the basic guidelines from Table 8 are again applicable. In this step, the organization must look at the currently owned capabilities without necessarily defining them in detail, as they will be compared against the target state capabilities. What is

however important is to define their current performance state. Although a capability portfolio typically includes the hierarchy and the interrelationships between capabilities, it is not necessary within this step because its output will be later projected onto the output of Step D, which has these elements already in place. However, it is suggested to create the decomposition hierarchy in order to avoid inconsistencies later when the two states will be compared. For this reason, this step and its attributes are almost identical to the previous ones, the difference being that here we consider the as-is state of the capabilities, instead of the to-be. Of course, the input for this step also varies (Table 13).

F. Identify capability gaps

The target capability map built in the previous step shows what capabilities the business needs to have to fulfill its business strategy and face future changes, as well as their hierarchy and interrelationships. The present capability map shows the capabilities the business currently has. The two deriving heat maps include additional information about the maturity level of capabilities in both target and present states and allow management to quickly identify redundancies, weaknesses and gaps and plan for solutions that will maximize the value and align to business objectives. A maturity gap analysis can be performed by comparing these two that will highlight which capabilities have become obsolete with time, and the ones that need more or less investment focus, or to put it differently, the upgrading and downgrading deltas. Only after this step the planning for the required changes can commence. Table 14 below provides the overview of Step F.

Table 14: Attributes of step F

Step F: Identify capability gaps	
Goal	To perform maturity gap analysis between target and current-state capabilities
Activities	• Combine the two capability heat maps
Input	• Target capability heat map • Present capability heat map
Techniques	• Adjust the coloring in the target capability heat map to include current state
Result	A set of capabilities that require attention depicted on a heat map

The result of this step is a side-by-side comparison of the maturity levels of every business capability in both to-be and as-is states. Unless the organization is in need of very big transformation, most of the capabilities should have values for both. It is, however, expected either that some capabilities are absent in the target capability portfolio or in the current capability portfolio.

Going further, a heat map can also help executives identify opportunities for outsourcing capabilities. For example, capabilities that do not provide strategic differentiation and have weak underlying support structures are strong candidates for outsourcing (Scott 2009). However, as this is beyond the scope of this thesis, it will not be elaborated further. Although the overall result of this step is a clear overview of the state of every capability that the

organization needs to fulfill its strategy, capability-based planning (as defined in TOGAF 9.1) deals only with the development and delivery of new capabilities. Therefore, in Phase III the discussion will be focused on which target capabilities are missing or are underdeveloped or which capabilities the organization owns and require a different investment approach.

5.3 Phase III: Capability Development and Delivery

Phase III might appear simple, but there is a high degree of complexity stemming from the need for planning and development. It is also the point where Enterprise Architecture comes really into the picture, since the development will occur through iterations of the ADM cycle of TOGAF and the creation of architectural artifacts is required.

Before proceeding in the final phase of the capability-based planning method, the organization should have a clear picture of which business capabilities require attention. However, not all of them will be of strategic significance to the organization. In step G it should cater to this issue, by evaluating which of these business capabilities are indeed strategic business capabilities, prioritize them accordingly and select the ones that are more urgent than others. The following step is all about developing the selected strategic business capabilities and incorporating their development through increments and dimensions within the ADM cycle of TOGAF. The final step of this phase, step I, deals with the delivery of the newly developed strategic business capabilities and the follow-up actions. This is also the final step of the entire method, which concludes the process and is again implemented through phases of the ADM cycle.

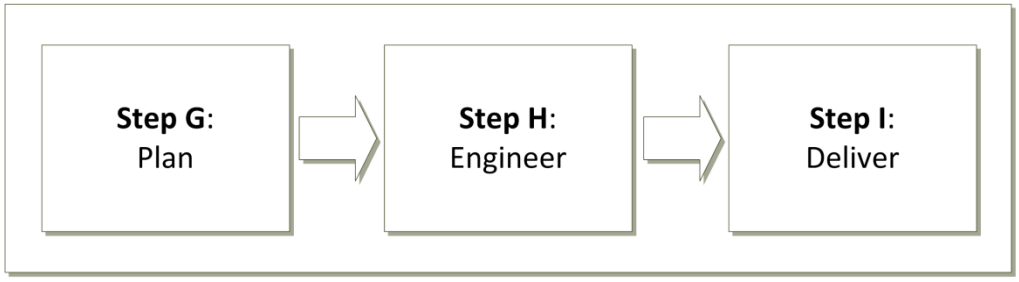


Figure 16: The steps of Phase III

G. Plan (evaluate, prioritize, and select)

After having built the combined capability heat map which shows which business capabilities the organization needs to develop, enhance or continue supporting, the organization is left with a rather large set of options. The next logical step is to select those capabilities that hold strategic importance or, generalizing on the TOGAF definition, those capabilities that are the most valuable for the business and should therefore focus on first. The number of business capabilities to be selected should be not too large, but for an average sized organization approximately five should be selected per iteration. The selection criteria could depend on the organization's business strategy or in other factors, for example a need for organizational change (business transformation or infrastructure changes). No matter the criteria, a decision

again has to be made about which combination of (upgrades of) strategic business capabilities maximize the achievement of the organization's strategic objectives.

The general idea for selecting the right combination of strategic business capabilities to be developed or improved comes from the defense literature, where both strategic significance and development costs play a part. More specifically, the choice is dictated by the Balance of Investment, which is in turn directly affected by the resource constraints on the one side and the strategic priorities on the other (The Technical Cooperation Program (TTCP) 2004). There can be two approaches regarding the selection; the first is to consider the business capabilities in isolation from each other and select independently the strategic ones; the second is to create possible combinations of strategic business capabilities and select the one with the optimal trade-off. In this research the second approach for selecting amongst alternatives is preferred mainly for three reasons. First because it might be possible that one strategic business capability can perform better in combination with another one or more out of the other considered strategic capabilities, so it would make sense to select those as well, as long as the overall result justifies the selection. Second, because it ensures that the secured financial resources are adequate for the entire selection by looking at the bigger picture. And third because by considering combinations and not standalone capabilities, different choices might come into light, like for instance downgrading a not so strategically important capability for the sake of a strategic important one. The details regarding Step G are given in Table 15.

Table 15: Attributes of step G

Step G: Plan (evaluate, prioritize, and select)	
Goal	To select the most urgent strategic business capabilities
Activities	• Distinguish the strategic capabilities • Create possible combinations of strategic business capabilities • Estimate the Balance of Investment for the considered combinations • Select the best combination • Highlight the individual strategic business capabilities on the heat map • Communicate
Input	• Combined capability heat maps • Capability upgrade and development costs • Resource constraints (budget) • Strategic priorities
Techniques	• Interviews with business stakeholders
Result	A set of approximately 5 strategic business capabilities

It should be noted that an attempt to make this selection more rigorous was made by (Cheng et al. 2011) who developed an optimization algorithm for the national defense sector. The authors designed a simple bi-level programming (BLP) model and a six-step algorithm which, for the sake of simplicity, considered only the constraints of the costs of the resources necessary for

developing a capability. However, their proposition has neither been applied nor tested yet, particularly in the business and strategy field.

Alternatively, a type of analytic hierarchy process (Saaty 1990) can support this type of decisions to be made with full comprehension of both the upside and downside of a particular choice. The original technique developed in the 1970s would require quantitated data that can be placed inside a vector, one for each combination of capabilities. At this point, what a business can estimate early on about a capability is its cost and its strategic criticality of its creation or upgrade, which can be combined and expressed in a single numerical value. It can be then compared against the entire range of values of the other capabilities, which in turn can provide some insight on how they relate to each other. There are many portfolio management techniques to be found in the literature; for the sake of completeness, we will refer in general to the Multiple-criteria decision analysis (MCDA) and the extension to method of Bedell for IT portfolio valuation. MCDA methods utilize a decision matrix to provide a systematic analytical approach for integrating risk levels, uncertainty, and valuation, which enables evaluation and ranking of many alternatives (covered extensively in (Figueira et al. 2005)). In the extension of Bedell, (Buschle & Quartel 2011) presented a decomposition of the value of IT into the importance and effectiveness of IT in supporting the business, within the scope of using Enterprise Architecture models in conjunction with the original method. Based on these two indexes, an organization's IT portfolio can be evaluated to better serve its strategic business goals.

Once the selection is made, the chosen strategic business capabilities can be depicted in the same heat map built in the previous step. This could be done by highlighting the selected strategic business capabilities with thick borders as (Weldon & Burton 2011) suggest, or by other means of visualization.

H. Engineer (define increments, dimensions, timeline)

After the organization has defined in which strategic business capabilities the focus should be placed on, it can start defining the details of the implementation. In capability-based planning a capability is delivered through a defined number of increments (one or more) which deliver discrete, visible and quantifiable outcomes, indicative of the different points in time. Capability increments document the changes to each business capability that is needed to implement the business or IT strategies. The exact definition of an increment as provided in the TOGAF specification document describes it as "*[a] discrete portion of a capability architecture that delivers specific value. When all increments have been completed, the capability has been realized.*"

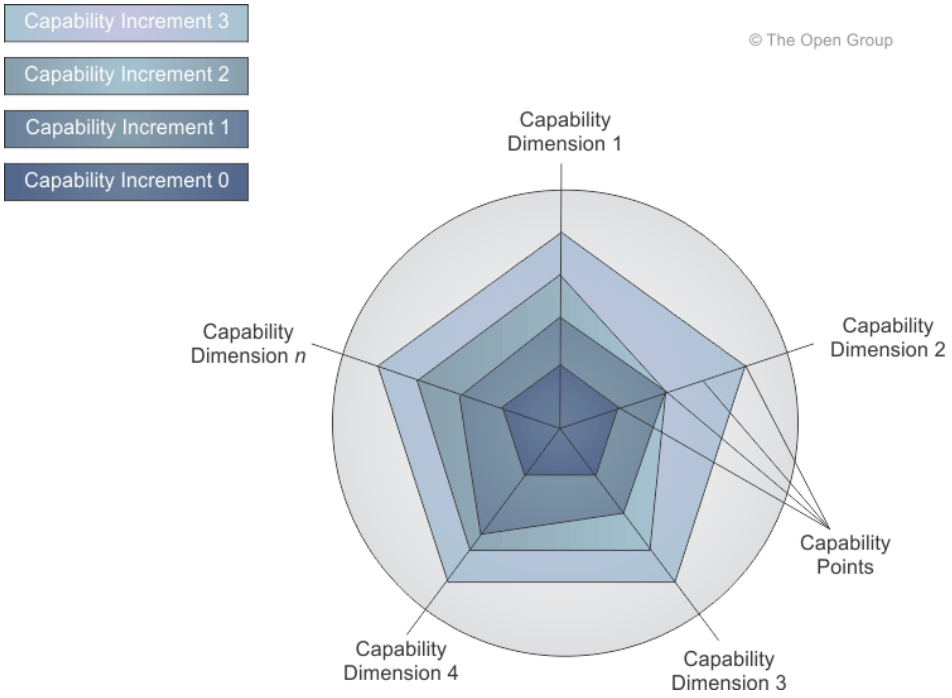


Figure 17: Capability Increment "Radar" (The Open Group 2011)

Every increment traverses various dimensions (one or more) which are similar but somewhat different in every organization and are spread across the corporate functional portfolios (The Open Group 2011; van Gils & van Dijk 2013). The Capability Increment "Radar" diagram (see Figure 17) describes how a capability will evolve over time. The lines radiating from the center of the diagram represent the dimensions that the architect has selected as important to the stakeholders and defines the capability points for each dimension. By joining up the capability points into a closed loop, it is demonstrated how each capability increment will extend over the previous increment. In the diagram the capability increment 0 at the center represents a starting capability and, accordingly, the capability increment 3 signifies that the engineering of a capability is complete. An example of such a set of capability dimensions presented in TOGAF and based upon the Canadian Department of National Defense could include personnel, research & development, infrastructure/facilities, concepts/processes, information management, and material. Finally, every capability may have a different set of dimensions. Regardless of what the selected set of dimensions is, it should be well explained and understood. Figure 18 graphically shows the relationships between a capability, its increments, their dimensions and some example business functions that are included in the dimensions. To put it simply, a capability is decomposed into capability increments and, in turn, each increment decomposes into dimensions.

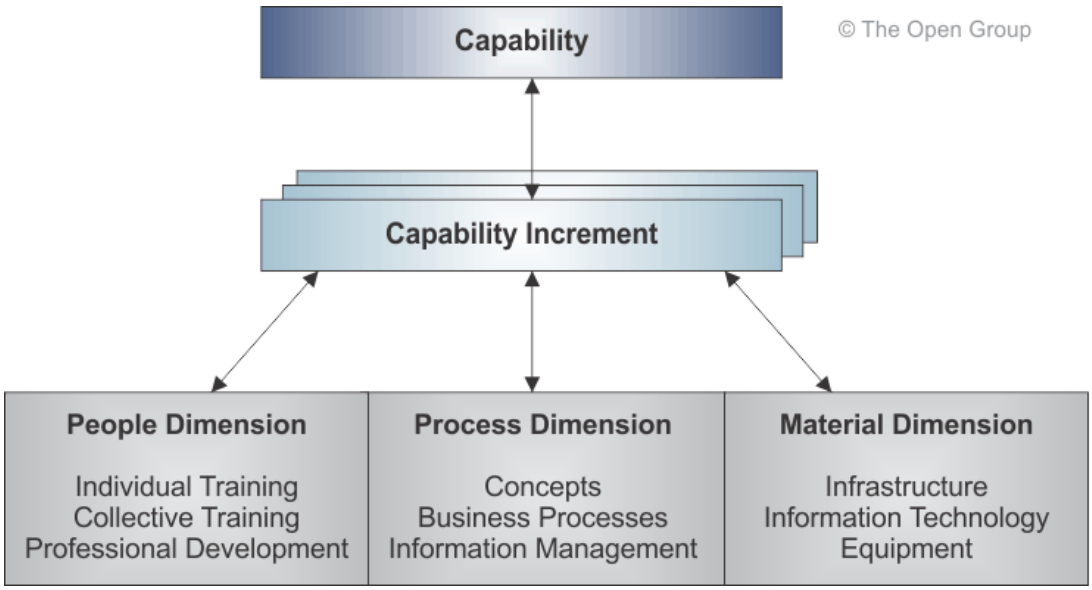


Figure 18: Capability Increments and Dimensions (The Open Group 2011)

This step is rather complex, labor-intensive and time consuming, because a number of architectural artifacts need to be created, following the flow of TOGAF's ADM cycle including baseline, transition and target architectures. It is here that the actual architectural work takes place. It is assumed that any organization interested in following a capability-based planning method already has some experience in enterprise architecture with TOGAF and has reached a certain level of architecture capability maturity in terms of architecture approach, principles, scope, vision, and governance. Therefore, the engineering or development of the target strategic business capabilities should be incorporated into the next iteration of the ADM cycle from baseline to target architecture.

The phases of the ADM cycle were described in section 3.2.2 earlier. But how does the suggested method fit within the cycle?

As mentioned in 5.2.D, the outcomes of capability-based planning (i.e. the target state of the business capabilities) are defined early on during Phase A: Architecture Vision of the ADM cycle. Every increment of a business capability means a new iteration within the cycle in successive transition architectures. Starting from the baseline architecture, the increments of a capability are materialized through a series of transition architectures, until the capability is realized to the target level with the final increment when the target architecture has been implemented. Multiple capabilities can be developed in parallel, as long as potential temporal dependencies (i.e. when a specific business capability has to exist before another business capability can be achieved) are considered. This means that capability increments of different capabilities can be grouped together into successive transition architectures, as work packages.

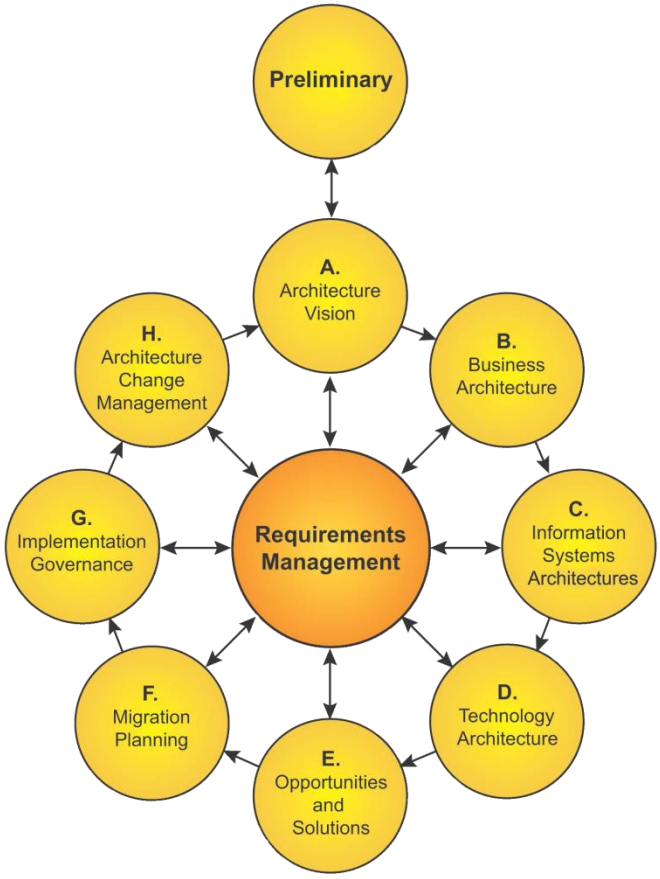


Figure 19: TOGAF®'s ADM cycle

Reflecting the above on phases of the ADM cycle, every new capability increment has a number of dimensions, which are realized in different architecture domains, spread over Phases B, C, and D of the ADM cycle. Some of the example dimensions of a capability listed before are part of the Business Architecture (BA); others are part of the Information Systems Architectures (ISA); and others part of the Technology Architecture (TA). More precisely, personnel and concepts/processes belong in the BA, information management and data standards in the ISA- Data, application landscape in the ISA – Application, and infrastructure/facilities, and material in the TA. In other words, Phases B, C, and D is where elements from different areas come together to define a business capability in terms of necessary components.

During Phase E: Opportunities and Solutions is where the capability increments are defined and the work packages determined, needed for the development and delivery of the considered business capabilities. The actual implementation of the capability increments happens during the next two phases of the ADM: Migration Planning (Phase F) and Implementation Governance (Phase G).

Mapping capabilities onto strategic roadmaps creates a clear picture of what current assets can be leveraged and what needs to be created. Implementation can then be described as a series of capability enhancements. Consequently before starting any architectural work, a capability has to be componentized and broken down into a set of increments. First the proper dimensions for each capability are determined. Then, for each dimension, a number of capability points – same as the number of capability increments – that signify the level of completeness of each dimension per increment.

The timeline for the realization of each capability depends on the timeline for the realization of its capability increments. In turn, capability increments follow the organization's overall planning from the baseline architecture to the transition architectures and finally to the target

architecture. Ideally, a capability increment is realized or should be realized through a single transition architecture (or a single plateau as the corresponding term is in ArchiMate[25]). If that is not the case, and a capability increment is realized through multiple transition architectures, then it should be investigated whether that specific capability increment is too complex and should therefore be decomposed further. Nevertheless, as mentioned earlier, if there are dependencies between the selected strategic business capabilities to be developed, this has to be reflected on the planning of the timeline. Additionally, capability increments of different capabilities might also have dependencies between them. In such cases, a dependency matrix can help architects uncover these interdependencies. And by rearranging the increments, the dependency order in which they need to be realized can be shown from the baseline architecture through transition architectures up to the target architecture (see Figure 20). The attributes of this step are summarized in

[25] From the ArchiMate 2.1 standard: "*a plateau is defined as a relatively stable state of the architecture that exists during a limited period of time*".

Table 16.

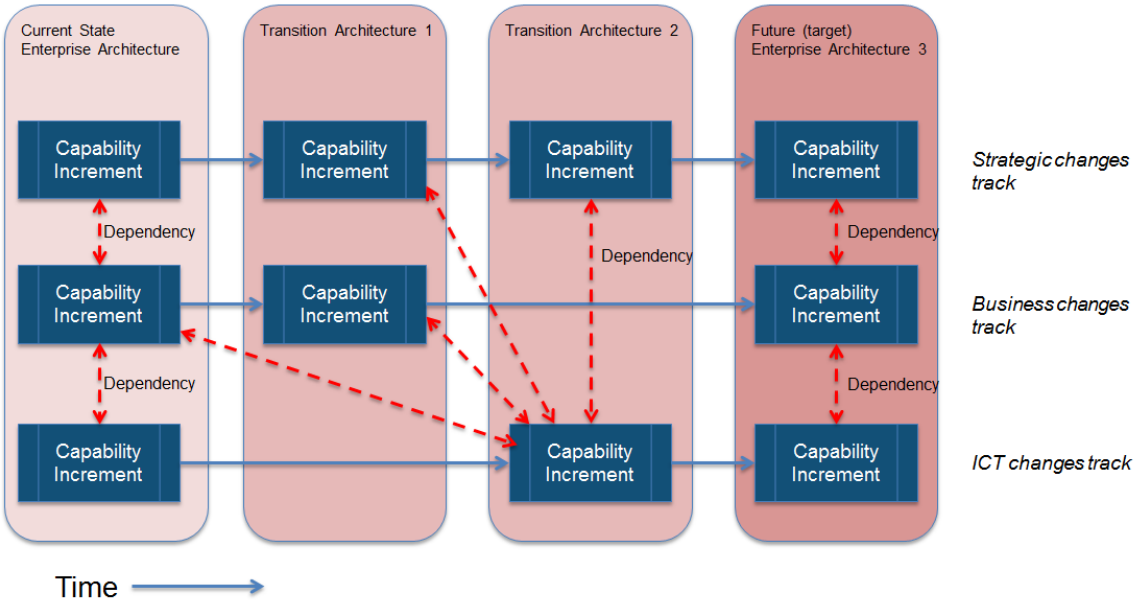


Figure 20: EA Roadmap structure (source: on Enterprise Architecture[26])

[26] http://ingenia.wordpress.com/2013/06/16/business-capability-based-ea-roadmap/ (accessed 14/12/2013)

Table 16: Attributes of step H

Step H: Engineer (define increments, dimensions, timeline)	
Goal	To develop the selected strategic capabilities
Activities	• Define dimensions for each capability • Define points on each capability dimension • Discover interdependencies across capability increments • Incorporate increments into different baseline, transition and target architecture domains • Set roadmap timeline
Input	• Baseline architecture • Set of selected strategic business capabilities
Techniques	• Iterations on the ADM cycle • Dependency matrix of capability increments
Result	A set of newly engineered or improved strategic business capabilities

I. Deliver

The final step of the method deals with monitoring the strategic business capabilities with proper tools and ensuring coordination and alignment of the capabilities across business verticals (The Open Group 2011). Now that the target capabilities are a reality, the organization has to figure out the ways, the skills, and the resources required to deploy them successfully in the organization. It also has to review the process and manage any risks that the monitoring might reveal. The steps of Phase G: Implementation Governance fully describe the necessary post-implementation actions and are listed as the activities of this step of the method in Table 17 below.

Table 17: Attributes of step I

Step I: Deliver	
Goal	To monitor the coordination and alignment of the engineered/improved capabilities
Activities	• Identify deployment resources and skills • Communicate the results • Monitor risks • Conduct post-implementation reviews
Input	• Architecture Repository • Operational data
Techniques	• Facilitated workshops • Risk questionnaires and risk surveys • Brainstorming • Skills development and training implementation
Result	Successful deployment and monitoring

Once a set of strategic business capabilities has reached the desired level of performance/maturity, the organization has two options: either to repeat Steps G and H and select the next combination of capabilities to focus on or repeat the process from Step C onwards. This decision depends on the time invested in the engineering of the previous

combination of capabilities and the stability of its internal and external environments. Finally, operational data can be used to assess how well the newly delivered business capabilities perform, compared to the target metrics set. This data can be fed into feedback loops for the purpose of maintaining the architecture and ensuring that actions are taken so that the delivered capabilities can reach their target maturity state/performance, post-deployment.

6. Modeling Capability-based planning

This chapter will examine and present an overview of the necessary concepts to model capability-based planning based on work presented earlier; it will examine the relevant existing concepts in the metamodels of ArchiMate core and its two existing extensions; and finally argue that a number of new concepts are required for ArchiMate to support the modeling of capability-based planning.

In the chapter of the TOGAF standard specification dedicated to capability-based planning (Chapter 32) it is mentioned that capability-based planning deals with the strategic business capabilities of an organization. However it should be stressed that whether a capability has strategic importance and to which degree is a rather subjective perception; it largely depends on the organization's Line of Business and the strategic plan it has set at any given point in time. Thus, it should be left to the organization to determine which (business) capabilities are strategic and which are not. That being said, from here on we will simply refer to them simply as capabilities or business capabilities (considering the discussion here is about organizations/businesses). This will also be reflected in the modeling of the concept of the capability, where all types of capabilities are modeled inseparably.

6.1 ArchiMate core, extensions, and viewpoints

The ArchiMate architecture modeling language consists of a generic set of core concepts and relationships and two other sets of concepts and relationships of the two language extensions that have been adopted by The Open Group: the Motivation extension and the Implementation and Migration extension. A brief description follows; for further details regarding each concept and relationship, please refer to the ArchiMate standard specification (The Open Group 2013).

The core language consists of three main types of elements: active structure elements, behavior elements, and passive structure elements (objects). Furthermore, ArchiMate defines three main layers based on specializations of the core concepts:

1. The *Business Layer* offers products and services to external customers, which are realized in the organization by business processes performed by business actors.
2. The *Application Layer* supports the business layer with application services which are realized by (software) applications.
3. The *Technology Layer* offers infrastructure services (e.g., processing, storage, and communication services) needed to run applications, realized by computer and communication hardware and system software.

The above aspects and layers are organized as the ArchiMate Framework, which is basically a set of nine cells, each expressing a unique combination of an element type and an environmental layer. In Figure 21 below (Iacob, Quartel, et al. 2012) have represented the core ArchiMate language and the ArchiMate framework together in a simplified view.

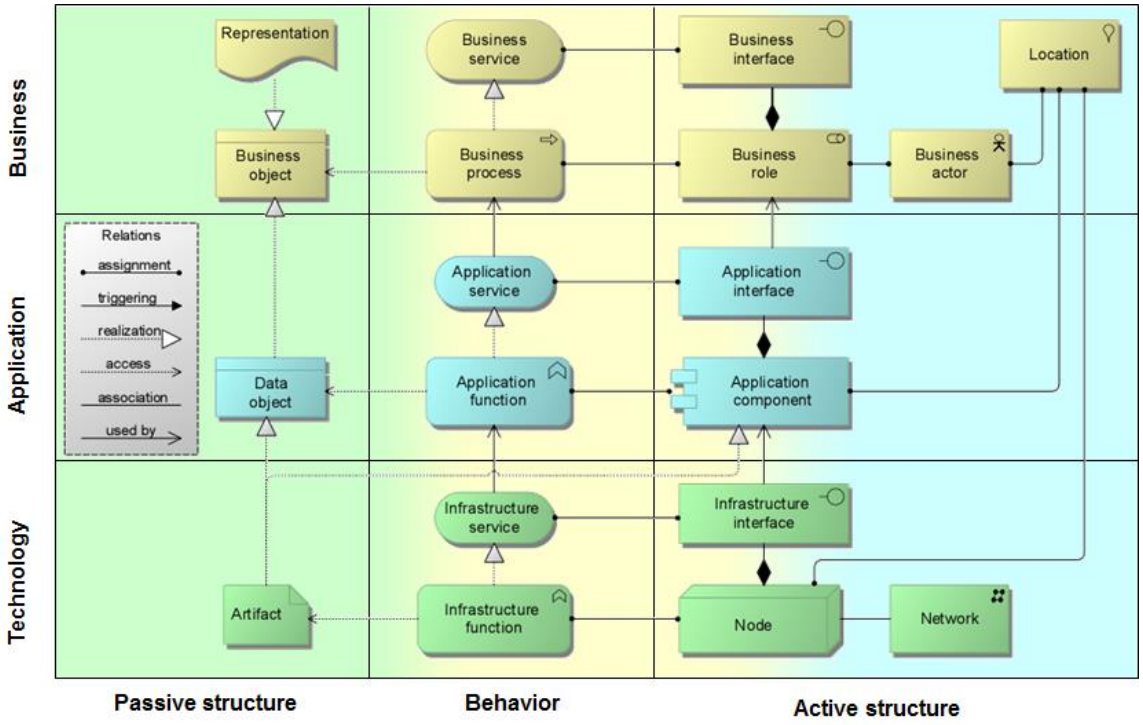


Figure 21: Simplified ArchiMate metamodel (source: (Iacob, Quartel, et al. 2012)**).**

The Motivation Extension includes the actual motivations or intentions – i.e., goals, principles, requirements, and constraints – and the sources of these intentions; i.e., stakeholders, drivers, and assessments. It addresses the way the enterprise architecture is aligned to its context, as described by motivational elements. There are seven concepts that comprise the Motivation Extension as shown in the image below, expressed in the ArchiMate notation: Stakeholder, Driver, Assessment, Goal, Requirement, Constraint, and Principle. There are also three intentional relationships: Aggregation, Realization, and Influence, not included in the diagram.

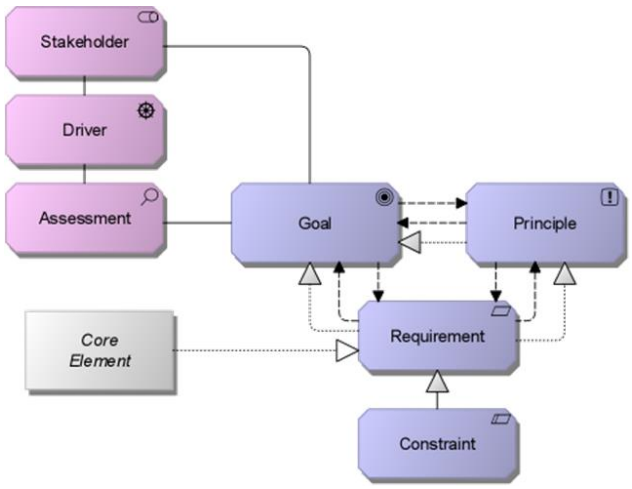


Figure 22: The Motivation Extension metamodel

Finally, the Implementation and Migration Extension adds concepts that support the process of getting the enterprise architecture in place, by breaking it down into programs and projects. More specifically, it supports project portfolio management, gap analysis and transition and migration planning. Four additional concepts have been introduced with this extension: Work Package, Deliverable, Plateau, and Gap, which are shown in Figure 23.

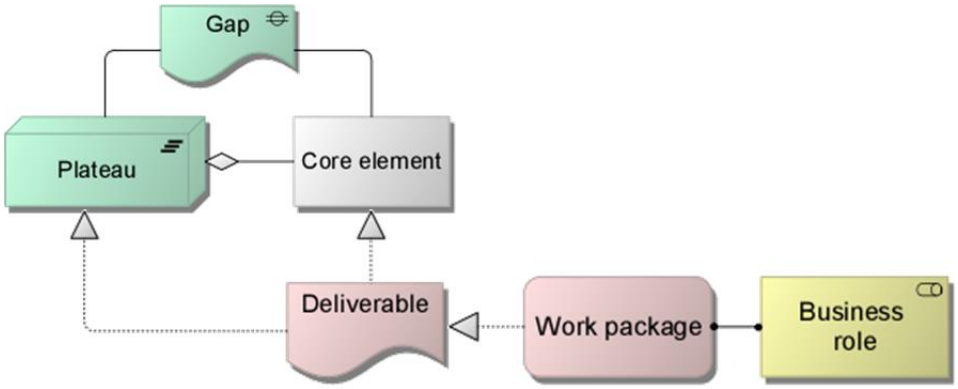


Figure 23: Implementation and Migration Extension metamodel

In addition, several viewpoints are distinguished, each of which focuses on particular aspects of the architecture and allow a modeler to focus on certain aspects. These aspects are determined by the concerns of a stakeholder with whom communication takes place (The Open Group 2013). There are eighteen standard viewpoints in ArchiMate, six in the Motivation Extension and three in the Implementation and Migration Extension.

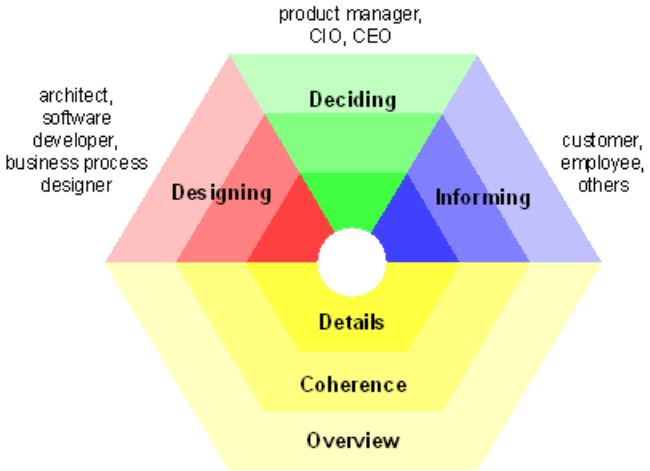


Figure 24: Classification of Enterprise Architecture Viewpoints (source: (The Open Group 2013))

A framework is used to facilitate the selection of the appropriate viewpoint in every case, which is based on two dimensions: purpose and content. The purpose dimension is supported by three types of architecture: i) Designing, ii) Deciding, and iii) Informing, while content is characterized based on three abstraction levels: i) Details, ii) Coherence, and iii) Overview. In Figure 24 the

dimensions of purpose and abstraction level are visualized in a single picture, together with examples of typical stakeholders that are addressed by these viewpoints.

6.2 Extending ArchiMate

In order to be able to model capability-based planning in ArchiMate, we need to discuss whether the necessary concepts are already covered in ArchiMate core and its two extensions (section 6.2.1). Furthermore, definitions for each and every concept will be offered. Next, in section 6.2.2 a metamodel fragment will be presented that will provide an abstract syntax for capability-based planning. Apart from the abstractions, a number of relationships are proposed and a motivation will be offered for each and every one of them. Then, for every concept included in the suggested extension, a notation will be suggested that fits with the ones already present in ArchiMate. Finally, three new ArchiMate viewpoints are proposed in 6.2.3, each focusing on a particular aspect of the metamodel. As with the existing viewpoints, each one will be addressing the concerns of different stakeholders.

6.2.1 Essential concepts

The performed literature review presented in chapter 3 and the suggested method for capability-based planning overlaid in chapter 5 already give some indication of the concepts that are necessary for modeling purposes. Especially the upper half of the ontology domain model in Figure 8 hints at what concepts could be used to model capability-based planning. However, not all of them are important towards that purpose, so here we will investigate which ones are absolutely necessary and to what extent these concepts are already represented by ArchiMate core and its extensions. In fact, we will see that when a concept is presently sufficiently expressed or represented by the existing language concepts, it is included in the two extensions and not the core.

At first glance, most of the necessary concepts are not already represented, but upon further inspection it becomes clear that only a handful are really new. We will first examine the following: *Maturity Assessment*, *Capability*, *Capability Increment*, *Capability Dimension*, and *Resource*.

- **Maturity Assessment** (or **Gap Analysis**), as the outcome of the essential analysis activity performed on a given capability from two different perspectives: current and target state. The assessment is expressed in terms of a maturity level associated with each of these two states. Without proper assessment of these two states it is almost certain that the goal of a capability will not be realized. The more general concept of 'assessment' already exists in the Motivation Extension of ArchiMate, where it is defined as '*the outcome of some analysis of some driver*'. For the purposes of modeling capability-based planning, it would probably make sense to add the concept of driver in the list of those necessary to model capability-based planning.
- **Capability**, the central concept of capability-based planning does not exist in the core ArchiMate or its extensions. However, the need to include it was previously argued for in the paper by (Iacob, Quartel, et al. 2012) for supporting IT portfolio valuation.

Whenever the need to model capabilities in Enterprise Architecture artifacts has arisen, practitioners frequently use the concept and notation of a business function, since it is regarded the one closest to the (business) capability.

- **Capability Increment**, which is required to distinguish between the discrete transition states of a capability towards its target maturity level, and every added increment is a step closer towards the realization of the goal. In each of these transition states specific value is delivered; and in each of the capability increments, a capability has a certain value that indicates how close to the target maturity level it currently is. A capability increment can be seen as a particular version of a capability and for the development or improvement of a capability an organization goes from one version to another, which means that the same capability is realized over time by different versions of the increment. Although it is possible that in some cases the various capability increments might adjoin the maturity levels of a capability, these two concepts are not equivalent. The concept of capability increment is not currently expressed in ArchiMate core nor in its extensions and it is very specific to capability-based planning.
- **Capability Dimension** (or **Metric**), a concept coming from the TOGAF specification, which can be looked at in two ways. First, it can be used in terms of the elements that every capability increment is composed of and describes the required resources or requirements for its realization. Like it has been mentioned before, for a capability to be achieved, a certain combination of resources, processes or other capabilities (which can be considered resources themselves) needs to take place. The closest existing concept in ArchiMate is that of 'requirement' again from the Motivation Extension: '*a statement of need that must be realized by a system*'. Second, it can be considered as an aspect of any considered capability, which should be measurable and monitored. This is supported by the TOGAF specification with the aid of spider chart called "Capability Increment Radar", showing how developed a capability increment – and a capability by extension – is at a certain point in time. The second view has the advantage that it not only defines what a dimension is, but it also defines how you want to measure it; depending on these measurements changes might be required in order to improve on a certain aspect of a capability, through improvements in its capability increments, or putting it more generally, through organizational change. This suggests that a capability dimension is a kind of a specialization of the driver concept of the Motivation Extension of ArchiMate in the form of a **metric** or KPI, that is currently absent from ArchiMate (Poole 2012). A metric is generally defined as a '*parameter or measure of quantitative assessment used for measurement, comparison or to track performance or production*'[27].
- **Resource**, which is a concept that can be used to describe the means that a capability needs in order to be developed. As mentioned earlier, a resource can be viewed as a building block of a capability, whether it is tangible, intangible or personnel-based. Besides, a capability owned by an organization can be viewed itself as a kind of resource; in the sense that it is owned and that it can itself be used as a strategic

[27] http://www.investopedia.com/terms/m/metrics.asp (accessed 15/01/2014)

building block. Additionally, the inclusion of the concept of 'resource' was advocated in the paper by (Iacob, Quartel, et al. 2012) and defined as '*an asset owned or controlled by an individual or organization*'.

Additionally, there are three more concepts that are necessary to model capability-based planning either because they are closely connected to the ones above or because they are too important to leave out. These are: *Driver*, *Requirement*, and *Plateau* and they come from the two extensions of ArchiMate.

- **Driver** is associated with assessment on one hand and with capability dimension / metric on the other; to be able to perform an assessment, the concept of driver is essential and a metric is a specialization of driver. It is covered in the Motivation extension of ArchiMate and is defined as '*something that creates, motivates, and fuels change in an organization*'.
- **Requirement**, a concept necessary for expressing what is realized by a capability, or in other words, motivating its existence. It is also covered in the Motivation extension of ArchiMate and is defined as '*a statement of need that must be realized by a system*'.
- **Plateau**, regarded as necessary due to its connection to the concept of capability increment; at any certain point in time there is an architecture that realizes a version of a given capability (i.e. one of its increments or the fully developed capability) through implemented work packages and projects. It is included in the Implementation and Migration Extension of ArchiMate, which defines it as '*a relatively stable state of the architecture that exists during a limited period of time*'.

6.2.2 Abstract syntax

In this section we will define and explain the relationships that the concepts explained defined earlier have with each other and with other concepts from the ArchiMate language. We will also define the abstract and concrete syntax of the proposed language fragment.

The above list highlights the abstracted concepts that are essential to discuss and model capability-based planning, but as explained, not all of them are reflected in ArchiMate in the same way. There are four possibilities that necessitate decision: i) a concept is already covered by the language exactly as it is, ii) a concept can be sufficiently represented by another concept with which it is fundamentally the same, iii) a concept can be introduced as a specialization of another (existing) concept, and iv) a concept is fundamentally different from any existing one and therefore needs to be introduced as part of a language extension.

These decisions should be supported by a set of principles that ensure that the language is kept as lean as possible: i) alignment with the current ArchiMate metamodel specification, ii) parsimony (i.e. the number of additional concepts is kept to a minimum and existing ArchiMate concepts and relationships are reused or specialized whenever possible) and iii) ease of use (i.e. the new concepts should be easy to learn, understand and use) (Iacob, Quartel, et al. 2012).

In Figure 25 a fragment of the adapted ArchiMate metamodel is shown; the proposed concepts are represented in gray color, while for the others the standard ArchiMate coloring scheme is used. As mentioned in the previous section, the concepts of Assessment, Requirement, and Driver come from the Motivation Extension, while the concept of Plateau comes from the Implementation and Migration Extension. This metamodel is aligned with the core metamodel of ArchiMate.

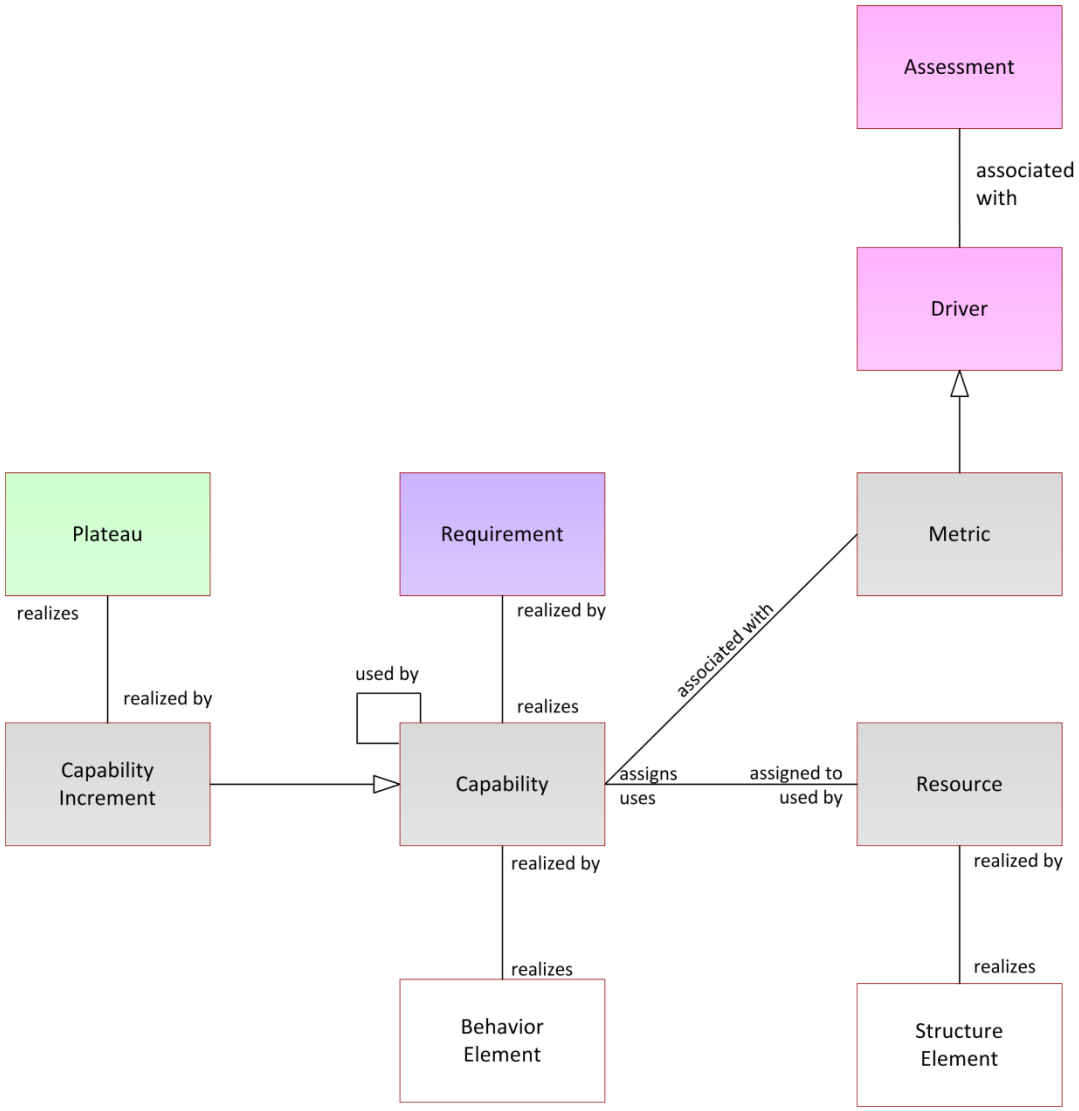


Figure 25: Abstract syntax (metamodel fragment) for capability-based planning concepts

The **capability** concept at the center of the metamodel is associated with four other elements and one abstract element. A capability realizes a set of **requirements** set by the business, which define what a capability should address. Since a requirement is directly associated to the concepts of *goal* and *principle,* as shown earlier in Figure 22, capability is indirectly connected by derivation to these concepts as well. Thus, a capability realizes a requirement, and by that, a capability indirectly realizes principles and goals. Every capability realizes some goal which is

connected to a stakeholder, either because the stakeholder has set the goal or in the broader sense that the stakeholder has an interest on the goal and its realization. A goal expresses what each capability should aim to achieve in its end state; so not only its purpose but also the extent of the fulfillment of the purpose in regard to its target maturity level[28]. Apart from the standard ArchiMate relationships which every concept has with itself (association, aggregation, composition and specialization), another type of special relationship has been added between capability and capability: the used by relationship, which is represented by the circular relationship. These relationships are justified by the way capability has been defined: a capability can group a number of capabilities (aggregation); it can be composed of one or more capabilities (composition); a capability can be a specialization of another capability (specialization); and a capability might use one or more capabilities to be realized (used by).

A capability is related to a **resource** in two ways. First, a capability uses a combination of resources in order to be developed, represented by the uses/used by relationship. Second, we could define resource as a *passive structure element* on which behavior is performed and capability as a *behavior element*, therefore an assigns/assigned to relationship also exists.

Considering the need for a capability to be objectively defined and quantitatively assessed and measured, capability is also connected to **metric** with an association relationship. As mentioned earlier, a metric can be the force behind organizational change, which comes very close to the concept of a **driver**. However, since their fundamental difference is that a driver is not necessarily measurable, while a metric is, it makes sense to introduce the concept of metric as specialization of the concept of driver.

A capability is viewed in regard to both its current/baseline and its target maturity levels resulting from analyzing the capability's current state and aspects like the organization, the environment and the budgetary restrictions that apply to a capability. For assessing this maturity we are going to adopt the existing, broader concept of **assessment**. And since in the Motivation Extension an assessment is defined as the 'outcome of analysis of some driver', an association relationship exists between the two.

Since a **capability increment** can be seen as a particular version of a capability, it makes sense to model the concept of capability increment as a specialization of the concept of capability. The relationships that apply to the parent concept of capability are allowed for the specialization, which in the metamodel are indirect. However, a capability increment stands at the lowest level

[28] The overall goal of each capability is set and managed by a stakeholder, while the target maturity level is defined by the maturity assessment of the target state. The concept of a goal was also introduced by the Motivation Extension and it is defined as '*an end state that a stakeholder intends to achieve*'.
A stakeholder represents the entity which has one or more interests in, or concerns about, the organization and its enterprise architecture. It is the stakeholder that can set, change, and emphasize the goal which is expected to be realized by each capability through architecture outcomes. This concept has already been introduced by the Motivation Extension of ArchiMate, where it is defined as '*the role of an individual, team, or organization (or classes thereof) that represents their interests in, or concerns relative to, the outcome of the architecture*'.

of granularity in terms of what is implemented and delivered, while a capability can be seen as an aggregation of one or more capability increments.

A **plateau** is defined to show a milestone or state of the architecture at certain point in time, in the same way that a capability increment is defined to show the state of a capability at a certain point in time. So both of them refer to a certain state of an object at some point in time and are both characterized by their limited viability; a newer version will render the previous one obsolete. A capability increment is realized in a plateau, through the projects that realize this plateau. Defining a realizes/realized by relationship between a capability increment and a plateau results in an indirect derived relationship of the former to the rest of the concepts from the Migration and Implementation Extension, namely *deliverable*, *gap* and *work package*.

The two abstract elements that appear in the metamodel (**behavior element** and **structure element**) serve the purpose of connecting the new concepts to the existing concepts of the ArchiMate metamodel. A structure element can be as active (if it performs behavior) or passive (if behavior is performed on it), while a behavior element is defined as 'a unit of activity performed by one or more structure elements'. As shown previously in Figure 21, some examples of structure elements are *data objects* and *artifact* (passive), and *business actor* or *location* (active). Examples of behavior elements are *business process* and *application service*.

6.2.3 Concrete syntax and viewpoints in ArchiMate

In the previous section the language fragment metamodel that was presented motivated the inclusion of the concepts and the relationships between them. Here, a graphical notation for that fragment is presented, along with the distinguished viewpoints that will help illustrate the proposed method for capability-based planning. Figure 26 depicts the notation for the four proposed concepts: resource, capability increment, capability and metric.

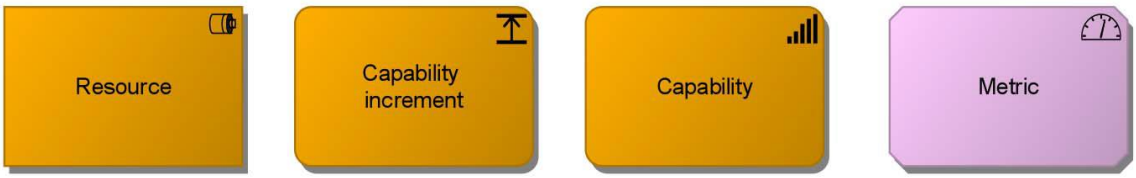


Figure 26: Concrete syntax (notation) for capability-based planning

A number of standard viewpoints for modeling capability-related aspects have been defined. Each of these viewpoints sits on a different abstraction level, presents a different perspective on modeling capability-based planning, and allows focusing on different aspects. The following viewpoints are distinguished:

1. The **Capability Map Viewpoint**, which is the intermediate abstraction level
2. The **Capability Motivation Viewpoint**, which focuses on a higher abstraction level than the capability map viewpoint (from the capability and higher)

3. The **Capability Realization Viewpoint**, which focuses on a more detailed abstraction level than the capability map viewpoint (from the capability and lower)
4. The **Capability Increment Assessment Viewpoint**, which links each capability increment with the desired value of the associated metrics and with the plateau which realizes it.

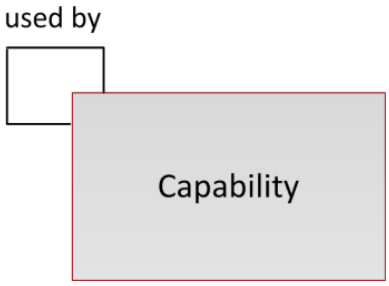
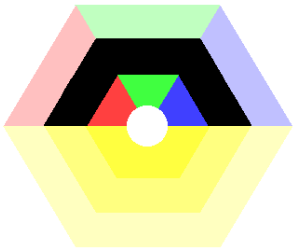


Figure 27: Concepts and relationships in the Capability Map Viewpoint

The **Capability Map Viewpoint**, shown in Figure 27, highlights the relationships of a capability with other capabilities. It only contains the capability element and, as detailed earlier, five relationships: the four standard relationships (association, aggregation, composition and specialization) and the used by relationship. It sits on an intermediate level of abstraction and it is very useful in creating a capability map. Table 18 describes the various characteristics of the viewpoint.

Table 18: Capability Map Viewpoint Description

Capability Map Viewpoint		
Stakeholders	Enterprise, process, and domain architects, product managers	
Concerns	Hierarchy building in a capability map	
Purpose	Designing, deciding, informing	
Abstraction Level	Coherence	
Layer	Business layer	
Aspects	Behavior	

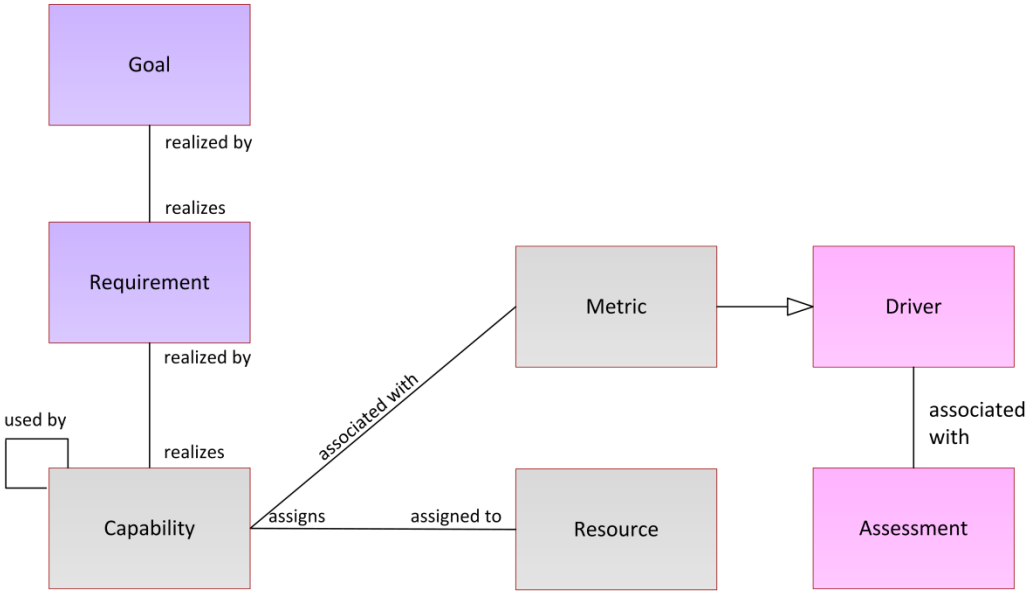
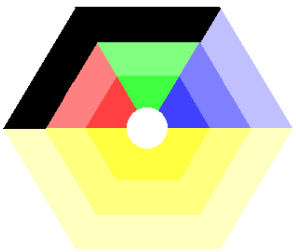


Figure 28: Concepts and relationships in the Capability Motivation Viewpoint

The **Capability Motivation Viewpoint** (shown above in Figure 28) focuses on the relationship of capability with business strategy and the different elements that motivate it. The included elements of driver, metric, and goal describe what motivates the business strategy. Additionally, the inclusion of resource in the viewpoint gives the complete picture of how the business strategy is realized through capabilities and resources. It can also be used to show which resources are required to implement a certain strategy, therefore it will be used when considering the planning of capability implementation. This viewpoint is on a higher abstraction level (from more concrete to more abstract) by connecting the capabilities with the business strategy. Table 19 describes the various characteristics of the viewpoint.

Table 19: Capability Motivation Viewpoint Description

Capability Motivation Viewpoint		
Stakeholders	Application, infrastructure, and process architects, operational managers, CIO, CEO	
Concerns	Performance, strategy realization, resource utilization	
Purpose	Designing, deciding	
Abstraction Level	Overview	
Layer	Business layer	
Aspects	Behavior, passive structure	

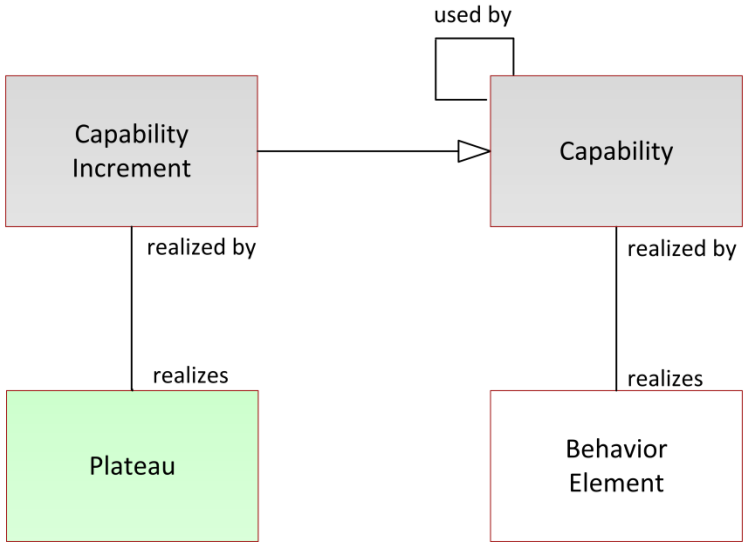
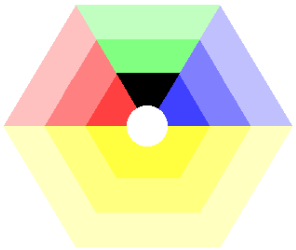


Figure 29: Concepts and relationships in the Capability Realization Viewpoint

The **Capability Realization Viewpoint** (shown in Figure 29) focuses on the decomposition of capabilities and their increments into architectural elements (such as deliverable and work package), through the relationship with the plateau. Thus, this viewpoint is on a lower abstraction level (from more abstract to more concrete) and it will be used when considering the engineering of capabilities, through consequent plateaus and transition architectures. It also expresses the relationship of the new elements with the existing ArchiMate ones. Table 20 describes the various characteristics of the viewpoint.

Table 20: Capability Realization Viewpoint Description

Capability Realization Viewpoint		
Stakeholders	Enterprise, process, and domain architects	
Concerns	Realization of capabilities in transition architectures	
Purpose	Designing	
Abstraction Level	Details	
Layer	Technology layer, application layer	
Aspects	Passive structure	

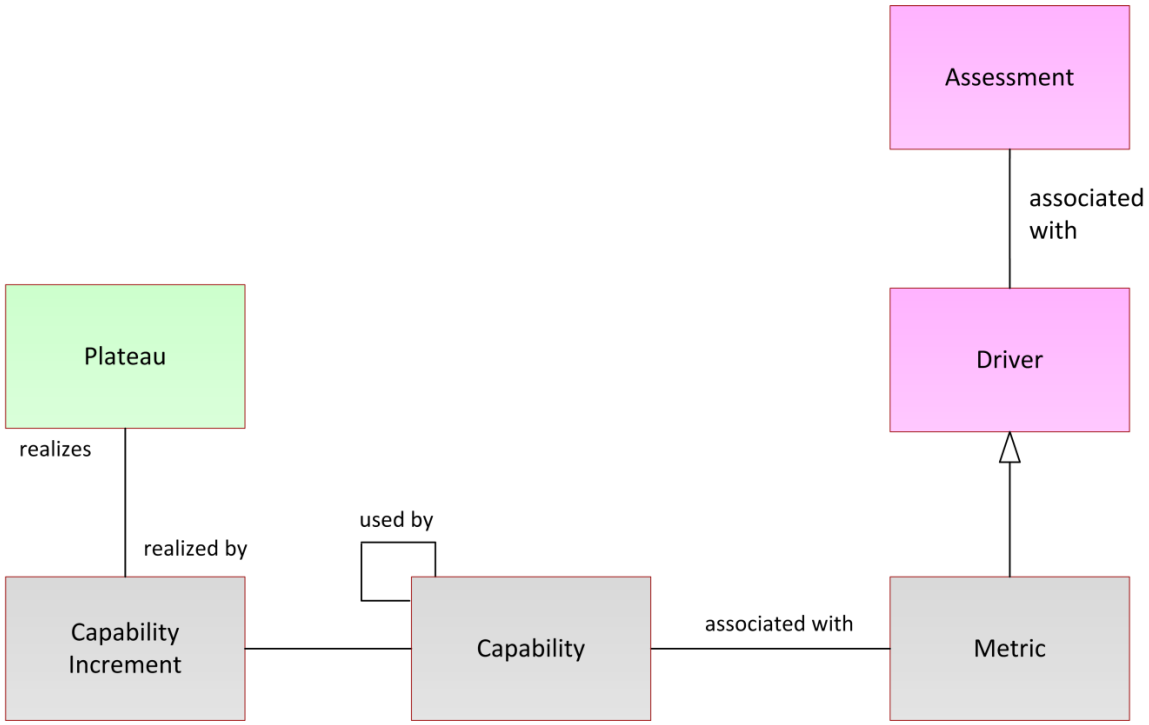
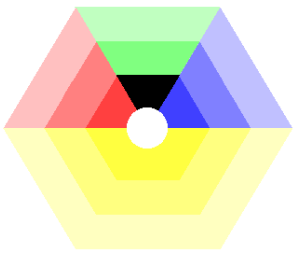


Figure 30: Concepts and relationships in the Capability Increment Assessment Viewpoint

Finally, the **Capability Increment Assessment Viewpoint** (shown in Figure 30) describes how the metric defined is going to be measured. It aims to fill the gap between the **Capability Realization Viewpoint** and how increments are being assigned a target value and assessed based on that value, resulting from an assessment. In that sense, it sits on a lower level of abstraction from the previous viewpoint. Table 21 describes its various characteristics.

Table 21: Capability Increment Assessment Viewpoint Description

Capability Increment Assessment Viewpoint		
Stakeholders	Application, infrastructure, and process architects	
Concerns	Analysis of the values of the capability increments	
Purpose	Designing	
Abstraction Level	Details	
Layer	Technology layer, application layer	
Aspects	Behavior, passive structure	

7. Demonstration of the method

The goal of this chapter is to demonstrate how the suggested method for capability-based planning can be applied in practice, using the case of ArchiSurance. The ArchiSurance case study is a fictitious example developed by (Jonkers et al. 2012) to illustrate the use of ArchiMate in the context of TOGAF to resolve issues related to integration and alignment of ArchiSurance's business processes and information systems. It is being used throughout accredited ArchiMate training courses and as the context for the ArchiMate certification examinations. Here, for the purpose of this thesis, we will take the company through the entire capability-based planning process, applying every step of the method. With the help of the capability-based planning method, ArchiSurance can on one hand effectively face some of the challenges ensuing from mergers and on the other become a competitive force in the insurance market.

7.1 Introduction to the ArchiSurance organization

ArchiSurance is a company that was created after the merger of three other previously independent insurance companies to take advantage of the numerous synergies between them in order to control costs, maintain customer satisfaction, invest in new technology and take advantage of emerging markets with high growth potential. They realized that only a larger, combined company could achieve these goals when lower-cost competitors started entering their markets and at the same time new opportunities in high-growth regions emerged; thus they decided to join forces.

The three original organizations were 'Home & Away', which provided home and travel insurance to its clients; 'PRO-FIT', which provided auto insurance; and 'Legally Yours', which was specializing in legal expense insurance. Although the three pre-merger companies were selling different types of insurance, they had similar business models; they all sold direct to consumers and small businesses through the web, email, telephone and postal mail channels, without using an intermediary channel. The created company, operating as ArchiSurance, is now providing all the aforementioned services of the three pre-merger companies (as shown below in Figure 31). Like its three predecessors, ArchiSurance sells directly to customers via print, web, and direct marketing and intends to frequently adjust its offerings in response to changing market conditions.

After the merger, ArchiSurance set up a shared front-office as a multi-channel contact center for sales and customer service, with a primary contact center at the pre-merger headquarters of Home & Away. There are still three separate back-offices that handle the insurance products of the three original companies. A Shared Service Center (SSC) has been established for document processing at the pre-merger headquarters of PROFIT (Jonkers et al. 2012).

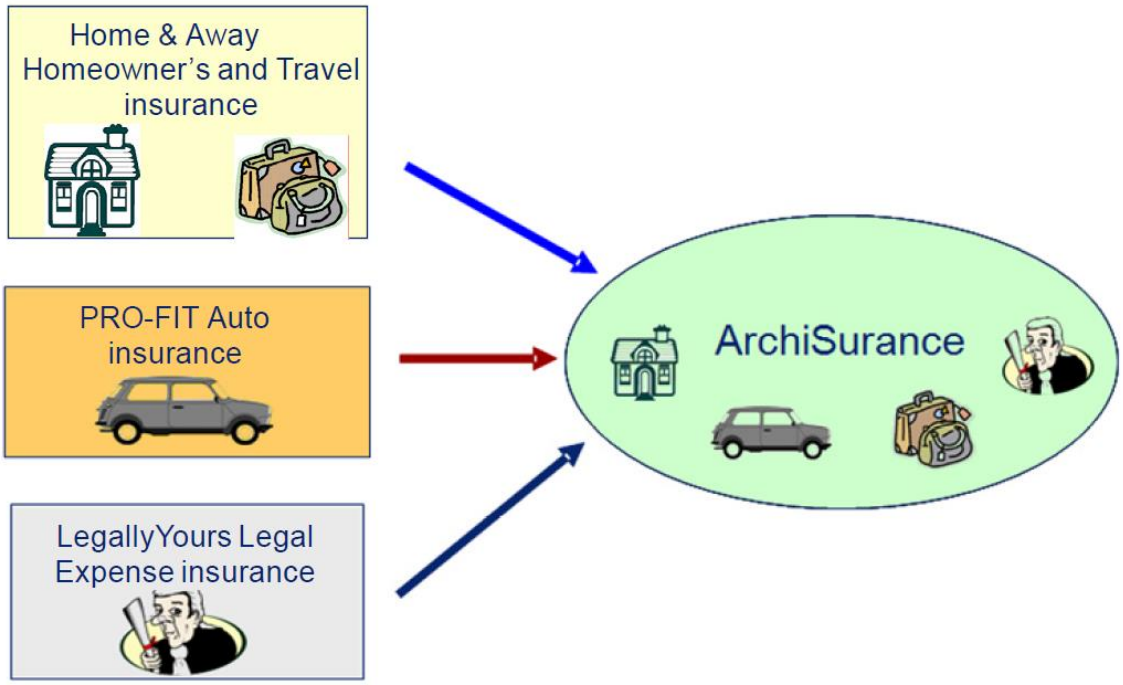


Figure 31: ArchiSurance: the result of a merger of three insurance companies (source: The Open Group, 2012)

The new company should be able to make significant new IT investments that each company individually could not but had to in order to remain competitive. As any transformational change, this merger calls for a fresh look at the organization's combined product portfolio and customer base, which also brings together the activities, the offerings, the strengths and weaknesses of the three pre-merger organizations.

7.2 Current situation in ArchiSurance

In this post-merger landscape there are various challenges the newly formed organization is facing and it must take steps in order to overcome them. The topic of Post-merger Integration (PMI) is complex in its own right and spans over all aspects and expressions of business activity, from re-defining and aligning organizational culture to re-defining and aligning quality KPIs. Two of these challenges are of interest here and are elaborated below; the first one commonly ensues from a merger and the other is about finding the orientation for future investments that the organization – with a still delicate structure – needs to make to face the competition.

Usually mergers take place between two companies and the post-merger integration situation always contains a number of possible risks, making it a true challenge. It goes without saying that when there are three organizations involved in a merger instead of two, the challenge becomes even more effortful. Deloitte, one of the largest professional services network in the world, has examined over 300 factors of merger success of which 35 were found as potential risks, within four categories (Gerds et al. 2010). They were all placed in a model which can be found in

Appendix G: Post-merger risks. Out of those, relevant to the ArchiSurance case and the scope of this research are the risks stemming from i) the complexity of synergy goals and ii) the business process heterogeneity. In other words, the newly created composite organization has – among other challenges – to ensure that there is a common and organization-wide understanding of the goals and the fundamental elements of its business.

At the same time, under these unstable conditions, the organization needs to make fast and efficient decisions about the significant new IT investments that will enable it to face the competition and stand out. At this point, the merger has brought together three heterogeneous business vocabularies which often results in discussions about the same things using different languages.

The first thing that had to happen was to formally set the mission and vision statements and the business strategy of the new company by the Board of Directors, comprising of the senior-most leaders of the organization (including the CEO). This way it would become clear to all stakeholders and clients what the organization presently does and does not do, what it aspires to be doing in the future and what the roadmap towards the end vision is. The new mission statement of ArchiSurance has been formulated as follows (adapted from (Aldea 2013)):

> *We strive to provide our customers financial peace of mind by delivering the best value supported by excellent customer service and integrity.*

Going forward with describing the organization's future identity adopting an ambitious view but that can be realistically achieved, the Board of Directors formulated the vision statement of the organization as (also adapted from (Aldea 2013)):

> *In the next 5 years we strive to become one of the country's leading automobile insurance providers by delivering the best value in legal expense, automobile, and home and travel insurance that is supported by excellent customer service and integrity and by proactively responding to the changing needs of our customers.*

The above statement adds a layer of clarity by making the planning time-bound and describes a bright future for ArchiSurance while it also expresses a realistic aspiration by avoiding being overly ambitious. By comparing its present state expressed in the mission statement to its targeted state expressed in the vision statement the differences emerge. The Board of Directors acting as a planning team decided to develop the organization's business strategy through an organized strategic planning process. This was done deliberately based on a thorough analysis of its internal and external environment (SWOT analysis and audits). With the new combined offering of insurance packages, they concluded that the new strategy should focus on building intimacy with the existing and future customers. The new strategy dictates that in order for the company to take one of the leadership positions in its home country, the focus should fall on precisely segmenting and targeting markets and offering specialized packages of services to these segments (Treacy & Wiersema 1993).

Table 22: The core values of ArchiSurance

→ **Caring:** We treat all people with fairness, empathy, compassion and understanding.
→ **Credibility & integrity:** Each one of us bears a personal responsibility for the highest standards of behavior, credibility and integrity, which are to be taken as a given in every single aspect of our work.
→ **Customer satisfaction & quality of service:** We respect our customers, listen to their wishes, and understand their expectations exceeded by the quality and service that we strive to provide.
→ **Appreciation & respect:** We honor the rights and beliefs of others, we treat every individual with dignity and we are proud of the considerable benefits brought by a diversity of employees and ideas.

Next, the same team went on defining the core values for ArchiSurance which underpinned the company vision and the business strategy. These values also provide the principles that guide an organization's internal conduct as well as its relationship with the external world. The team decided that the following four core values describe ArchiSurance's guiding principles best: i) Caring, ii) Credibility & integrity, iii) Customer satisfaction & quality of service and iv) Appreciation & respect. Two of them are also included in the mission and vision statements and all four of them are described in more detail in Table 22.

7.3 Thinking in capabilities in the post-merger landscape

Once the business strategy was decided upon, it became clear that the two challenges mentioned earlier –the differences between the three companies and the need for orientation for future investments– were the most urgent and significant issues to be tackled in the post-merger organization. As discussed in section 2.1, a capability view of the business can provide a common language within an organization, usually between business and IT, but also between different parts of the business, like in the case of ArchiSurance. Moreover, it enables laser-like business investment focus and by focusing first on the 'what' it provides a clear interpretation of what the organization does in its very core (or what it should be doing).

Naturally, each of the three organizations brought to the table of the merger a different set of capabilities. However, no matter how well developed or not these capabilities are, with the significant shift in the underlying business model occurring with the merger, they need to be re-evaluated in terms of importance, completeness/maturity and redundancy and they need to be aligned across business sectors. It might even be the case that they are not fully aware of capabilities that they already have if these occurred organically without specific planning. Additionally, it is almost certain that the post-merger organization is lacking some of the strategic business capabilities needed to rise to the occasion of the highly competitive environment. The newly developed business strategy needs to be supported by the necessary strategic business capabilities which can drive towards the achievement of the strategic business goals.

Capability-based Planning can firstly help ArchiSurance examine its capability portfolio in terms of range and maturity, identify the ones that hold strategic importance to the business and through gap analysis to detect which ones of them need to be developed or dropped, upgraded or downgraded. Secondly, it can guide the organization through the necessary steps in order to obtain the target capability portfolio and point the right direction for investments. And finally the understanding of what the business does and what it needs to be doing become crystal clear and the ambiguity surrounding the common language will be dissolved.

7.4 Applying the capability-based planning method

In this section the suggested method for performing capability-based planning will be illustrated with the use of ArchiMate models and others (e.g. for scenario creation and capability mapping). The steps will be followed as they were laid out in chapter 5.

7.4.1 Step A: Start with the Business Strategy

The first step of the capability-based planning method is about helping an organization –in this case ArchiSurance– to formulate and choose the most appropriate strategy. ArchiSurance early on right after the merger realized that deciding upon a well-formulated business strategy was of the highest importance for the organization, therefore it choosing and formulating one became one of the first activities to be completed. However, for other companies this might not be the case and that is where the techniques and activities described in Table 6 can provide some insight.

As stated in the previous section, ArchiSurance decided that its new, post-merger strategy should prioritize the building of intimacy with existing and future customers. By focusing on the segmentation and targeting of the markets, ArchiSurance will be able to offer tailored packages of services to each of the different customer segments, which is expected to boost sales and increase its market share. And by complementing its offering with excellent after sales services, in accordance to the core values stated in Table 22, ArchiSurance expects that customer satisfaction and intimacy grow.

7.4.2 Step B: Perform scenario planning

ArchiSurance, as every other insurance company competing in the modern market is facing uncertainty in several different forms. Through facilitated workshops it examined different plausible future circumstances that might affect its business (or parts of it, e.g. home insurance) and the relationship with its customers. The workshop participants identified as the top-three key issues the following: i) the uncertainty caused by future changes in the insurance legislation, ii) the effects of climate change and rising extreme weather events to insurance claims and iii) the impact of the continued economic crisis on the demand for ArchiSurance's offerings.

Out of these three key issues the second was selected to develop scenarios for and was formulated as such: "*Is it possible to manage and mitigate the risk caused by the rising extreme weather events in our home market in the next 10 years?*". The reason behind this selection is that it deals with an issue that the insurance industry has long tried to understand, analyze and

mitigate since the late 1980s[29] [30]. Next in the workshop the participants identified the major forces that could influence this issue negatively or positively, some of which are focusing on financial risk management and others on a more proactive, holistic approach, for example:

- Comprehension of climate change on global scale;
- Ability to change consumer behavior;
- Adaptability of the government to the climate change;
- Length of exposure to high-risk areas;
- Acceptance of innovative products and services in response to climate change and
- Public awareness.

Out of these six forces, some are certain or more predictable and others are not. Two of the forces that aren't exactly predictable at this point in time are selected: the comprehension of climate change on global scale and the ability to change consumer behavior. These two forces are then represented as continua on a 2D grid, forming four areas or quadrants, each of which in turn represent a scenario described as a compelling narrative, and all of them represent the scenario space shown in the following table:

Scenario 1	A market with flexible consumer behavior and comprehension of the climate change.
Scenario 2	A market with rigid consumer behavior and comprehension of the climate change.
Scenario 3	A market with flexible consumer behavior and incomprehension of the climate change.
Scenario 4	A market with rigid consumer behavior and incomprehension of the climate change.

For each of the scenarios an action plan is devised or selected among alternatives. One way to deal with the uncertainty in the first scenario would be to tailor the offered services to mitigate the risk, like for example the "Pay-as-you-drive" insurance products and policies that other insurers have started introducing for car insurance. Actions to mitigate the risk in the second scenario could involve taking steps to cancel or not renew policies in areas highly likely to be affected by extreme weather phenomena. For the third scenario the plan involves actions with which insurers make their customers' assets more resilient to risk after they have had to pay out. And finally, the action strategy for the fourth scenario is driven by the participation in public policy and the support of those that reduce and make risks more predictable. The two continua, the four scenarios and the corresponding action plans are depicted in Figure 32 below.

[29] http://www.iii.org/articles/global-climate-change-extreme-weather-exploration-scientific-uncertainty-economics-insurance.html (accessed 12/12/2013)
[30] http://www.karenclarkandco.com/articles/ReinsuranceMagazine20080400.pdf (accessed 12/12/2013)

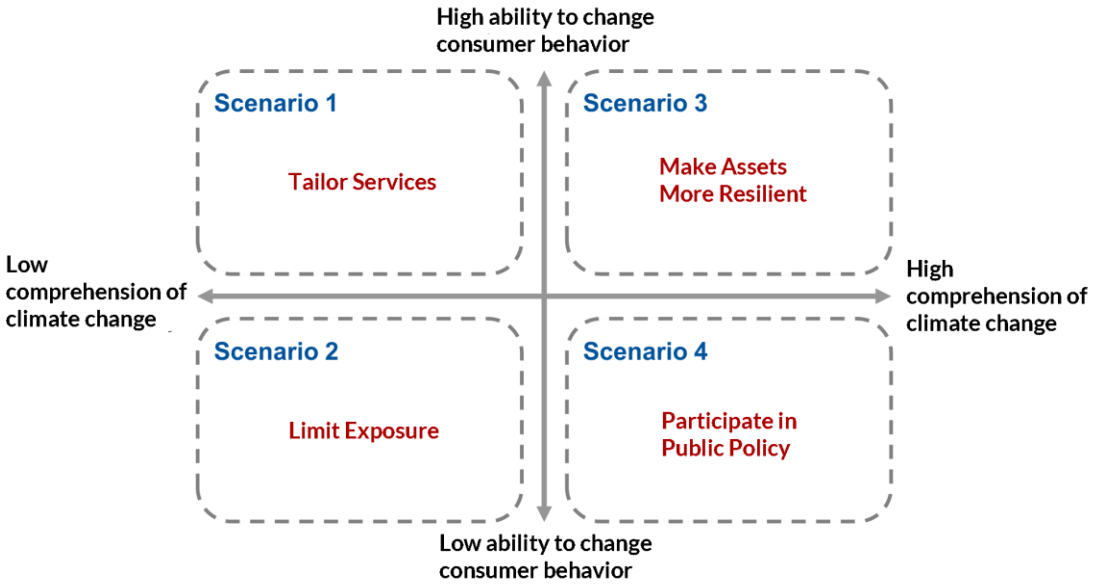


Figure 32: Scenario creation in ArchiSurance (adapted from Gartner (July 2012))

Now that there are four scenarios in the scenario space, a selection of one or more has to be made that ArchiSurance need to focus on, at least for now. This requires the attachment of risk and criticality values to each of the scenarios, the combination of which will dictate the appropriate scenario(s) to be selected (please refer to Figure 13 for details). After this process was completed, it became clear that the scenario with the lowest risk and the highest criticality is Scenario 1, because on one hand it does not require full understanding of the drivers and causes of climate change and on the other hand attempting to modify customer behavior might be easier to accomplish than adopting a holistic approach to the overall issue.

Another benefit of this selection is that it offers a different insight on the tailoring of the offered services described in ArchiSurance's business strategy. Before performing scenario planning the offering was limited to tailored packages of services to each of the different customer segments, whereas after scenario planning it became clear that the business strategy would need to be re-adjusted so that ArchiSurance would also offer the more flexible "Pay-as-you-go" services to its customers.

7.4.3 Step C: Define high-level target capabilities

Now that there is a good understanding of what ArchiSurance needs to be doing in order to achieve the strategic goals and to deal with the long-term business what-ifs, it can start specifying and defining the needed business capabilities. In this step, it will focus on doing that for the Level 1 or foundation capabilities which will set the baseline for further analysis, decomposition and detailing later. Through facilitated workshops and validation with the business, a set of the target business capabilities (i.e. what ArchiSurance should be capable of

doing) was decided upon and is presented in Table 23 below[31]. The reference number appended to each capability not only distinguishes between capabilities, but it also points out the level of a capability within the hierarchy. This is a convention that will be used throughout the analysis and mapping of the capabilities. In this case, when describing Level 1 capabilities, the adopted convention is x.0, where x is different for each one.

Table 23: ArchiSurance's foundation business capabilities

Ref. number	Name	Description
1.0	Vision and Strategy Development	Involves the definition of the business concept and long-term vision, as well as the development of the business strategy and the management of strategic initiatives.
2.0	Products and Services Development and Management	Includes the study, design, planning, promotion, and overall management of product and service portfolio and the determination of product prices and reserve levels.
3.0	Investment Management	Covers the ability to manage, construct, or acquire fixed assets that represent economic value that is expected to provide long-term benefits.
4.0	Marketing and Sales Management	Encompasses the ability to identify market segments and new markets to enter, and to perform sales approaches, competitive positioning, and brand management. It also includes the development and management of the company's overall marketing and sales approach.
5.0	Customer Service Management	Includes the interactions between ArchiSurance and its customers before or after the provision of products or services; it handles customer questions, captures incoming claims, and conducts direct marketing campaigns.
6.0	Risk Management and Compliance	Addresses the ability to analyze and manage enterprise risk (strategic, operational, financial, and hazard risks).
7.0	External Relationships Management	Encompasses the ability to manage relationships with the investors, the government, the industry, and the Board of Directors, as well as to manage legal and ethical issues and the public relations program.
8.0	Financial Resources Management	Encompasses the ability to perform all financial management practices, including the regular premium collection from the customers.
9.0	Claim Handling	Addresses the ability to asses a claim, to formulate and execute a response to each claim against ArchiSurance's policies and to settle a claim.
10.0	Document Processing Management	Covers the supporting capability to create, input, edit, and produce documents.

[31] These capabilities were jointly derived from the business functions in the ArchiSurance case study published by The Open Group (Jonkers et al. 2012) and from the business processes in APQC's Process Classification Framework (PCF) (American Productivity & Quality Center 2013).

The above listed business capabilities are mostly defined autonomously, however there are two cases where a capability is internally dependent upon another capability. First, capability 2.0 “Products and Services Development and Management” works in synergy with capability 4.0 “Marketing and Sales Management” in designing new products. And second, capability 8.0 “Financial Resources Management” works in combination with capability 9.0 “Claim Handling” in settling a financial claim. Finally, two additional capabilities that can be also included are “Human Capital Development and Management”, and “IT Management”.

7.4.4 Step D: Create target capability/heat map

After having defined and described the Level 1 business capabilities, they are placed in a capability map that is specific to ArchiSurance and gives a high-level overview of what the company needs to be doing to achieve its strategic goals. The organizing model that was adopted was a categorization of the business capabilities according to whether their value is strategic, tactical or operational, as shown in Figure 33. During scheduled sessions with the business the Level 1 capability map was validated and published in the company’s internal repository.

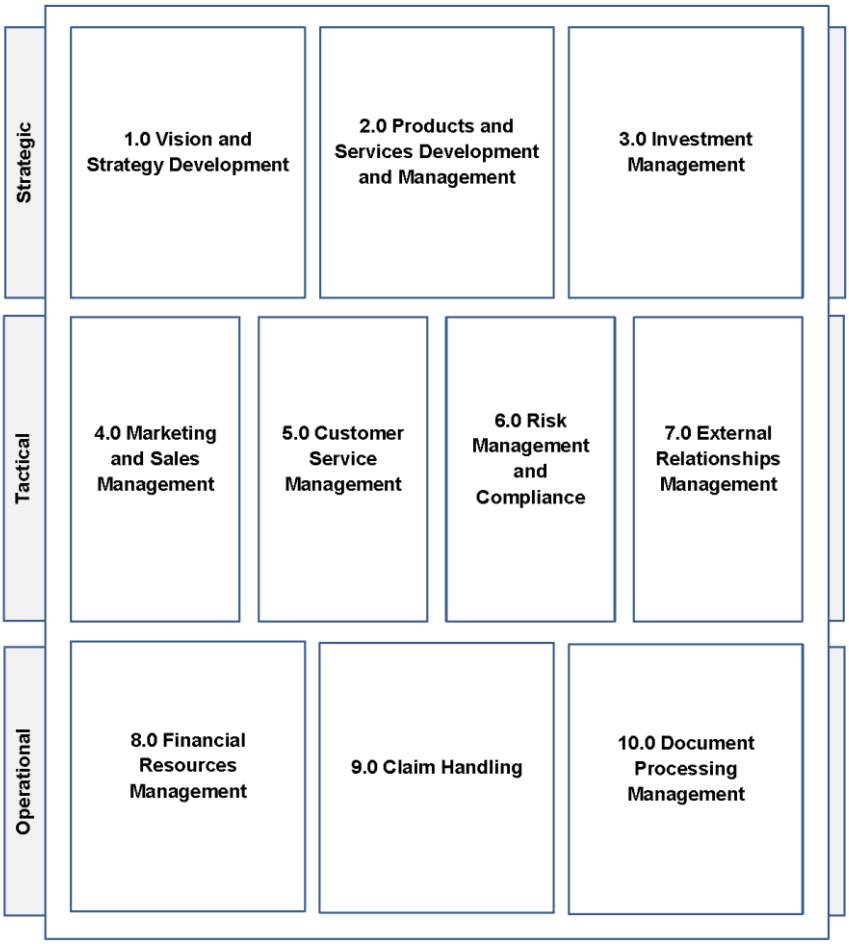


Figure 33: The Level 1 target capability map of ArchiSurance

Next, interviews with the business stakeholders determined the decomposition priorities, or in other words whether some specific foundation capabilities will be further analyzed and decomposed now and the remaining later or if all the foundation capabilities will be. The majority of the stakeholders expressed interest in decomposing all Level 1 capabilities into their lower, Level 2 capabilities, as shown in Figure 34. These are also named capability groups, because they encompass the Level 3 capabilities, which are ArchiSurance's capabilities at the lowest level of the hierarchy and are the ones that are actually implementable. In Figure 35 the same capability map is expressed in a **Capability Map View**, where the composition relationship is expressed by nesting the capabilities and the categorization by grouping them.

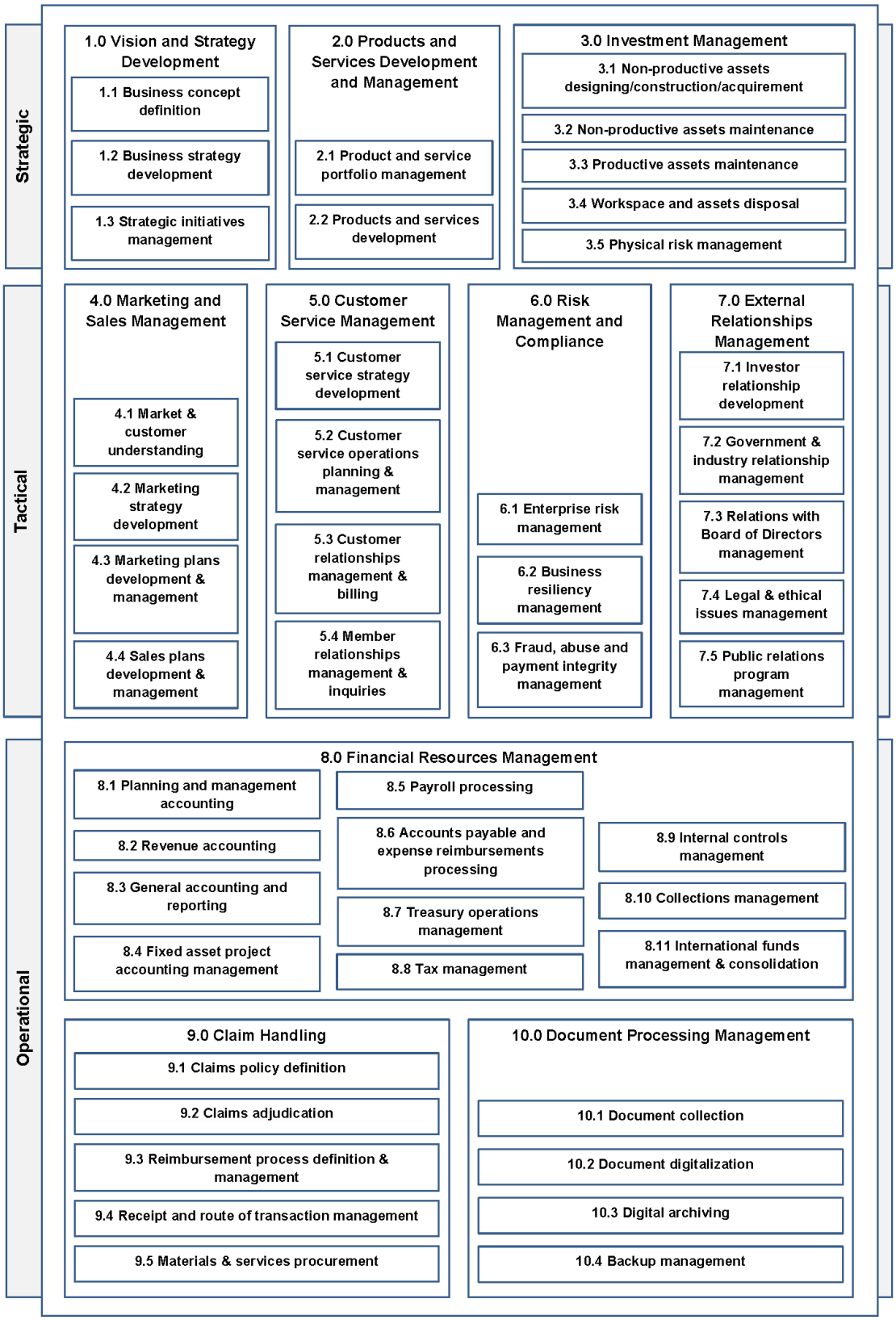


Figure 34: The Level 2 target capability map of ArchiSurance

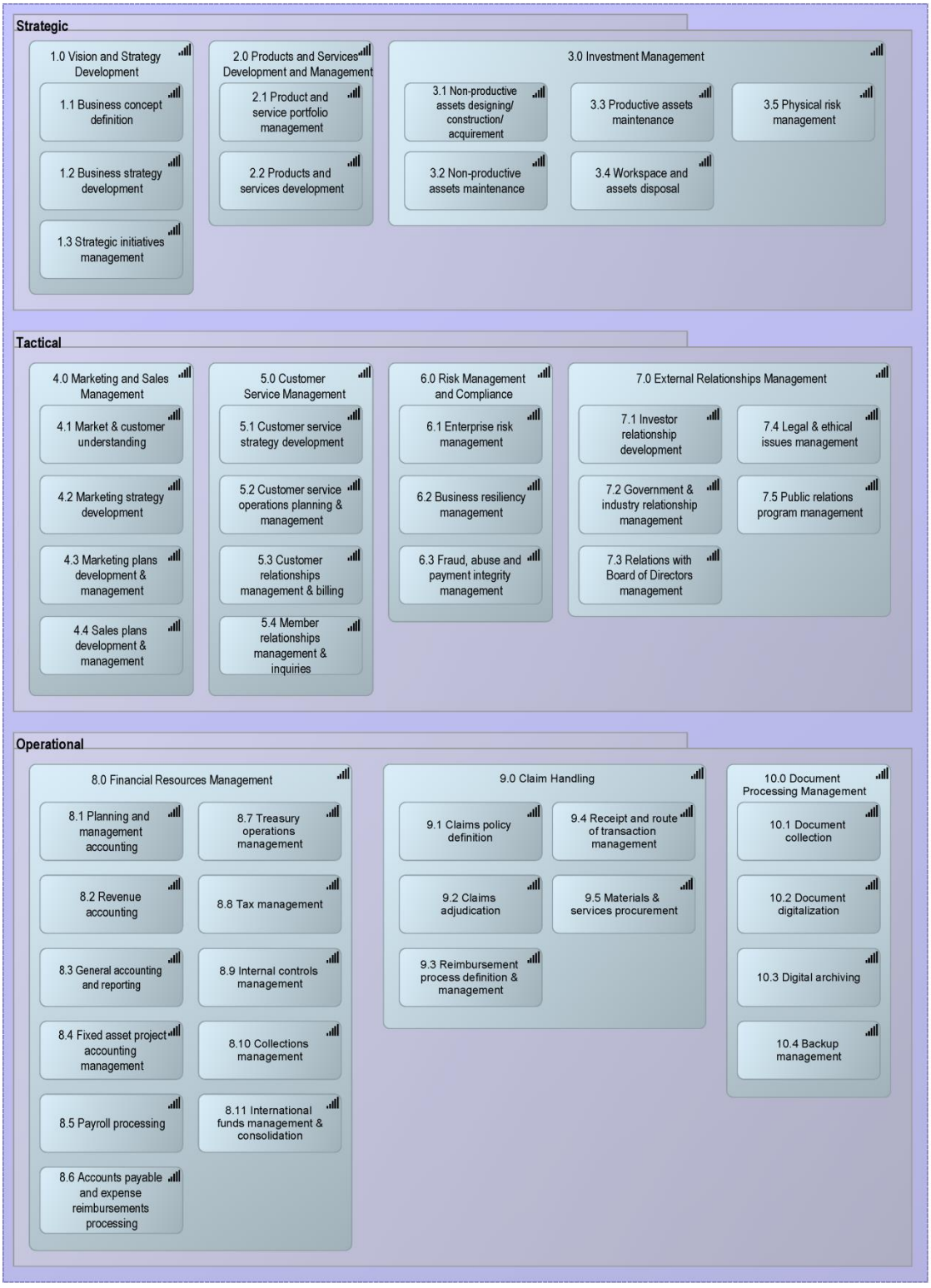


Figure 35: Capability Map View of the Level 2 target capabilities of ArchiSurance

The next step in building the capability map is to establish the Level 3 capability decomposition priorities. While it is important in general to establish and document Level 3 capabilities for value-add and strategic capabilities, it was decided that, for now, the vision statement of the organization (as formulated in 7.2) should dictate the focus on a subset of capabilities as a priority. The vision statement set the strategic direction towards: i) offering the best value in products and services to the customer, ii) responding proactively to changes in the customer needs and iii) providing excellent customer service. For each of these, a number of Level 2 capabilities were selected to be further decomposed, shown in Table 24 below.

Table 24: Level 3 capability decomposition priorities

Best value offering	Response to customer needs	Excellent customer service
2.1 Product and service portfolio management	4.1 Market & customer understanding	5.1 Customer service strategy development
2.2 Products and services development	4.2 Marketing strategy development	5.2 Customer service operations planning & management
	4.3 Marketing plans development & management	
	4.4 Sales plans development & management	

Following a similar approach as before, the above eight Level 2 capabilities are decomposed into a total number of 45 Level 3 capabilities. For this decomposition another level of business professionals below the management layer that worked on Level 2 decomposition was involved. This was necessary because the decomposition to Level 3 uses and encapsulates information better known to that particular level within an organization. After the decomposition, the capability map is once again published in the appropriate communication channels of the organization. Gathered feedback can help further refine and improve it before it is finalized. An excerpt from the Capability Map View for capability '2.0 Products and Services Development and Management' is presented in Figure 36. It shows the decomposition of the Level 1 capability into its Level 2 and Level 3 capabilities. (Note: normally all 45 Level 3 capabilities must be included into the same capability map, but doing so here would render the map difficult to read).

The following table (Table 25) is an example of the set of the attribute descriptors of one of the Level 3 capabilities. It is based upon Table 11 and shows the description of a business capability, together with the supporting human resources, the related high-level processes, the supporting technologies, the supporting information, and the operational metrics.

Table 25: Attribute descriptors for capability 4.1.2

4.1.2 Market opportunities evaluation & prioritization

Description: The marketing capability includes all aspects of identifying new markets to enter, sales approaches, competitive positioning, and brand management. It also includes the development and management of the company's overall marketing and sales approach.		
Supporting human resources: • Market strategists • Market analysts • Statisticians • Creative content developers • Media buyers	**High-level processes:** • Market segmentation • Market targeting • Competitive analysis • Brand management • Contract management	**Supporting technologies:** • Market survey tools • Analytical tools • Social media • Traditional media
Supporting information: • External market research data • Current client profiles • Consumer trend reports • Competitor data	**Operational metrics:** • New customer acquisition rates • Percent of wallet growth • Current customer loss rates	

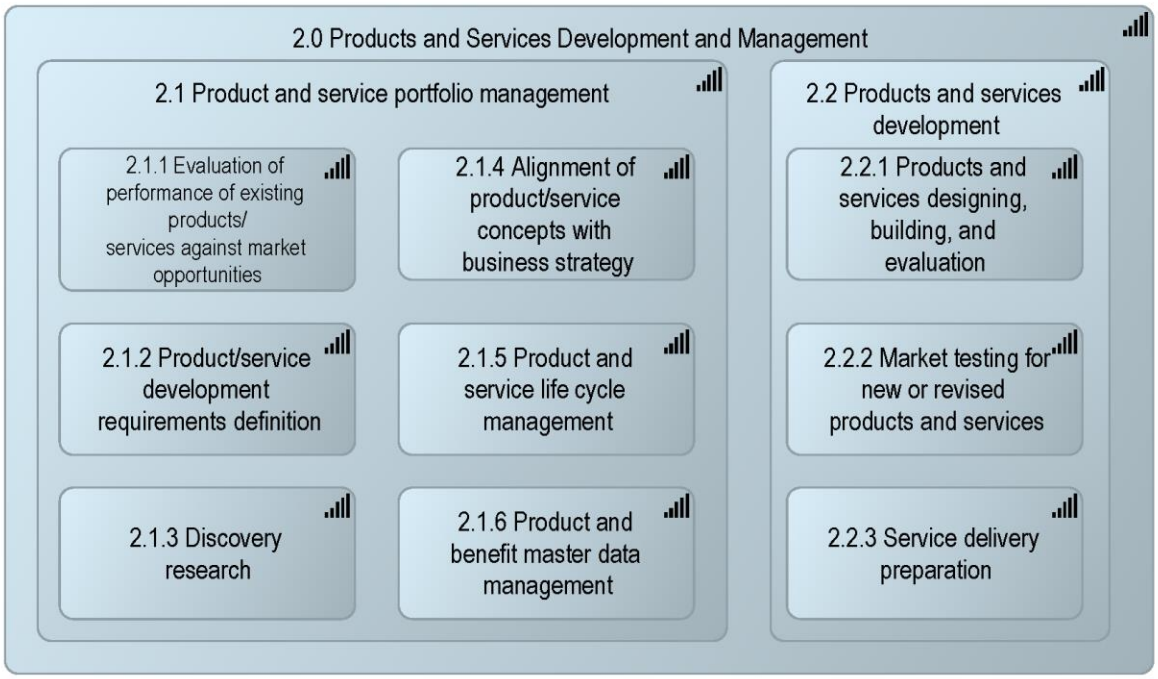


Figure 36: Excerpt from the Capability Map View of the Level 3 target capabilities of ArchiSurance

The next activity is to assign a value from 1 to 5 to each and every Level 3 capability that expresses its target maturity level. Each value will then correspond to a specific color, which will enable the heat mapping, by projecting them onto the capability map view. The color coding that was adopted depicts capabilities at maturity level 1 in red color, at level 2 orange, at level 3 in yellow, at level 4 in light green and at level 5 in deep green. An excerpt from the heat map again for capability '2.0 Products and Services Development and Management' is shown in

Figure 37 and excerpts of the heat map for the other two ('4.0 Marketing and Sales Management' and '5.0 Customer Service Management') are included in Appendix H.

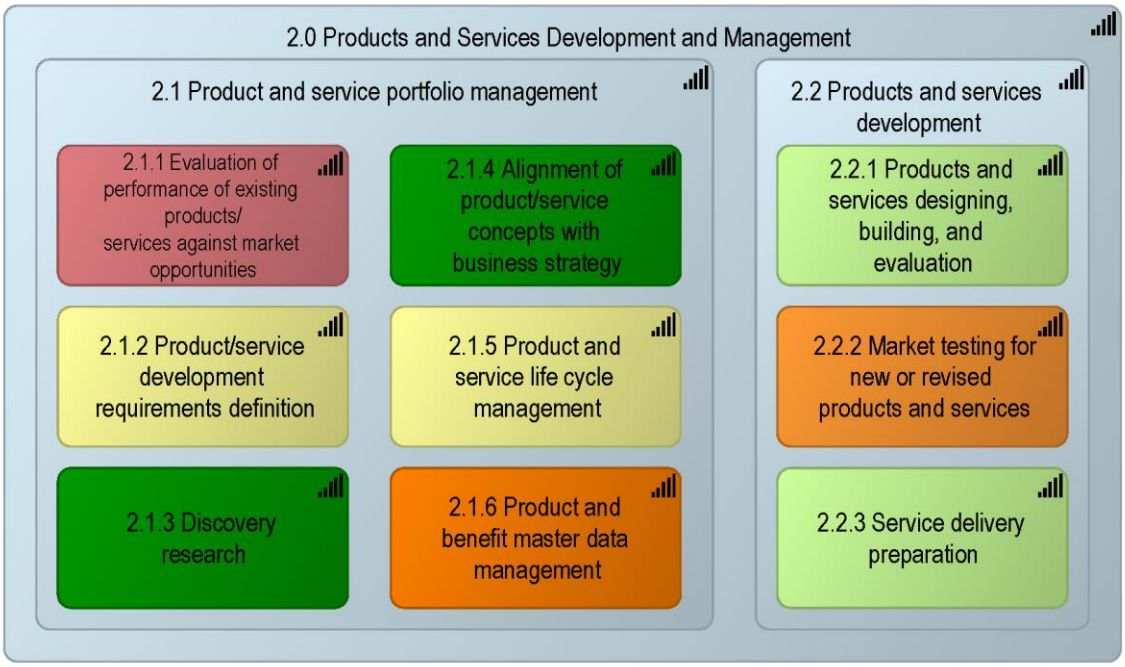


Figure 37: Excerpt from the Level 3 target capability heat map view of ArchiSurance

7.4.5 Step E: Create present capability/heat map

By now, the decomposition of capabilities and the creation of capability and heat maps should be a familiar process across ArchiSurance, which would make its repetition for the present capabilities a more straight-forward task. ArchiSurance starts by creating a current capability portfolio, and then decomposing and mapping. Then, assessing the maturity of each one of the capabilities allows the assignment of maturity values and finally the color coding of the capability map into a heat map. Since the process was described before, it will be omitted from here. In Figure 38 the equivalent present view of the previous target view is shown. Although the majority of the capabilities are present in both, the most differences lie in their maturity levels, as the next step will show. Note that since capability '2.1.1 Evaluation of performance of existing products/services against market opportunities' is not currently owned by ArchiSurance, it is not represented in the present capability heat map view. Therefore, the numbering is different than in the target capability heat map view presented earlier. This makes sense considering there is a possibility that there are present capabilities that will be decommissioned, which makes a one-to-one mapping not the best approach.

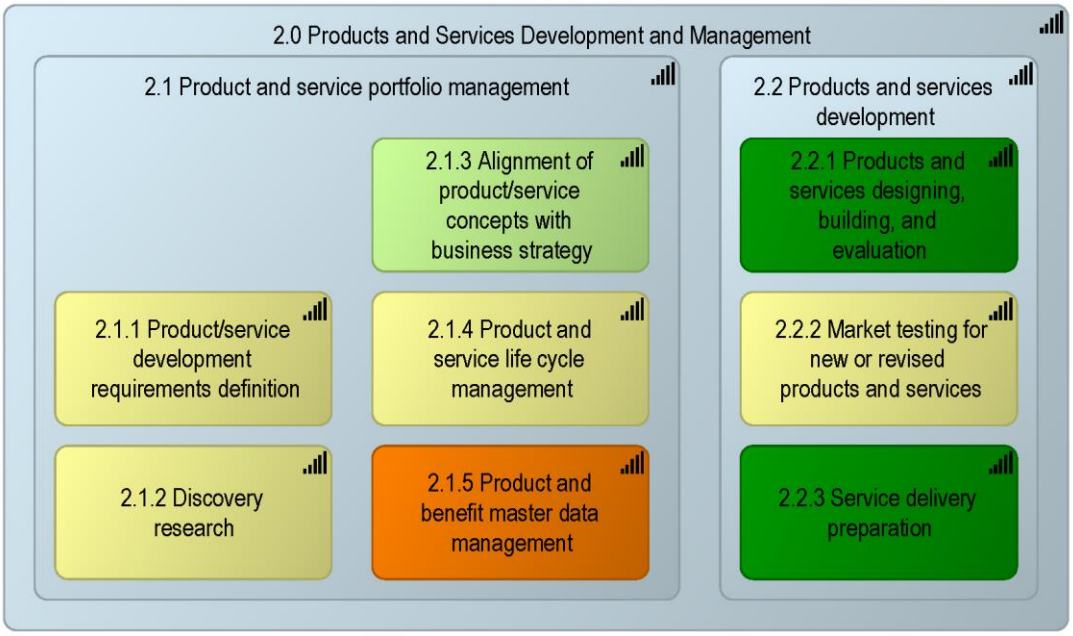


Figure 38: Excerpt from the Level 3 present capability heat map view of ArchiSurance

7.4.6 Step F: Identify capability gaps

In order to identify capability gaps, either in the existence of needed capabilities or their maturity, a maturity gap assessment must take place. This assessment is nothing more than a side-by-side comparison of the maturity assessment of the present and target states. By combining the two heat maps created in two the previous steps, deltas in maturity can be easily uncovered, using the combined heat map as a visual aid. Heat maps are instruments that are easy to comprehend, making them visual tools that facilitate the communication with the business. The combined heat map will highlight several points of concern.

As shown in Figure 39 below, some capabilities now have two different colors assigned: the left one indicates the present maturity state/level and the right one the target maturity state/level. For example capabilities 2.1.3 and 2.1.4 are currently at level 4 maturity and ArchiSurance needs them improved to level 5. When a capability has only one color this means that there is no delta between the two states, like for example capabilities 2.1.2 and 2.1.6. Also, the white color suggests that that particular capability does not exist in the corresponding state. For instance, capability 2.1.1 is not currently owned, but ArchiSurance wishes that they have it at least in level 1 maturity in the to-be situation. It could very well be the opposite case, if a capability was to be decommissioned in the future state. Finally, the numbering for the capabilities is adopted from the target capability portfolio, since the present one will soon be outdated. Two additional excerpts from the combined capability heat map view are included in Appendix H.

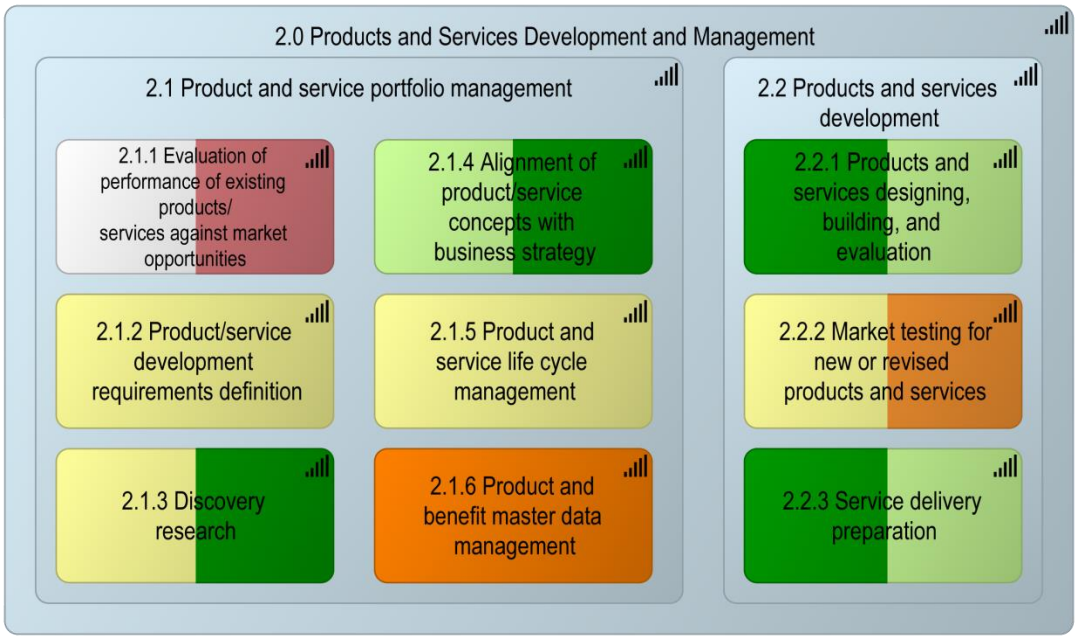


Figure 39: Excerpt from the Level 3 combined capability heat maps of ArchiSurance

7.4.7 Step G: Plan (evaluate, prioritize, and select)

The process of heat mapping capabilities and comparing between present and target states has indicated which ones require attention for the sake of the realization of the business strategy. However, because this capability is set is rather large, ArchiSurance needs to choose on which ones it should focus first. The capabilities selected must be strategic and they will comprise a combination –among other combinations– so that they collectively offer the best Balance of Investment. This process can be repeated for future iterations, selecting another combination.

In Table 26 the Level 3 capabilities of ArchiSurance with maturity delta other than zero are summarized. Positive delta value means that the capability needs to be upgraded by that many levels, while negative delta value means the opposite (the full list of the Level 3 decomposed capabilities along with their maturity levels and their maturity delta is presented in Appendix I). The nine capabilities in bold are those that at this point can best serve the realization of the business strategy and are the ones that will be considered for improvement or development first.

Table 26: Capabilities of ArchiSurance with positive or negative maturity delta

Capability	*Present Maturity*	*Target Maturity*	*Maturity Delta*
2.1.1 Evaluation of performance of existing products/services against market opportunities	0	1	-1
2.1.3 Discovery research	3	5	-2
2.1.4 Alignment of product/service concepts with business strategy	4	5	-1
2.2.1 Products and services designing, building, and evaluation	5	4	1
2.2.2 Market testing for new or revised products and services	3	2	1
2.2.3 Service delivery preparation	5	4	1
4.1.2 Market opportunities evaluation & prioritization	1	4	3
4.2.3 Channel strategy definition & management	3	2	1
4.4.6 Sales partners & alliances management	0	1	-1
5.1.1 Customer service segmentation/prioritization (e.g., tiers) development	5	4	1
5.1.2 Customer service policies & procedures definition	3	2	1
5.2.1 Customer service work force planning & management	0	1	-1
5.3.3 Account member setup & maintenance	4	3	1
5.4.2 Member inquiry intake management	4	2	2

These nine strategic business capabilities can be combined in multiple ways, creating a large number of alternatives, but not all combinations make sense[32]. After considering which of these strategic capabilities better complement each other and calculating the Balance of Investment for each of those combinations, it was decided that the winning combination was the one containing the following capabilities:

- 2.1.1 Evaluation of performance of existing products/services against market opportunities
- 2.1.4 Alignment of product/service concepts with business strategy
- 2.2.1 Products and services designing, building, and evaluation

[32] Assuming sets of five capabilities, 126 different combinations are possible (from calculating the binomial coefficient C(9,5)).

- 4.1.2 Market opportunities evaluation & prioritization
- 5.1.1 Customer service segmentation/prioritization (e.g., tiers) development

These capabilities were then highlighted on the heat map with bold borders, and the heat map was again published internally. The Capability Motivation View in Figure 40 below expresses the above connections with an example of one of the above capabilities, using the proposed ArchiMate notation. Considering that capabilities within the same combination might have some connection themselves, it would be possible to depict an association relationship between those capabilities. This (not exhaustive) model shows the entire path from the business strategy to structural and behavioral architectural elements, in a vertical view. It also shows how a resource is realized by three application components and how a capability is connected to a business process and, indirectly, to a business function.

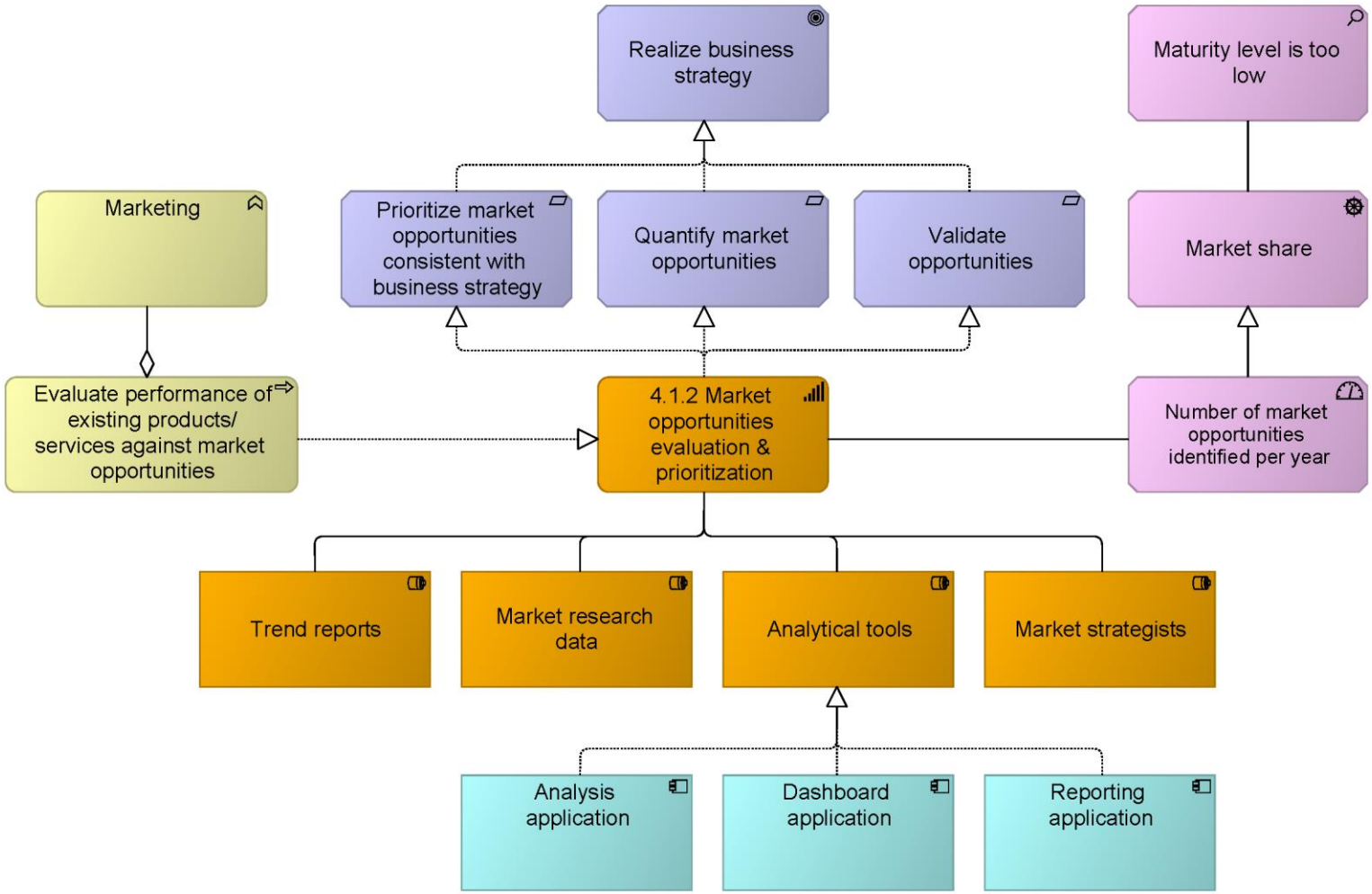


Figure 40: Capability Motivation View for a L3 capability

7.4.8 Step H: Engineer (define increments, dimensions, timeline)

In this step, each one of the previously selected five strategic business capabilities is analyzed in terms of their capability dimensions, which in turn, define the specific capability increments that comprise that capability. The capability increments of all five capabilities are organized in work packages, based on which a roadmap timeline is set. At the end of this step, the capabilities in question are developed or improved, according to the target state defined earlier.

First, a set of dimensions for each capability which are measurable aspects of interest needs to be defined. These will determine what each capability increment takes into account, and also the different values per dimension delimit the scope of each capability increment. For the capability '4.1.2 Market opportunities evaluation & prioritization' an Enterprise Business Architect from ArchiSurance selected the following dimensions as the most important:

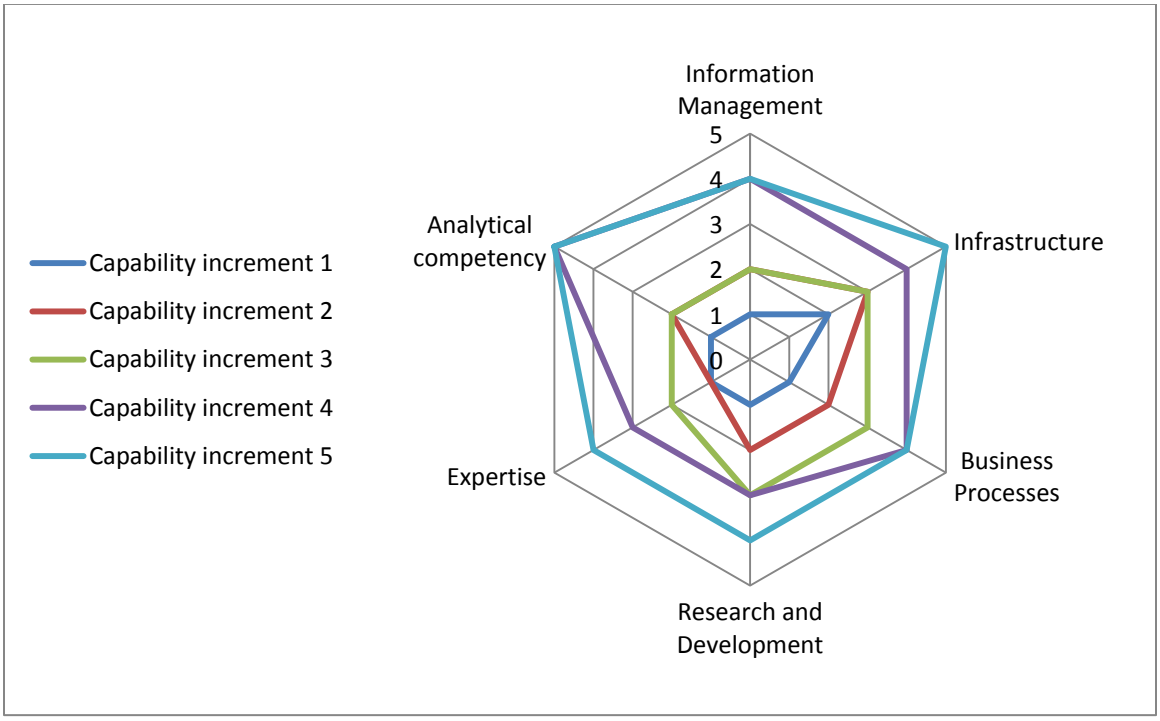


Figure 41: Capability increment radar chart

Figure 42 depicts the connections between capability increments, baseline, transition and target architectures, capability and resources. Since a capability increment is realized or should be realized through a single transition architecture, in the model there is a one-to-one realization relationship between capability increments and transition architectures. Capability increment 5 corresponds to the fully realized or improved capability within the target architecture. Figure 43 on the other hand, the Capability Increment Assessment View, shows how the defined metric for capability 4.1.2 is actually measured, given that a capability increment represents the desired value of the metric. The increments are given values from the assessment. Finally, the dimensions of the increments are modeled as a set of metrics, which are aggregated by the metric associated with the capability and expresses what is measured.

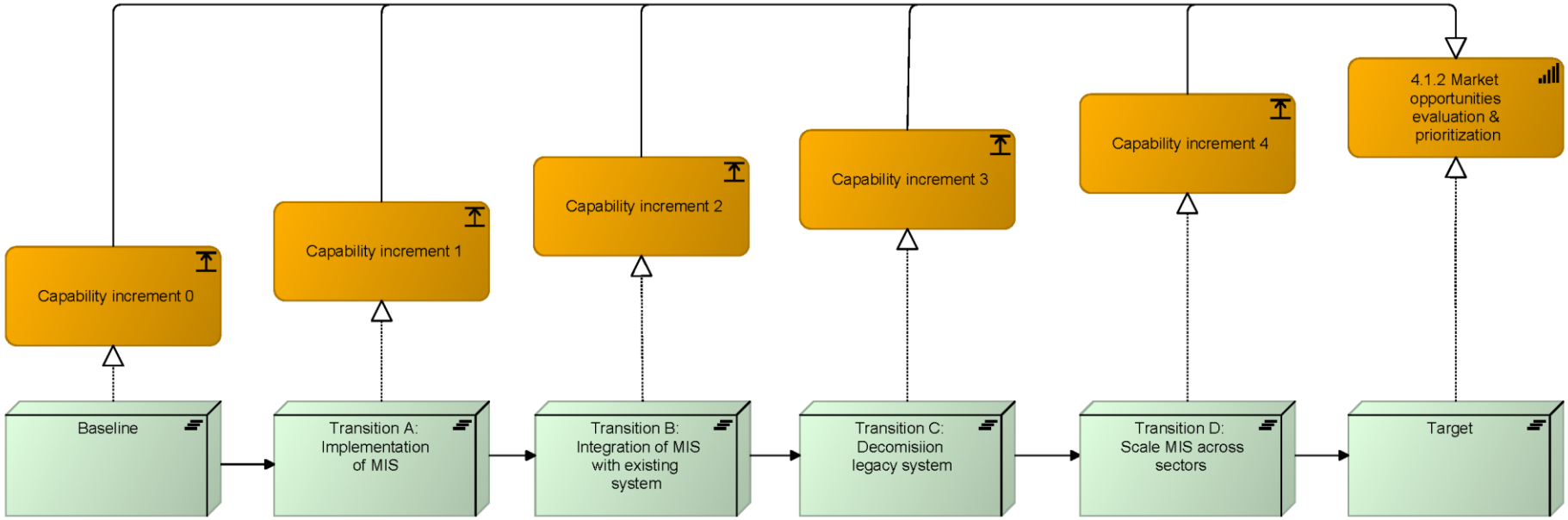


Figure 42: Capability Realization View for a L3 capability

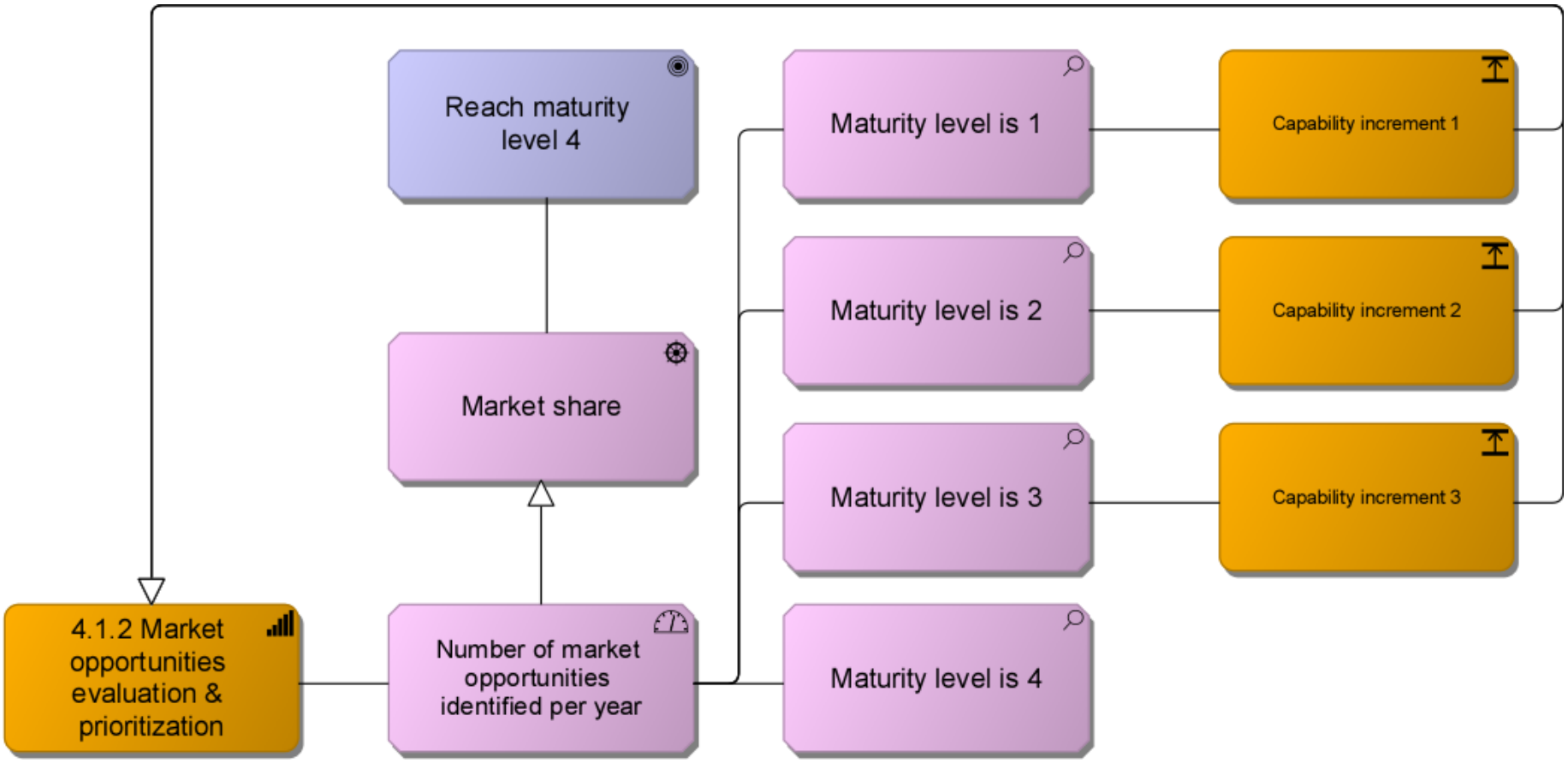


Figure 43: Capability Increment Assessment View for a L3 capability

7.4.9 Step I: Deliver

In this step ArchiSurance has to monitor whether the capabilities are successfully deployed across the organization and identify the necessary resources and skills that will make it possible. Communication is key, especially since ArchiSurance was until recently three different companies; therefore commitment from all sides will determine whether the deployment will be successful or not. Once identified, ArchiSurance must ensure that these necessary resources and skills are available. For example, in the case of capability '4.1.2 Market opportunities evaluation & prioritization' it has to provide trainings to its employees to familiarize themselves with the new Management Information System in place or ensure continuity in the supporting infrastructure.

After the deployment of the capabilities operational data can be used to monitor their actual state. This data can be used to compare the current performance/maturity level of the newly developed capabilities against the target metrics for those capabilities and uncover possible deltas in performance/maturity level. Maintaining the architecture could bring back in feedback loops into engineering and delivery to handle the change management. The Operations department of ArchiSurance can handle this and ensure proper change management, either before initiating subsequent cycles of the ADM or during.

Furthermore, monitoring risks related to or resulting from the capabilities will enable ArchiSurance to not only act on its feet, but to adjust further iterations of the capability-based planning. This, along with regular post-implementation reviews can be valuable input, experience and knowledge source for future efforts.

8. Validation

It is important that the findings and suggestions of this thesis resonate well with the business. After all, the practitioners are the major group that it primarily addresses. More specifically, the author believes that as the suggested method for capability-based planning, the proposed metamodel extension and the proposed notation extension for ArchiMate are of special interest to practitioners such as Enterprise Architects and Business Analysts. In order to validate the findings presented here, a series of validation sessions with four practitioners from the field were held. This section documents the background of the sessions and of the participants and also presents the findings.

All four practitioners came from the same company, which is headquartered in the Netherlands. It is one of the largest electronics companies in the world and employs around 122,000 people across more than 60 countries. The four professionals belonged to the department within IT which manages the strategy and architecture of the organization. Their roles were: Business Analyst, Process & Tools Manager, Business Architect, and Enterprise Business Architect, with experience on the field ranging from 5 to 16 years. Three out of four professionals were very familiar with business capabilities and with ArchiMate; two of which were also ArchiMate certified. Within the company, ArchiMate has started gaining more ground in the past 1 to 2 years.

Separate sessions were held with each practitioner. Each session lasted approximately one hour and consisted of two parts; a presentation and a semi-structured interview. The goal of the presentation was to showcase the major focal points of the thesis and more specifically the following:

1. The thesis objective
2. A selection of the most important definitions: three from the literature (business capability, strategic business capability, and capability-based planning) and three associated with the metamodel extension (capability increment, metric, and resource)
3. The suggested method for capability-based planning
4. The application of the method on the ArchiSurance example case
5. The ArchiMate metamodel extension
6. The ArchiMate notation extension

After a 20 minute presentation, each practitioner was asked a number of questions which were aiming to investigate and record their reaction to the presented elements. In addition the participants were asked some background information about their professional experience and role, as well as the usage of capabilities and/or capability-based planning in their organization. The list with the question can be found in Appendix J.

The definitions

The practitioners overall agreed with the definitions presented to them. The Business Analyst commented that "*They're clearly defined and even without the metamodel, it is easy to see the relation between all of them*", and similar comments were made by the rest three professionals.

The method

Second, regarding the proposed method for capability-based planning, all four participants seemed to find it complete and appropriate, although there were some minor comments on the structure. As expected, they overall found Phase III the most interesting, but the Business Analyst thought that it was the least explained during the presentation. The same person also commented that although the method is not strictly linear, the diagram of the method reads as a waterfall model, which was put forward by the Process & Tools Manager as well. The Process & Tools Manager further indicated that an initial roadmap for capability development should be included at the end of Phase II, and be further detailed in the next phase. He also recommended the addition of one extra step in the end of Phase III after delivery, dedicated exclusively to change management with the use of operational data and not including it in the delivery step.

The Enterprise Business Architect found interesting the scenario planning step as a way to enforce the business strategy; he thought that it added certain value to the method. Moreover, he mentioned that it would be interesting to investigate its application within his company. One comment that came from the Process & Tools Manager and the Enterprise Business Architect was about adding the output of Phase I and Phase II into the diagram describing the method, which was directly implemented in the current version. The Business Architect commented that assessing the maturity level of all capabilities before deciding on which ones to focus makes the method rather resource intensive, which was repeated by the Enterprise Business Architect. Although the author acknowledges that, it should be noted here that in their company, first the strategic business capabilities of most importance are selected and only those are assessed. On the contrary, the Enterprise Business Architect did not think that was a real issue. He said that although it might be recommended to not perform the assessment first, in the end all the capabilities would have to be assessed anyway.

When asked about whether they thought that performing maturity assessment of the capabilities in a qualitative manner is an appropriate approach, the Business Analyst commented: "*I think qualitative is good, as probably (looking at the target) some or a lot capabilities are currently not in the baseline or a quantitative assessment depends heavily on if and how data is available*". The Enterprise Business Architect mentioned that a maturity assessment can also be quantitative in some cases; however as an assessment that takes place more on the business side, he did consider it appropriate. The Process & Tools Manager mentioned that not only it is appropriate, but that it should have a more central role in the metamodel, because it is widely adopted across the industry, as he pointed out. Nevertheless, he would prefer a combination of the two: a qualitative maturity assessment for the strategic

(or "*differentiating*") capabilities for which you need to innovate and a quantitative assessment for the simple operational ones for which you need to simply be "*good enough*" or efficient.

The application of the capability-based planning method on the ArchiSurance case was found to be clear, although due to the restricted time available, it was not possible to present it in high detail. Some minor adjustments in the naming of certain objects came as a result from ambiguity created during the presentation for instance in Figure 40: Capability Motivation View for a L3 capability. Those comments were taken into account and the changes are already implemented in this version. Overall, the Process & Tools Manager commented that the application of the method in the ArchiSurance case was not that far off from what they have already been doing in his company.

Furthermore, the professionals work in a company which is in the middle of a large transformation process. As part of that process, business capabilities were first introduced approximately three years ago, but capability-based planning was not yet considered. Reflecting this fact on the proposed method, it could be said that the company has completed the effort up to and including Phase II. The company has adopted another capability framework: a proprietary one, designed by one of the largest business consulting firms globally. Given these circumstances, the participants unanimously stated that indeed, their company would be interested in applying the method and particularly Phase III. They estimated that this effort would probably take the company another two years at the most, which is considered very acceptable. For other companies that are just now starting with business capabilities, the Process & Tools Manager rated the method as "*good enough*".

The extensions to the abstract and the concrete syntaxes

Third, the abstract syntax and the viewpoints that were presented met generally favorable reviews, although they did fuel up the discussion. In the interview with the Process & Tools Manager there were many points that there was a difference of perception regarding the various concepts. For example, he stated that the way he sees capabilities, a capability increment is actually the gap between the as-is and the to-be maturity levels. He did not see it as a particular version of a capability at a point in time, but rather as a maturity level increment. In that sense, he might have replaced the concept of increment with gap. For the metric, he considered it more like the target setting of a performance indicator that would be more relevant in the post-deployment phase of a new or improved capability. He also expressed a need to have the maturity assessment more prominently featured in the metamodel because in the industry that capability maturity models are broadly used. Additionally, instead of capabilities, he stated that it should be made clear that it is business capabilities and no other types of capabilities, such as IT capabilities. Related to that, the 'used by' relationship of capability with itself is more confusing than helpful, because –according to him– this is already represented by the relationship of a capability with the behavior elements object in the metamodel.

Regarding the distinguished viewpoints, overall the reaction was positive. Three of the four professionals stated that they saw the value of the specific viewpoints, and also that they were appropriately defined and justified their given names. The fourth participant, the Process & Tools Manager, although he overall agreed with the defined viewpoints, he suggested to also associate a gap with a plateau and multiple capability increments in the capability realization viewpoint, to better reflect the changes between the plateaus. This comes closer to the concept of a work package, associated with multiple capabilities and realized by a single plateau. However, this is something that was considered when distinguishing the four viewpoints, but it was deemed that it would add unnecessary complexity to that high level representation. That being said, the author agrees that there is value in considering that aspect as well.

Furthermore, regarding the suggested extension to ArchiMate notation and its intuitiveness and well-fitting with the standard notation, there were mixed reactions. Three out of four participants described the notation symbol for the resource concept as confusing and not intuitive, while one said the same for the notation for the capability concept. The notations for (capability) increment and driver received the full support of the participants.

9. Conclusions and implications

The content of this chapter covers two main areas. First, the main results of this research are presented in relation to the research questions defined early on. And second, the theoretical and practical significance of the study will be discussed, along with recommendations for BiZZdesign.

9.1 Answers to RQs

The scope and overall goal of this research were expressed in chapter 1 as the investigation of the requirements for performing capability-based planning in an organization using TOGAF and the ArchiMate modeling language. The main research question was formulated as "*How can ArchiMate support organizations that have adopted TOGAF to perform capability-based planning*?" and to assist in answering it, the following three sub-questions were formulated:

RQ1: What are the definitions found in scientific literature and in the practice regarding capability-based planning and other related concepts?

RQ2: What would constitute a good method for capability-based planning in TOGAF?

RQ3: How do the new, capability-based planning concepts fit with the existing ArchiMate metamodel?

RQ1 has been answered in chapter 3 and the results are summarized in chapter 4 with the aid of an ontology model. More specifically, an extensive systematic literature review of scientific articles from three scientific databases was performed according to the methodology presented in chapter 3. The search results were complemented by the addition of practitioner literature and of studies by Gartner and RAND and were all reviewed indistinguishably. In parallel an online survey was performed, which was targeted at enterprise architecture practitioners and was aiming to take their views into account (in sub-chapter 3.4). Through this method an attempt was made to clarify a set of fourteen concepts that were found in the literature: eight of them made up a sort of taxonomy for capabilities, while the rest were closely related with the concept of capability, either by means of association or by means of interchangeable usage. They are enlisted in sub-chapter 3.3 and in Table 4 and Table 5 in chapter 4. These concepts were then included in an ontology model in Figure 8, which aimed to provide an overview of the taxonomy of capabilities and of the relationships between the set of the concepts.

For addressing RQ2, in sub-chapter 3.2 we examined how capability-based planning has been performed until now, in both the business world and the national defense world – where it originated from – and combine activities from these fields. Using the description from the TOGAF specification as the starting point, a method consisting of three phases and nine steps was constructed in chapter 5. The first phase is dedicated to defining the business strategy and validating it with the aid of scenario planning. The second phase is tailored to help organizations derive the necessary business capabilities form its business strategy, evaluating them and assessing the maturity gaps, while also creating the capability models. The third and final phase

is dedicated to building those capabilities while moving from the baseline to the target architecture. The three phases are presented in sub-chapters 5.1, 5.2, and 5.3 where each step is documented in terms of goals, activities, inputs, techniques, and results.

For RQ3 the answers to the other two were used as input in identifying the concepts that would be needed in ArchiMate to appropriately and sufficiently model capability-based planning. We considered the concepts from the ontology domain model and from the method suggested for capability-based planning and we selected those that satisfied a set of three criteria: alignment, parsimony and ease of use. We ended up with the concepts of *capability*, *capability increment*, *metric* and *resource* in sub-chapter 6.2.1 and argued that they need to be considered for an extension to ArchiMate or as specializations of the existing ones. Then in a metamodel fragment in Figure 25 we showed how the suggested concepts, which are presently missing from ArchiMate, fit within the language metamodel, using abstract syntax. Concrete syntax (notation) was also proposed in sub-chapter 6.2.3, along with four distinguished viewpoints: the Capability Map Viewpoint, the Capability Motivation Viewpoint, the Capability Realization Viewpoint, and the Capability Increment Assessment Viewpoint.

The usage of ArchiMate in an organization that has adopted TOGAF and is initiating the effort of capability-based planning was showcased by means of an example, the fictional case of ArchiSurance and presented in chapter 7. More specifically, the original case was extended to facilitate the development of the example in sub-chapters 7.1 to 7.3 and the proposed 9-step method was applied to the case in sub-chapter 7.4 to demonstrate how the author believes capability-based planning should be performed. The new ArchiMate notation was used to model the proposed concepts. Several business capabilities were defined for ArchiSurance (in Figure 33 and Figure 34), and the four proposed ArchiMate viewpoints were used to show different parts of the architecture (in Figure 35, Figure 40, Figure 42, and Figure 43 respectively).

The method for capability-based planning, a selection of definitions, and the proposed extension (abstract and concrete syntax, as well as four ArchiMate viewpoints) was validated by means of presentations followed by interviews in a large multinational organization that is currently undergoing a major transformation process. Four practitioners were interviewed: a Business Analyst, an Enterprise Architect, a Business Architect, and an Enterprise Business Architect. The results were overall positive, with the symbols used in the notation and the abstract syntax becoming the centerpieces of discussion. The description of the validation process and the main findings are presented in chapter 8.

Summarizing and to answer the main research question, we found that standard ArchiMate is not sufficient to support organizations in a capability-based planning effort. There are several concepts that are not part of the core language or its two extensions; therefore a new extension that would include them was deemed necessary. This would entail making additions in the abstract syntax and adding four concepts in the notation: resource, capability increment, capability, and metric, together with four distinguished viewpoints: the Capability Map Viewpoint, the Capability Motivation Viewpoint, the Capability Realization Viewpoint, and the

Capability Increment Assessment Viewpoint. Furthermore, it was showed that ArchiMate with the above additions can support a capability-based planning method, consisting of three phases and nine steps.

The remaining sections of this chapter address the implications for research and practice, and a proposition for BiZZdesign regarding the usage of the findings and the propositions. The various limitations and suggested future work are discussed in the final chapter.

9.2 Implications for research and practice

The findings and propositions of this thesis have a number of implications for research and implications for practice. They are briefly presented below, and related future work is discussed later in sub-chapter 10.1.3.

First, one implication for research is that it provides a set of definitions which can progress the discussion towards a common language. Together with the ontology domain model, the author believes that these two will help clear that "*rather thick terminological haze over the landscape where 'capability' lies*" identified in the problem statement (see chapters 2, 3, and 4). Second, in this thesis, one method of assessing capabilities is used and another is proposed. This can be a starting point for further research which would aim to investigate which of the two is better, or whether a combination of them would be best. Third, the result of this thesis offer rich material to be properly validated, via further research. The method, the metamodel fragment, and the viewpoints can be the subjects of future validation studies in academia.

Regarding the implications for practice, first it is likely that the introduced concepts of capability, capability increment, resource, and metric together with the four viewpoints can answer the demand from the practitioner side for the ability to model these architectural aspects, using a common language. This demand has long remained unfulfilled and it makes sense that it will gain acceptance from a large part of the community (not without fueling the discussion of course). Second, practicing architects can also validate or use the method for capability-based planning, or at least use it as starting point and tailor it to the needs of their organization. The method is sufficiently defined so that if they choose to utilize only a part of it, there is still plenty to be gained. For example, this thesis provides an overview of the existing work on capability mapping and suggests a way to model capabilities, using best practices. And third, with business capabilities having been established as communication and comprehension enablers that foster business and IT alignment, capability-based planning can enable business and IT transformation. These are two staple issues within the practice, which experts are still struggling with.

9.3 Recommendations for BiZZdesign

BiZZdesign, which has sponsored this research, can benefit from it in more than one ways, primarily by supporting its commercial potential. BiZZdesign offers integral solutions to its customers in different areas, such as Business Model Management, Enterprise Architecture Management, and Lean Project Management. These solutions typically consist of consultancy, tools, and training components. A similar solution could be developed for capability-based

planning and offered as an integrated approach including the CBP method and related best practices, tool support, and training.

First, the method can be simplified to make it less resource demanding and it can be tailored to meet the needs of a specific organization. Because the proposed method has been defined in such a way that it can be used by organizations in different levels of preparedness, some steps or even entire phases can be excluded, like for example Phase I. An analyst or a consultant going into an organization should before anything else assess the current practices and level of preparedness, as well as factors that would have an effect on a capability-based planning effort. Possible questions they should ask include the following:

- Does the organization have a validated and well-defined business strategy?
- Are there presently business capabilities defined in the organization?
- If there are, at which level?
- If there are, to what degree are the business capabilities of the organization linked to its Enterprise Architecture?
- What are the restrictions regarding resource availability and implementation timeline?

Best practices can be applied when defining and mapping capabilities, as briefly described in Table 8 and Table 11, and Table 10 respectively. A simple way to make them more accessible would be to have a set of reference cards or a handbook that showcase with the aid of examples how to perform these activities.

The proposed method follows a qualitative approach for assessing the state of capabilities for reasons explained in section 10.1.2. However, if possible, a quantitative approach should be preferred using performance data for the resources. This would enable the adoption of SMART criteria for capabilities and of an analytic hierarchy process for assessing the capabilities. Therefore, the analyst or the consultant has to investigate if and to which degree performance data is available and decide which approach fits the organization better.

Because capability-based planning will bring change to the organization, performing an impact analysis beforehand is recommended. Adopting capability-based planning is a major decision and this can help foresee and evaluate the associated consequences and decide early on the course of action.

Second, regarding tool support, BiZZdesign can incorporate in BiZZdesign Architect, the tool for Enterprise Architecture, not only the introduced concepts of capability, capability increment, resource, and metric, but also the ability to connect the capabilities of an organization to concepts of lower abstraction, such as resources and business processes. This way, capabilities can be somewhat quantified and planning for their development or improvement can be made more solid. Perhaps integration with the BiZZdesigner tool can offer further insight, if that would be technically feasible.

A tool with this feature will also make possible to apply lenses on the capability map or the capability map view on ArchiMate to dynamically color the capabilities according to target and present maturity levels and deltas between the two. This is currently possible in BiZZdesign Architect, by applying different views (e.g. the Colour View). However, many possibilities exist for applying different lenses that highlight different aspects of the business capabilities of an organization (e.g. which business capabilities are strategic, tactical, or operational, how business capabilities perform compared to the industry average and so on).

Assuming that the supporting data about the performance and costs of the associated resources are available and dynamically updated, it can also simplify the monitoring of the performance of the capabilities, post-implementation. This way, possible combinations of strategic business capabilities can be generated and the one with the optimal trade-off can be selected during planning (as described in Step G of the method in sub-chapter 5.3). Such a feature, apart from the simplification of the process, would also provide a clear visualization of attention areas with an appropriate lens for rapid and easy analysis and decision making.

Related to the above and especially for when a quantitative approach is followed for assessing the capabilities, a useful addition would be a 'wizard' tool or add-on component. This would guide the user through the process of inventorying the present capabilities in all levels of abstraction and defining the target capabilities. It could also provide a standardized interface of connecting a capability to the associated resources and business processes, or other capabilities.

Third, a training course offered by BiZZdesign about capability-based planning, should aim to communicate the method and the best practices mentioned earlier. Training should address for example:

- Performing scenario planning
- Separating a business capability from a business process or a business function
- Defining a business capability on the right abstraction level
- Selecting the optimal set of strategic business capabilities
- Breaking down business capabilities into capability increments
- Defining a timeline for development

Summarizing, a starter kit for capability-based planning would consist of BiZZdesign Architect with the ability to model, connect, visualize, measure and break down business capabilities, a white paper presenting the method and the ArchiSurance example and a handbook or reference cards containing the notation and the viewpoints, best practices and how-to's. A training offered by BiZZdesign would act complementarily, offering guidance and support to the customers.

Apart from the above, a white paper can be proposed to The Open Group by BiZZdesign, with the findings of this research. At the time of writing, a kick-off meeting for initiating the project of capability-based planning has been scheduled, with the cooperation of the ArchiMate and Architecture Forums of The Open Group. Several elements of this research could possibly be

used in this effort: the definition set, the method, the extension of the ArchiSurance case, and of course the language extensions.

10. Limitations and future work

This chapter addresses the limitations of the research in two dimensions. First, there are limitations that might affect the validity of the research, stemming mostly from the availability of literature and from the results of the performed online survey, discussed in 10.1.1. And second, the limitations that are connected to the proposed capability-based planning method and which interested practitioners should be aware of, discussed in 10.1.2. These possible limitations set the path for future work in the area, which is proposed in 10.1.3.

10.1.1 Limitations of the research

One of the most effortful parts of this research was finding scientific literature which touched upon the subject of capability-base planning from an EA perspective or literature that contained prescriptions regarding the development of capabilities. Scientific literature on this topic is scarce and addresses the problem in a fragmented manner. Although the amount of returned search results was not negligible, most of the research views capabilities through two lenses: the resource-based view and the national defense, each posing a different limitation. The first limitation means that although a discussion around capabilities is not complete without considering the resource-based view, it does not fully cover the scope of capabilities in the enterprise architecture context, nor does it deal with actually obtaining the needed capabilities. The second limitation means that although capability-based planning is commonly present within the national defense literature it is approached from a different angle, that of developing a capability to deal with threats, whereas a business is interested in developing a capability to deal with opportunities, strengths and weaknesses as well.

This lead to resorting to other resources from the practitioner world, which frequently are not rigorous enough or they are simply views of a single expert. Apart from the Gartner research used extensively and which can be considered well-grounded to theory, blog posts, LinkedIn group discussions, and PowerPoint presentations were also considered. While the topic of capability-based planning is primarily practitioner oriented and although the author tried to critically assess these resources, it has to be noted that these resources might hinder the credibility of parts of this research.

Regarding the ArchiSurance case, not a lot of information is provided by The Open Group. Although this might be one of its strengths, in the sense that it is very flexible to correspond to different needs, a large number of assumptions had to be made in order to tailor it to the needs of the present research. While they were based on research, the author recognizes that some of these assumptions are either not fully justified or that sometimes they do not mirror reality. That being said, the author believes that these assumptions are sufficiently – for the purposes of this thesis – elaborated for the sake of illustration.

Finally, the sample for the online survey and the results from it pose two types of limitations. First, the sample is small due to the limited participation of practitioners. The questionnaire was posted twice on related LinkedIn groups and was emailed to members of The Architecture Forum of The Open Group, but the response was below the expected level. This could be

attributed to the nature of the topic itself, which might be challenging to tackle, especially in an online medium where it is easy to be ignored. Second, the responses themselves presented a scattered image of the practitioners' views on fundamental concepts and on the differences between them. This lack of consensus made the drawing of conclusions an arduous task of excluding several of the responses and taking into account those few ones that formed some sort of majority.

10.1.2 Limitations in practice

Some limitations regarding the capability-based planning method need to be noted. First, the proposed method is – to a large extent – suggestive and should be viewed as a first attempt in touching upon this topic. Although the method for capability-based planning that was presented here attempts to cover the needs of most organizations, tailoring it to the specific needs of a single should be the first concern, before attempting to perform it. In that sense it should not be viewed as a method that can be applied to all cases or one that can be followed blindly. After all, it has not been transferred into the setting of a real world company, but rather projected onto the fictional case of ArchiSurance for demonstration purposes.

Second, in general two approaches exist for assessing the state of capabilities: qualitative and quantitative, with the latter being generally preferred because it links resources to capabilities and monitors them in conjunction. The activities of assessing capabilities presented throughout this thesis employed simply a qualitative (based on their significance, desirability, maturity etc.) and not a quantitative approach for two reasons. First, it is assumed that many organizations might not have available performance data for the resources and second, a quantitative approach requires first the assessment of resources needed to deliver a capability, an effort whose prescription is beyond the scope of this thesis. Following the qualitative approach only requires some taxonomy of capabilities, and this was deemed sufficient to present the method for capability-based planning. That being said, if an organization can support the option of assessing capabilities with a quantitative approach, it should; this could also enforce the maturity framework with SMART criteria (as mentioned in 5.2.D) and could enable the organization to adopt the analytic hierarchy process for assessing capabilities, as described in Step G of the proposed capability-based planning method.

Additionally, when the capabilities are linked to program and project costs, then the resulting map can show the level of investment in developing each capability. Further capability decomposition and additional business analysis and business/IT mapping allow the capability map to play a major role in business/IT transformation. For example, business capability mapping performed this way provides a clear road map to service-oriented architecture (SOA), in terms of implementation, because it identifies the stable elements of the business around which architecture can be modeled (Cook 2007).

10.1.3 Future Work

The author would like to invite members of the research community to extend and improve on the research presented here. The purpose of this thesis was, above all, to fuel and expand the

discussion around business capabilities and capability-based planning, while highlighting their value to the business. That being said, there is room for improvement in the following four areas.

First, further validation of the method and the language extension (metamodel fragment and viewpoints) is necessary. In this thesis, they were illustrated by means of an example case study; therefore a proper validation is pending, e.g., with real-life cases. Regarding the method, it remains to be investigated whether it really is applicable to all possible scenarios, under different settings. The proposed metamodel remains to be checked from an ontological point of view, for assessing how well-defined it is, as well as for consistency, completeness, and uniqueness, i.e., for assessing if it has enough expressive power. These points can be the subjects of separate validation studies.

Second, the suggested method could be restructured to better reflect the everyday reality in an organization that is considering of initiating this effort. As some of the professionals pointed out during the validation sessions, by rearranging the steps of capability maturity assessment and strategic capability selection, the method can become less resource intensive. The componentized structure of the method allows for it to be customized according to the needs of a specific organization. Thus, it would be interesting to compare different sequences of the steps and find which approach would be the most effective.

Third, the method could work better by performing quantitative assessment on capabilities; however scientific and practitioner literature at the time of conducting this research was nearly non-existent. The author believes that there is scientific interest in investigating separately what is the best way to assess business capabilities. As one of the participants in the validation commented, a hybrid of the two assessment methods could be the most effective. Also, researching the concept of value and how it can be measured can provide a new and different view on what capabilities the organization needs to focus on.

Finally, during the study of the literature on the EA field and even in the TOGAF and ArchiMate standards, some definitions remain ambiguous. For instance the TOGAF definition of capability-based planning leaves big room for interpretation. Practitioners are still trying to clarify the conceptual differences between the basic notions of business capability, business process, and business function. This might be partly caused by the lack of total alignment between the two standards; however it is something that The Open Group should address, in order to make the progress of the field less jarring. This also became apparent during the validation sessions, where one practitioner described the misconceptions created within his company around basic terms as the IT capability.

Table of figures

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Appendix A: Survey Questionnaire

Survey on Capability-based Planning

First, let me introduce myself; my name is Anastasios Papazoglou, and I am a Masters student of the University of Twente, the Netherlands. As part of my graduation project I'm conducting research at BiZZdesign, where I am exploring and trying to clarify the concept of Capability-based Planning, as well as other associated concepts. This short survey is part of a research project towards this goal.

Everyone is talking about Capabilities and Capability-based Planning right now, but the way to do it and the anticipated benefits it can bring to an organization are not as clear. BiZZdesign is looking into ways of how it can help these organizations and how to support them both methodologically and with respect to modeling.

This document consists of some concept descriptions drawn from the literature, followed by a semi- structured part. The whole survey should take no longer than 10 minutes to complete. Please rest assured that all findings will be thoroughly anonymized, and no personal or confidential information will be used in any way. If you feel uncomfortable answering any of the questions, you can always choose not to answer.

For helping out with this complicated topic, the respondents can have access to the results of the research (e.g. a white paper) before anyone else outside BiZZdesign and the University of Twente.

Business Capabilities
Capabilities represent an organization's capacity to achieve a desired outcome. They can be thought of as describing the organization's potential and they represent the 'what', which rarely changes, whereas the process and people represent the 'how', which changes all the time with the advancement of technology and of customer demand. Therefore, capabilities are the basis for introduction of new products and services, Strategic Analysis and Governance.

Capability Maps
Capability maps provide a stable overarching view of what is important to business leaders that can link business and IT initiatives together. Capability maps allow a hierarchical decomposition of the capabilities of an organization, and viewing the business in terms of capabilities provides a higher level view of its structure. These relatively simple views of the business provide the foundation for complex discussions on strategy and resource allocation. However, they don't reduce business complexity, but they do illuminate the complexity in ways that provide higher levels of insight and perspective.

Capability-based Planning
Capability-based planning is a planning discipline, in which enterprise change is defined, sequenced, coordinated and managed in terms of capability increments, in addition to projects and deliverables. It focuses on the business outcomes and specifically the planning, engineering and delivery of strategic business capabilities to the enterprise. It is complementary to both enterprise architecture and project portfolio management.

1. **Do you agree with the aforementioned distinction between a Capability and a Process?**
   Mark only one oval.
   - ◯ Yes
   - ◯ No

If not, why?

2. **What do you think is the difference between a Capability and a Function?**

3. **What do you think is the difference between a Capability and a Resource?**

4. **What do you think is the difference between a Capability and a Service?**

5. **Do you think that Capability-based Planning is the same concept as Capability Planning? Why/why not?**

6. **Has your company modeled its capabilities using a Capability Map?**
   Mark only one oval.
   - ◯ Yes
   - ◯ No
   - ◯ Not yet

If you answered yes, please indicate how comprehensible you find it:
Mark only one oval.
- ◯ Simple and entirely clear
- ◯ Simple and somewhat clear
- ◯ Complex but entirely clear
- ◯ Complex but somewhat clear
- ◯ Not clear at all

7. **Does your company measure the performance of its Capabilities?**
Mark only one oval.

- Yes
- No

If it does, how does it do it? If it doesn't, why not?

8. **What benefits would you expect from Capability-based Planning?**

9. **What kind of support is needed, in your opinion, for Capability-based Planning, regarding methodology, modeling, tools, etc.?**

10. **What type of organization are you working in and what is your function within it?**

11. **If you have any additional remarks, please note them here:**

Appendix B: The strategy model-based approach

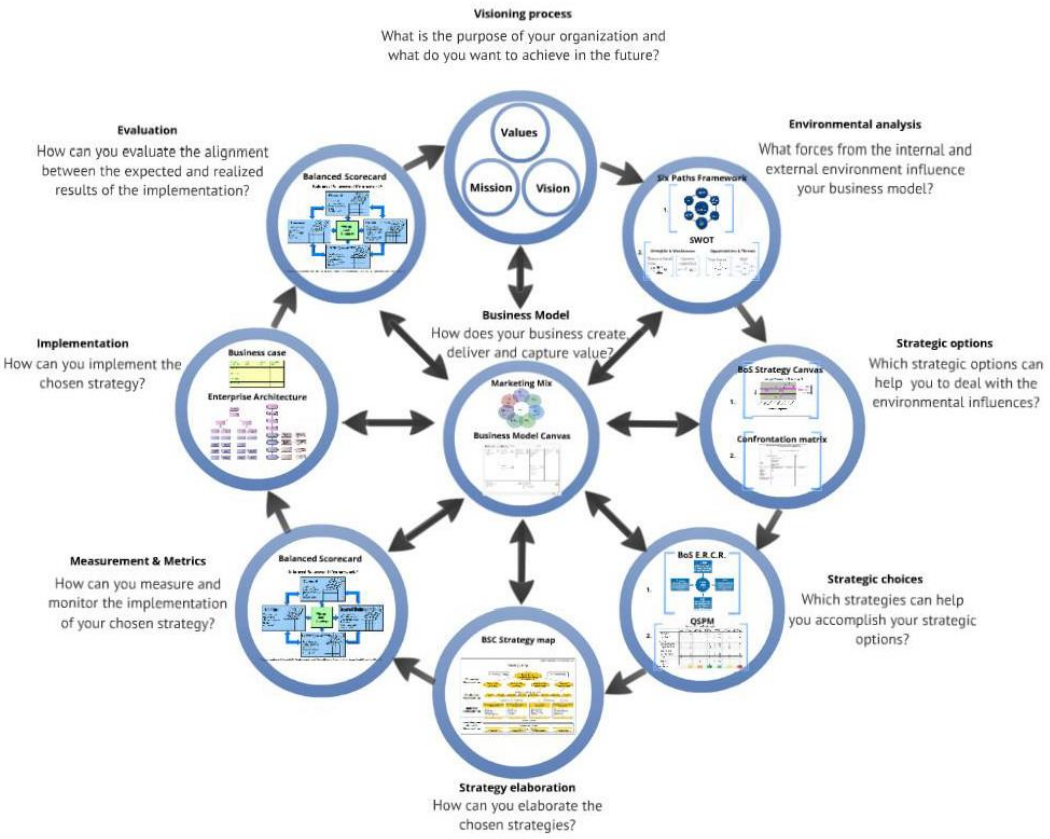


Figure 44: The strategy model-based approach (source: (Aldea 2013))

Appendix C: Forecasts vs. Scenarios

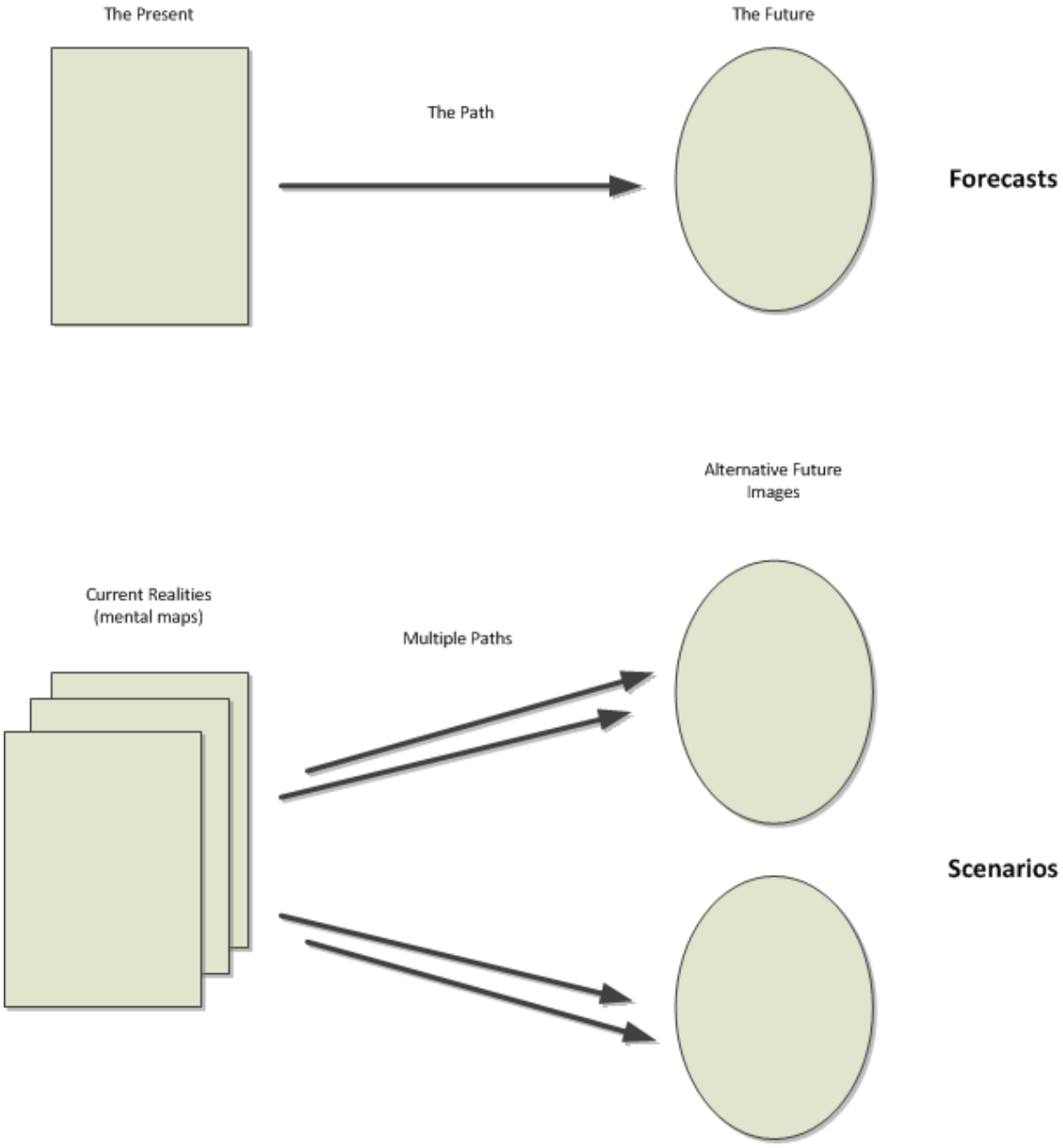


Table 27: Forecasts vs. Scenarios (Source: (Romani 2005))

Appendix D: Five Steps of Scenario-Based Planning

Table 28: Five Steps of Scenario-Based Planning (Source: Gartner (July 2012))

Step	Activities
1. Key issue and scope definition	Identify a key issue or focal question, its scope (local, regional, global, narrow or wide) and the relative time horizon (three, five or 10 years out). *For example: Should we replace the traditional manufacturer of a given product line over the next three years by using 3D-printing-based technology?*
2. Driving-force analysis	Identify the major forces or drivers that influence its outcome (failure or success), and distinguish between those that are certain or predictable (such as demographic drivers) and those that are not (such as political or environmental ones). Select the two or three most important, uncertain forces. *For example: Technology maturity, consumer demand for product personalization and the evolution of transportation costs.*
3. Scenario creation and scripting	Represent each force as a "continuum," spectrum or axis, with opposite values in a 2D or 3D grid. Each quadrant or area of the grid represents a "scenario" or potential future outcome, which should be described as a compelling narrative or story. *For example: A world of highly personalized, on-site manufactured/printed products and a world of totally commoditized/standardized products.*
4. Strategic options development	Identify action plans or strategies that make sense in all of the scenarios, and those that don't make sense in any of them. The common strategy elements should form the basis of a core strategy, independent of future developments. Scenario-specific elements become strategic options that complement the core strategy and represent responses tailored to the relative uncertainty.
5. Signpost identification and monitoring	Identify leading indicators or "signposts" for each scenario that may reveal whether a certain future is unfolding. Constantly monitor the indicators defined, and periodically present them to relevant stakeholders and decision makers to allow for adjusting strategic options. *For example: Unit prices of available 3D printers, transportation cost indexes and customer demand for more personalized products.*

Adapted from "The Art of the Long View: Planning for the Future in an Uncertain World," by Peter Schwartz.

Appendix E: Iterations in building a capability map

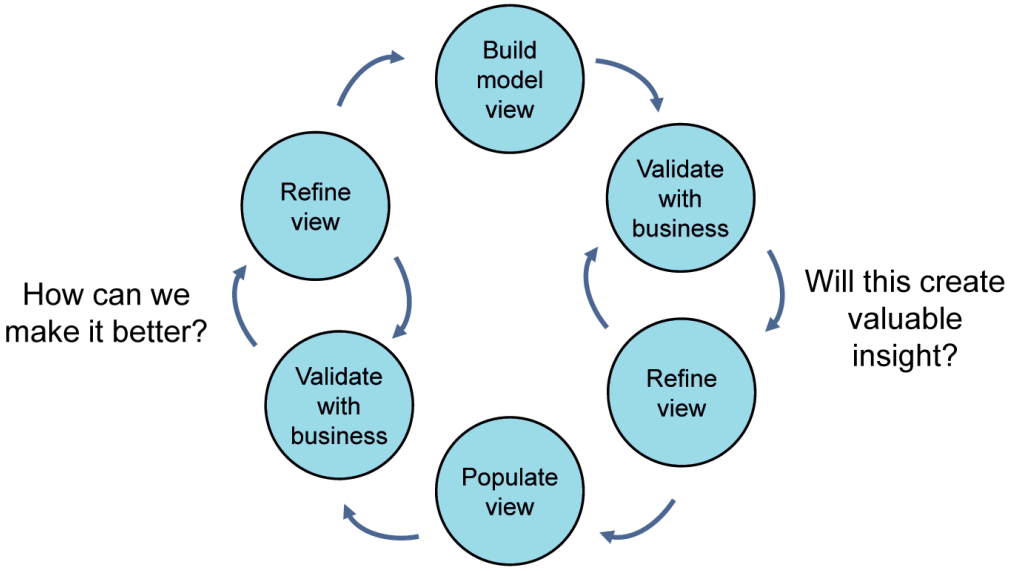


Figure 45: The collaborative, iterative approach in capability map building (source: (Scott 2010b)**, Forrester Research)**

Appendix F: Example of Level 1 and Level 2 capability maps

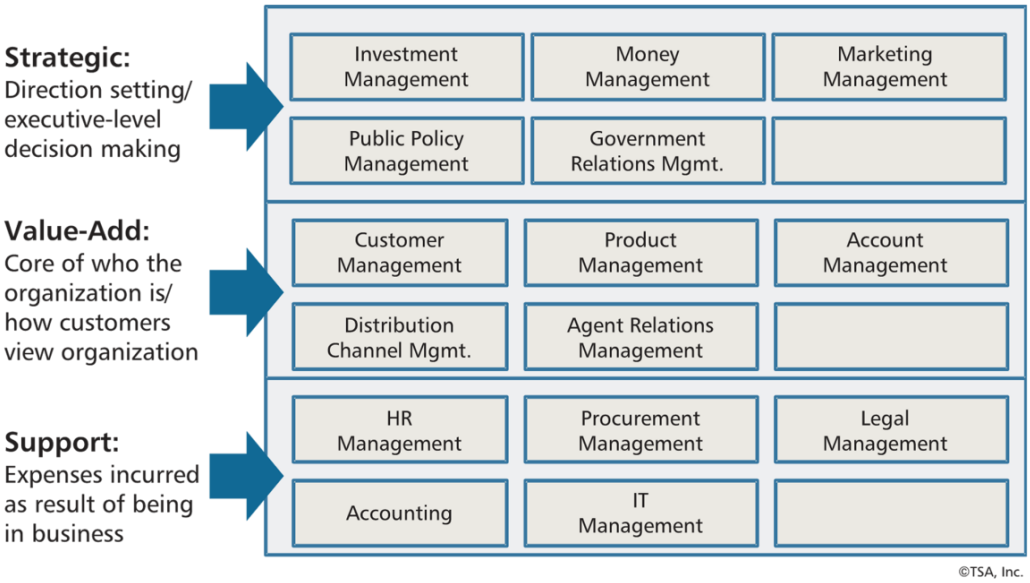


Figure 46: Sample Level 1 capability map, with capabilities layered by type (source: (Ulrich & Rosen 2011b)**, Cutter Consortium)**

Figure 47: Level 1 capability map for a travel loyalty management company (source: (Weldon & Burton 2011), Gartner)

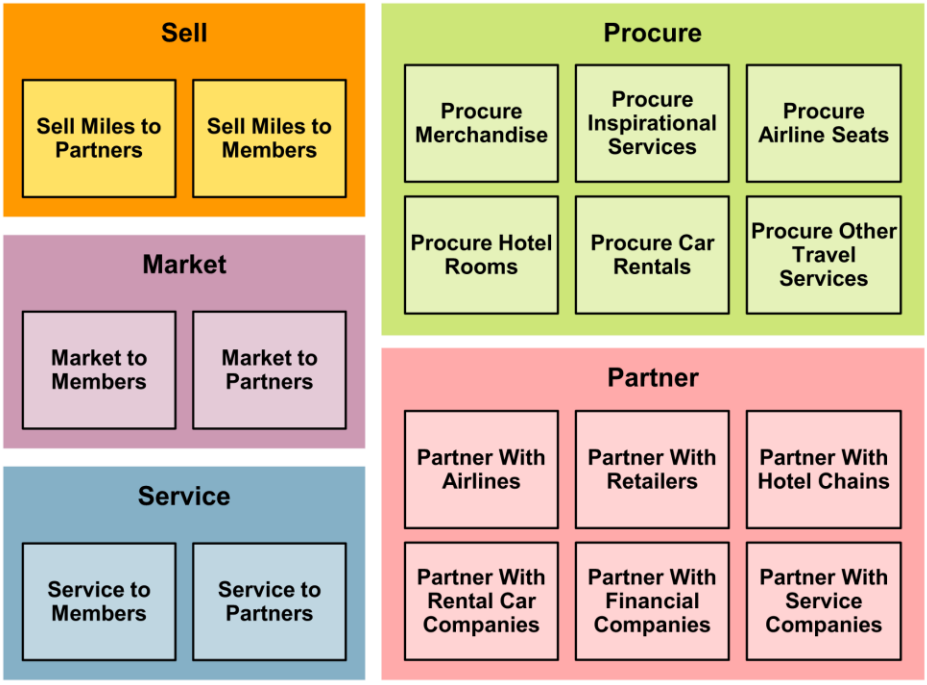


Figure 48: Level 2 capability map for a travel loyalty management company (source: (Weldon & Burton 2011), Gartner)

Appendix G: Post-merger risks

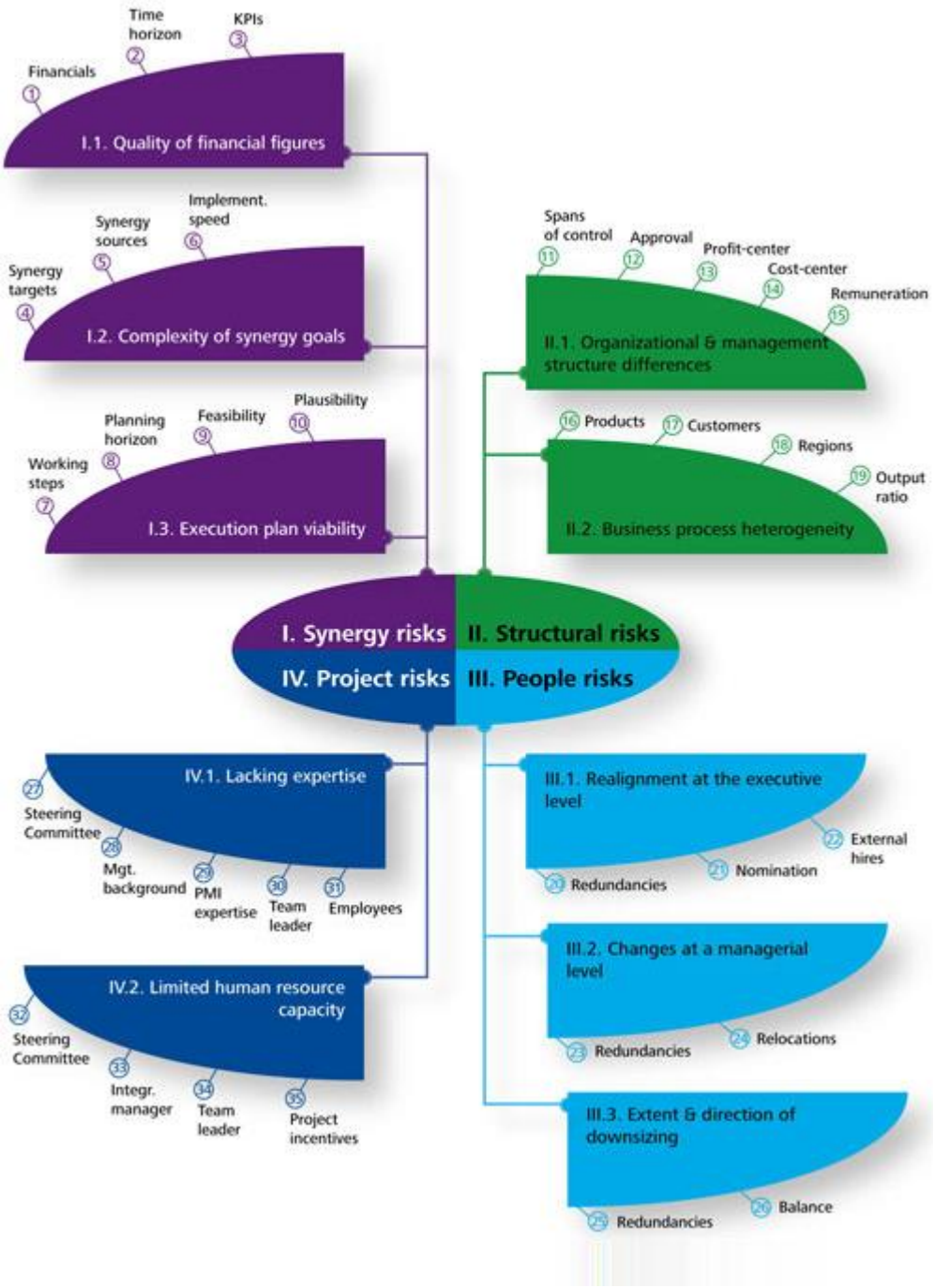
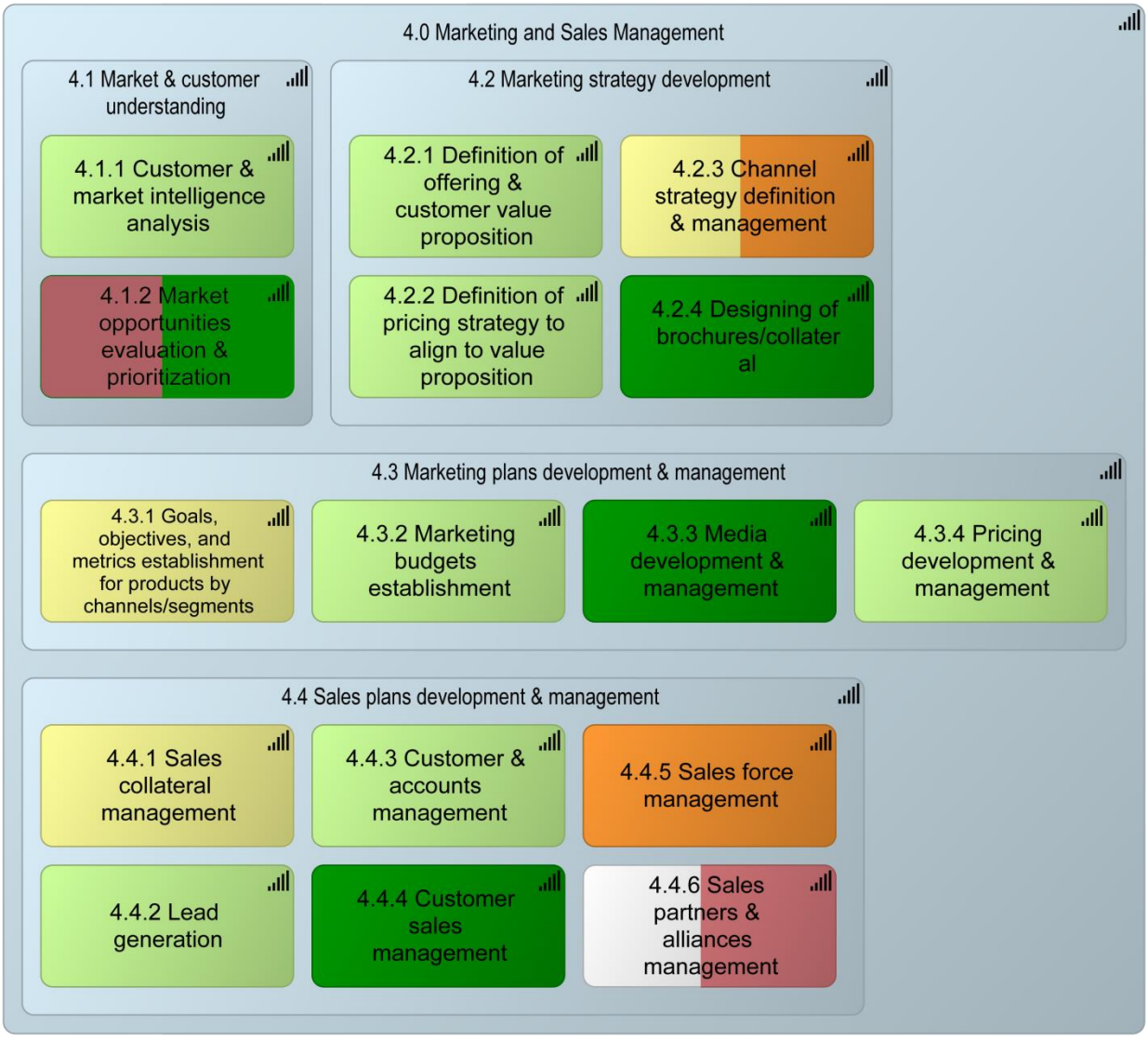
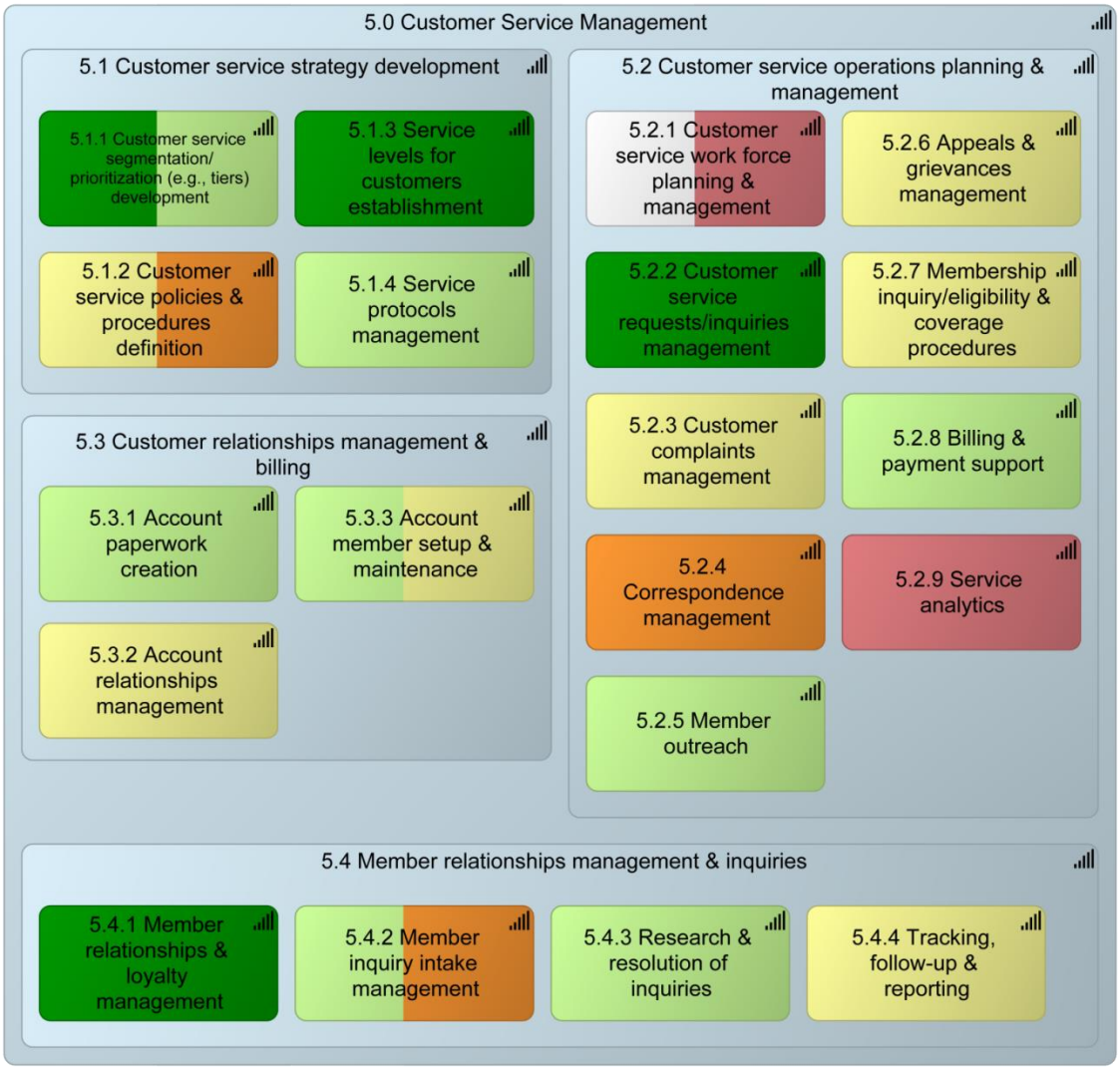


Figure 49: Post-merger integration risks to watch for (Source: Deloitte, 2010)

Appendix H: Excerpts of the capability heat map view of ArchiSurance showing maturity gaps in Level 3

Adapted from *APQC Process Classification Framework (PCF) - Healthcare Payer PCF (Version 6.0.0)* (American Productivity & Quality Center 2013).




5.0 Customer Service Management
5.1 Customer service strategy development
5.1.1 Customer service segmentation/ prioritization (e.g., tiers) development
5.1.3 Service levels for customers establishment
5.1.2 Customer service policies & procedures definition
5.1.4 Service protocols management
5.2 Customer service operations planning & management
5.2.1 Customer service work force planning & management
5.2.6 Appeals & grievances management
5.2.2 Customer service requests/inquiries management
5.2.7 Membership inquiry/eligibility & coverage procedures
5.2.3 Customer complaints management
5.2.8 Billing & payment support
5.2.4 Correspondence management
5.2.9 Service analytics
5.2.5 Member outreach
5.3 Customer relationships management & billing
5.3.1 Account paperwork creation
5.3.3 Account member setup & maintenance
5.3.2 Account relationships management
5.4 Member relationships management & inquiries
5.4.1 Member relationships & loyalty management
5.4.2 Member inquiry intake management
5.4.3 Research & resolution of inquiries
5.4.4 Tracking, follow-up & reporting

Appendix I: Comparison table of capability maturity levels

Capability	*Present Maturity*	*Target Maturity*	*Maturity Delta*
2.0 Products and Services Development and Management			
2.1 Product and service portfolio management			
2.1.1 Evaluation of performance of existing products/services against market opportunities	0	1	**-1**
2.1.2 Product/service development requirements definition	3	3	0
2.1.3 Discovery research	3	5	**-2**
2.1.4 Alignment of product/service concepts with business strategy	4	5	**-1**
2.1.5 Product and service life cycle management	3	3	0
2.1.6 Product and benefit master data management	2	2	0
2.2 Products and services development			
2.2.1 Products and services designing, building, and evaluation	5	4	**1**
2.2.2 Market testing for new or revised products and services	3	2	**1**
2.2.3 Service delivery preparation	5	4	**1**
4.0 Marketing and Sales Management			
4.1 Market & customer understanding			
4.1.1 Customer & market intelligence analysis	4	4	0
4.1.2 Market opportunities evaluation & prioritization	1	4	**3**
4.2 Marketing strategy development			
4.2.1 Definition of offering & customer value proposition	4	4	0
4.2.2 Definition of pricing strategy to align to value proposition	4	4	0
4.2.3 Channel strategy definition & management	3	2	**1**
4.2.4 Designing of brochures/collateral	5	5	0
4.3 Marketing plans development & management			
4.3.1 Goals, objectives, and metrics establishment for products by channels/segments	3	3	0
4.3.2 Marketing budgets establishment	4	4	0
4.3.3 Media development & management	5	5	0
4.3.4 Pricing development & management	4	4	0
4.4 Sales plans development & management			
4.4.1 Sales collateral management	3	3	0
4.4.2 Lead generation	4	4	0
4.4.3 Customer & accounts management	4	4	0
4.4.4 Customer sales management	5	5	0
4.4.5 Sales force management	2	2	0
4.4.6 Sales partners & alliances management	0	1	**-1**
5.0 Customer Service Management			
5.1 Customer service strategy development			

5.1.1 Customer service segmentation/prioritization (e.g., tiers) development	5	4	**1**
5.1.2 Customer service policies & procedures definition	3	2	**1**
5.1.3 Service levels for customers establishment	5	5	0
5.1.4 Service protocols management	4	4	0
5.2 Customer service operations planning & management			
5.2.1 Customer service work force planning & management	0	1	**-1**
5.2.2 Customer service requests/inquiries management	5	5	0
5.2.3 Customer complaints management	3	3	0
5.2.4 Correspondence management	2	2	0
5.2.5 Member outreach	4	4	0
5.2.6 Appeals & grievances management	3	3	0
5.2.7 Membership inquiry/eligibility & coverage procedures	3	3	0
5.2.8 Billing & payment support	4	4	0
5.2.9 Service analytics	1	1	0
5.3 Customer relationships management & billing			
5.3.1 Account paperwork creation	4	4	0
5.3.2 Account relationships management	3	3	0
5.3.3 Account member setup & maintenance	4	3	**1**
5.4 Member relationships management & inquiries			
5.4.1 Member relationships & loyalty management	5	5	0
5.4.2 Member inquiry intake management	4	2	**2**
5.4.3 Research & resolution of inquiries	4	4	0
5.4.4 Tracking, follow-up & reporting	3	3	0

Appendix J: Practitioner validation questionnaire

Part I: CBP in your organization

Do you perform capability-based planning or another similar method/framework in your organization?

a. If yes, which one?
b. If yes, who is responsible for it?
c. If yes, what is your role in it?

Part II: The CBP definitions

Do you consider the presented definitions for the below concepts to be clear and appropriate?

1. Business capability
2. Strategic business capability
3. Capability-based planning
4. Capability increment
5. Metric
6. Resource

Part III: The CBP method

1. Do you consider the steps of the presented capability-based planning method to be logical? Why? Why not?
2. Should there be anything else that you missed and that could be added to improve the presented method?
3. Do you think the qualitative assessment of capabilities based on maturity is sufficient? If not, would you prefer to have them quantitatively assessed instead?
4. Was the application of the method to the ArchiSurance case clear?
5. Do you think the method has any value to your organization? If yes, how? If not, why?
6. Would you consider tailoring the proposed method to the needs of your organization? If yes, what would you change?
7. How much time do you think your company would need to invest in using the presented method? Is that time acceptable?

Part IV: The Language Extension

1. Metamodel fragment:
    a. Do you think the selection of these particular concepts make sense? If not, why?
    b. Do you think the included relationships are appropriate? If not, why?
    c. Do you think the viewpoints justify their name and purpose? If not, why?
2. Notation:
    a. Do you consider that the proposed notation is intuitive enough? If not, why?
    b. Do you think that it fits well with the standard notation? If not, why?