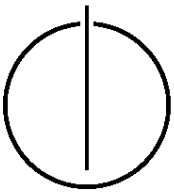
DEPARTMENT OF INFORMATICS

TECHNICAL UNIVERSITY OF MUNICH

Bachelor's Thesis in Information Systems

Analysis of Inter-organizational Business Capability Modeling Initiatives

Julian Feldmeier



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Analyse von Initiativen zur unternehmensübergreifenden Business Capability Modellierung

Analysis of Inter-organizational Business Capability Modeling Initiatives

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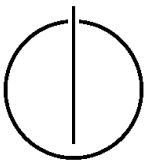
Submission Date:	15.07.2020



I confirm that this bachelor's thesis is my own work and I have documented all sources and material used.

Munich, 15.07.2020 Julian Feldmeier

Abstract

Enterprises are operating in a constantly changing market environment with continuous technological advancements. This necessitates both the focus on their key capabilities to keep their competitive advantage, but also the collaboration with industry partners, suppliers, and competitors. Business capabilities allow business leaders to get a holistic, abstracted view of the organization and support the alignment of business and IT. Additionally, business capabilities can improve communication with business partners. With the shift to collaboration in Enterprise Architecture, this reasons the collaborative identification and modeling of business capabilities by companies from the same industry. So far, there is a lack of research addressing this subject. This thesis will contribute to filling that gap by analyzing multiple case studies from inter-organizational business capability modeling initiatives. In total, 4 case studies are analyzed. The companies involved in the case studies are collaborating horizontally with different collaboration goals. To gain in-depth knowledge, which is necessary for the case study analysis, a literature review on business capability modeling in a single organization is conducted. Furthermore, the results of this literature review are compared with the results of the case study analysis. The main differences are a divergence of starting points for capability identification, like processes or goals, and a variation in the degree of granularity of the two approaches, where inter-organizational modeling initiatives tend to be more abstract and less detailed as components like responsibilities, which are included in single-organizational constructed capabilities, are missing. Eventually, in this thesis, a reference process for inter-organizational business capability modeling is derived from the case studies, evaluated through multiple interviews, and presented.

Contents

Outline of the Thesis

CHAPTER 1: INTRODUCTION

The first chapter presents the motivation of the thesis and further reasons the need for research in inter-organizational business capability modeling. Moreover, this chapter covers the objectives of the thesis as well as the research approach addressing them.

CHAPTER 2: FOUNDATIONS

The second chapter lays the foundation by presenting definitions of the key vocabulary of this thesis. To set a consistent terminology throughout this work, important terms and concepts are defined.

CHAPTER 3: LITERATURE REVIEW

In this chapter, the approach and results of the literature review are presented. It covers the most significant findings for business capability modeling in a single organization.

CHAPTER 4: RELATED WORK

The fourth chapter provides an overview of the research conducted in the area of inter-organizational business capability modeling and summarizes related work.

CHAPTER 5: CASE STUDY

This chapter first presents the schedule and approach for conducting the case study. It is followed by a detailed overview of the case study partners.

CHAPTER 6: BUSINESS CAPABILITY MODELING

The sixth chapter provides an overview of the results of the literature review and the case study analysis. Furthermore, this chapter presents and describes the derived reference process.

CHAPTER 7: DISCUSSION & LIMITATION

In this chapter, the key findings of this thesis are presented and discussed. Moreover, the limitations of this work as well as suggestions for future work are listed.

1 Introduction

1.1 Motivation

Globalization, changing regulations, time-to-market pressure, and progress in technology are challenging organizations as they are affecting their market environment [28]. In order to stay competitive, enterprises must adapt themselves to the changing circumstances [27]. This influences the role and structure of IT in the organization, which results in difficulties to align business and IT [27]. One way to address the changes in the environment and to improve the alignment of business and IT is the focus of an organization on its capabilities [28, 29]. By providing an abstracted, holistic view of an enterprise's abilities, business capabilities support the communication between business and IT stakeholders [46]. A capability-based view creates a shared language among business and IT stakeholders and therefore enhances strategic IT alignment [3]. Focusing on its capabilities allows an organization to adapt itself to changes and to keep its competitive advantage [27]. Business capabilities at the same time support strategic planning and decision making, e.g. for outsourcing decisions [26]. As problems can be seen from a holistic view, they can be addressed appropriately [46]. Hence, capability management and design received increasing attention. [28]. Another way of improving efficiency and keeping competitive advantage is inter-organizational collaboration. Due to the benefits of inter-organizational collaboration like reducing costs, spreading risks, or knowledge transfer [37], companies are working together for decades [13]. Especially in a globalized world, where companies are becoming more and more connected, inter-organizational collaboration is an important trend for organizations [14]. According to Moore, modern enterprises are not only collaborating with suppliers and customers but also competitors who are working in the same industry [34]. Weber et al. point out that regardless of the shift to inter-organizational cooperation, enterprises are still having difficulties to implement common strategies [47]. A new approach addressing these problems is a collaboration in Enterprise Architecture (EA) and Enterprise Architecture Management (EAM) [30]. When collaborating in EAM, it appears natural for companies to also collaboratively design and model their capabil-

ities as they provide an abstracted view of the enterprises. Furthermore, companies can take advantage of both the benefits gained through collaboration and business capability modeling. According to Koç et al., research regarding capability development and management received great attention recently [28]. Despite that interest, research on the inter-organizational modeling process of business capabilities is still missing.

1.2 Research Questions

According to Barroero et al., a business capability model "includes the description of capabilities and connections, how services are provided, their performance metrics, the people responsible for the service, and the systems that provide support for them" [5]. The goal of this thesis is on the one hand to provide an overview of the methods and procedures for identifying and modeling business capabilities in single organizations. On the other hand, this thesis aims to identify methods and processes for inter-organizational business capability modeling, and finally compare the two findings to reveal differences and similarities. With this background, the following research questions (RQ) were identified:

- **RQ1: How is the process of Business Capability (BC) modeling in a single organization structured?**
  The objective of the first research question is to identify and analyze current approaches for the identification and modeling of business capabilities in a single company. Additionally, the components involved and characteristics of the approaches will be presented.

- **RQ2: How do companies from the same industry proceed in modeling common BCs?**
  The goal of the second research question is to derive a reference process for inter-organizational BC modeling. Prior to that, related work and the findings of multiple case study analysis will be presented.

- **RQ3: How does the process of modeling inter-organizational BC's differ from the process in a single organization?**
  The third research question's goal is the identification of differences and similarities of the results in single- and inter-organizational BC modeling gained from RQ1 and RQ2.

1.3 Research Approach

Figure 1.1 shows the research approach for this thesis. To answer the first research question, a literature review according to Webster and Watson [48] was carried out. By conducting a literature review, relevant literature addressing the identification and modeling of business capabilities in a single firm. Additionally, this works as a reference point for the case study analysis. Regarding the second research question, a literature review was conducted to find relevant literature on inter-organizational business capability modeling and business capabilities in a collaborative context. The relevant work is the foundation for the analysis of documents and protocols of multiple case studies following the guidelines for a multiple case study of Runeson and Höst [38] and Yin [53]. After that, the findings of RQ1 and RQ2 are compared to find differences as well as similarities of the processes, answering RQ3.

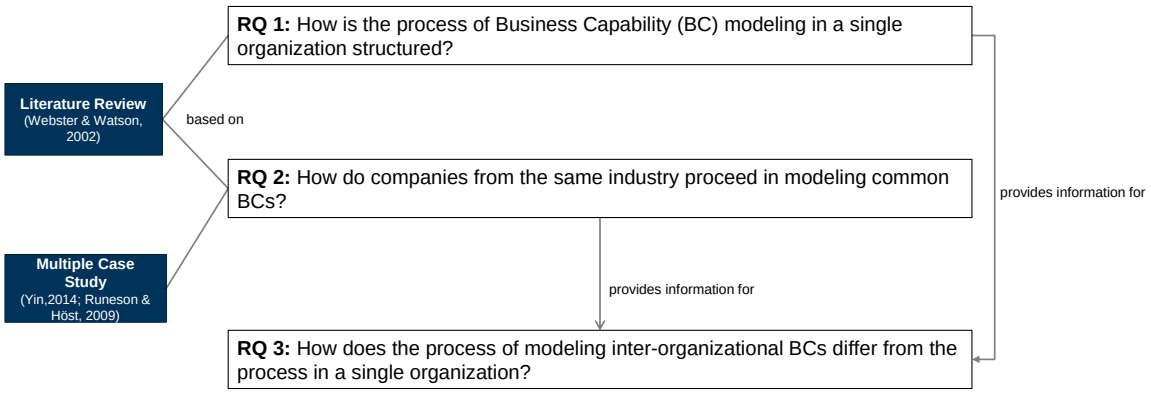


Figure 1.1: Research approach

2 Foundations

In this chapter, relevant terms and concepts will be defined to lay the foundation and provide an overview of the underlying concepts. Additionally, it will establish a common understanding and consistent terminology for the following chapters of this thesis. Starting with the concept of 'Enterprise Architecture' in Section 2.1, this chapter then focuses on the term 'Business Capability' in Section 2.2 before moving to Section 2.3, explaining the concept of a 'Business Capability Map'.

2.1 Enterprise Architecture

The IEEE standard 1471-2000 defines architecture as "The fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution" [23]. The Open Group, an association developing standards and guidelines, refers to that definition of architecture by IEEE [18]. In addition to that, they developed their definition of architecture: "The structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time." [18]. Following these definitions, enterprise architecture (EA) therefore is the composition and arrangement of an enterprise's components, their inter-connections and relations, as well as the principles and guidelines for their design and evolution. Simon et al. describe EA as "a structured description of the enterprise and its relationships, which may make it the fundamental 'management information system' for the enterprise" [41]. Aier et al. condensed the definition of enterprise architecture as the fundamental structure of an organization [1]. Enterprise architecture provides a holistic view of the "enterprise's organizational structure, business processes, information systems, and infrastructure" [25]. EA as a blueprint of an enterprise's business and IT structure supports the business/IT alignment, reduces costs, and increases the adaptability to changes [25, 31, 43]. Jonkers et al. point out that EA "captures the essentials of the business, IT and its evolution", and that these "essentials are much more stable than the specific solutions that are found for the problems currently at hand" [25]. Therefore, EA

also supports improving business strategy execution and allocating IT investments [25]. Consequently, EA depicts both the current, 'as-is' architecture, as well as the future, 'to-be' architecture of an enterprise [50]. As EA involves various components resulting in numerous artifacts, most EA frameworks consist of several architectural layers [50]. According to Winter et al., most frameworks differentiate between "Business Architecture", "Process Architecture", "Integration Architecture", "Software Architecture", and "Technology/Infrastructure Architecture" layers [50]. Buckl et al. developed an enterprise architecture model consisting of the three layers "Business & Organization", "Application & Information", and "Infrastructure & Data", going from business-related aspects to IT-related aspects [10]. The model, which can be seen in Figure 2.1, includes cross-cutting aspects to link the concepts which are not directly related to the layers with elements in a layer [17], but at the same time support the evolution of the architecture [11]. Goals for example "describe the desired result of the evolution, whereas projects are the implementors of architectural change" [11]. Information and elements are passed between the layers by using enterprise architecture concepts like business services [17]. Business capabilities, located in the business layer as illustrated in Figure 2.1, are essential components of enterprise architecture management. Enterprise architecture management (EAM) describes methods, models, and tools for the management and development of the organization, using the holistic view of its components [40]. Business capabilities are an abstraction instrument enabling and supporting business/IT alignment [27].

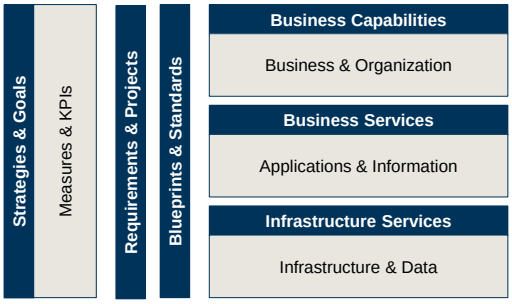


Figure 2.1: Enterprise architecture model proposed by Buckl et al. [11]

2.2 Business Capability

With the research on business capabilities increasing lately, several definitions have been proposed [27]. Even though there is a common understanding of a capability's characteristics, its definition varies [15]. Some of the definitions even contradict each other, e.g. in the role of resources as part of the definition [36], or tend to be more vague and lack details to circumvent any confusion [32]. In this section, the characteristics of a business capability will be presented. In addition to that, a definition will be established to work as a foundation for the rest of this thesis. The Open Group describes a capability in general as "an ability to do something", and a business capability as "the ability for a business to do something" [45]. To be more precise, a business capability is stated as "a particular ability or capacity that a business may possess or exchange to achieve a specific purpose or outcome" [45]. Offerman et al. conducted a systematic literature review on business capabilities, resulting in the following definition for business capabilities: "A particular ability that a business may possess or exchange to achieve a specific corporate goal" [36]. Their taxonomy is based on two major definitions for business capabilities, which were the result of their systematic literature review. The first one describes a business capability as "a particular ability or capacity that a business may possess or exchange to achieve a specific purpose or outcome" [36], and is based on an article from Ulrich Homann [21]. The second definition describes a business capability as "a corporate business goal the aim of business capabilities is to activate, use and maintain resources for specific business activities", which is a definition proposed by Wißotzki [52]. Similarly, Bērziša et al. describe a business capability as "the ability and capacity that enable an enterprise to achieve a business goal in a certain context", where capacity stands for the available resources [7]. Stirna et al. use the definition "the ability to continuously deliver a certain business value in dynamically changing circumstances" as the basis for their research on capability-driven development [42]. Zdravkovic et al. describe a business capability as "the resources and expertise that an enterprise needs to offer its functions" [57]. With The Open Group Architecture Framework (TOGAF) being one of the most used enterprise architecture frameworks [33], and is also providing a modeling approach for business capabilities, this work will refer to TOGAF's definition for business capabilities. The name of a business capability should be a noun, expressing the difference to a business process or function, which are written as verbs [45, 46]. TOGAF outlines the use of compound nouns like "Project Management" in practice [45]. Furthermore, capabilities should have a comprehensive description [17]. The naming and the description should use the internal vocabulary of

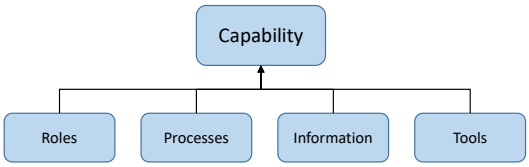


Figure 2.2: A capability's main components according to Zdravkovic [56]

the organization to enable common understanding [8]. Another important characteristic of business capabilities is their abstraction of underlying people, resources, and processes [8, 26]. As business capabilities are only describing 'what' an organization does and not 'how', 'why', or 'where' [46], those are only components enabling the capability. A process is used to deliver a capability, while information, as well as resources like tools and assets, are needed by the capability [56]. People and roles address the "individual actors, stakeholders, business units, or partners" [56]. Figure 2.2 illustrates the aggregation of EA components [56]. Fleischer et al. use the term "Value Added Module" for the union of business capabilities, processes, the used technologies, and resources, as these are not visible in a business capability at first [16]. This abstraction of its components allows capabilities to be stable regarding changes e.g. in technology [8, 45]. Components enabling a business capability might change, still the capability itself is supposed to be unaffected by the changes [45]. The before mentioned contradiction on resources as component occurs in the article by Homann, who defines capabilities as regardless of the resources [21, 36]. Nevertheless, this work will include resources as one component enabling the business capabilities. Another characteristic of business capabilities is that they are mutually exclusive and collectively exhaustive, which means they span the whole enterprise without an overlapping of the individual capabilities [8]. Additionally, business capabilities can be decomposed into lower-level capabilities which are more specific and detailed, and vice verse be aggregated into more general, high-level capabilities [8, 45]. An exemplary BC can be seen in Figure 2.3. Capabilities as in TOGAF are also supporting the cooperation between organizations [56]. By illustrating the individual abilities by "distinct functionalities or through a capability map", they allow "easier integration with other companies and partners" [56]. This confirms the appropriateness of business capabilities for inter-organizational collaboration.

Figure 2.3: Exemplary business capability with two levels

2.3 Business Capability Map

To facilitate business analysis, an organization can arrange its business capabilities to a business capability map (BCM). A BCM is visualizing the organization's individual capabilities and their relationships [26, 45]. A BCM works as "blueprint" of the organization's capabilities, illustrating its abilities for business and IT stakeholders [45]. The capabilities can be grouped in categories like core, strategic, and support capabilities, as proposed by TOGAF [45]. Through grouping, stakeholders can focus on the categories of capabilities relevant for them, which improves their possibilities for planning and analysis [45]. Just like business capabilities, a BCM can consist of general, top-level capabilities, and lower-level capabilities, which become more specific to certain domains and hence allow different stakeholders to extract the appropriate degree of information [8]. Business leaders for example can use the top-level BCM as basis for their strategic decisions [8]. Ulrich & Rosen outline that deconstructing a business capability "provides a better sense as to how capabilities fit in the overall view of the business" [46]. Depending on the underlying project, a BCM can be modeled starting with general, high-level capabilities first, which are then decomposed into lower-level capabilities ('top-down' approach), or with specific, lower-level capabilities first, aggregating them to high-level capabilities, ('bottom-up' approach) [45]. The business capability map also models the vertical and horizontal relationships between the capabilities [26]. As business capabilities capture the whole enterprise, there exists only one BCM for an organization [46]. If an enterprise decides to outsource a capability, the structure of the BCM does not change as the capability is still part of the business, and is only operated externally [6]. The BCM even allows to make outsourcing decisions and visualizes the role of external partners [6]. It additionally improves strategic decision making and allows business analysis to be more specific if used as basis for further enrich-

ment, or mapping it to additional business components like value streams, applications, business units, or informational assets [8, 45, 56]. A heat map can be created to visualize problematic capabilities concerning their fulfillment of the underlying area of examination using color-coding [8, 45].

3 Literature Review on Business Capability Modeling in a single Organization

This chapter describes the literature review that was conducted to find relevant literature on the modeling, identification, or development of business capabilities in a single company. The literature review was conducted after the guidelines by Webster & Watson [48]. The following academic literature platforms were searched to cover important articles, journals, books, reports, and proceedings: IEEE Xplore, AISeL, ACM DL, Scopus, ScienceDirect, and EBSCOhost. A search query was defined with the purpose of covering all combinations of the examined topic. This search query consisted of the following keywords, concatenated with an *AND* operator:

- "business capabilit*" *OR* "capability-based" *OR* "capability-driven"
- "definition" *OR* "creation" *OR* "planning" *OR* "modeling" *OR* "development" *OR* "design*"

The asterisk operator works as wild-card for omitted characters, so that for example 'business capabilit*' covers both 'business capability' as well as 'business capabilities'. If the initial search resulted in over one thousand results, the search was limited to 'abstract', 'keywords' and 'title' due to the dimensions of the results. This was the case on the platforms ACM DL, Scopus, ScienceDirect and EBSCOhost. The scope and results of our literature review can be found in table 3.1. Relevant literature that was referenced by the findings, as well as literature referencing them, were included as well, which corresponds to the concept of a forward and backward search recommended by Webster & Watson [48]. In total, 26 papers were found to be relevant for the process of modeling business capabilities in a single company, which provided an in-depth understanding of the topic. In the following section, significant literature that describes business capability modeling approaches or frameworks is presented and explained. Due to overlapping and the otherwise tremendous scope of this chapter, not all relevant literature will be presented.

Database	Limitation	Results	Relevant Literature
IEEE Xplore	-	313	5
AISeL	-	793	1
ACM DL	Title, Abstract, Keywords	18	1
Scopus	Title, Abstract, Keywords	1961	5
ScienceDirect	Title, Abstract, Keywords	153	0
EBSCOhost	-	535	2

Table 3.1: Scope and results of the literature review

3.1 Business Capability Modeling

Brits et al. propose a conceptual framework for the identification and modeling of business capabilities. First, relevant information of the organization needs to be collected. That includes "Business Entities", "Business Rules", "Business Processes", and "Strategic Artifacts" like current and future visions and goals [9]. The information can be collected through sample documents, questionnaires, interviews, reading, and observation. Business entities encapsulate for example customers or suppliers of the organization. Business rule analysis reveals business rules, business rules statements, and business policies. Business process analysis makes use of the organizational value chain, improving the understanding of value-creating activities. At the same time, dependencies between capabilities can be identified through analysis of the value chain. The strategic analysis represents "probably the most significant part of management's decision-making process" [9]. It shapes the direction of the enterprise by focusing "all of the decisions of the organization towards a shared vision, a couple of mission statements, goals and objectives" [9]. Furthermore, a business capability is defined with a strategic component, which makes it on the one hand cross-functional due to the applicability in different functional areas, on the other hand "goal- and future oriented", facilitating competitive advantage [9]. With extensive knowledge and information about the organization, the respective objects which will be used for constructing the capabilities can be identified, namely "Organizational Entities", "Strategic Objects", "Business Rule Objects", and "Business Process Objects" [9]. All this information is now applied to the conceptual framework to model the capabilities. The framework, which can be seen in Figure 3.1, is a matrix consisting of perspectives as rows and abstractions as columns, where abstractions can occur multiple times in different perspectives. Abstractions consist of "Elements of Guidance", "Business Processes", "Resources", "Technology", "People", and "Objects", whereas "External-" and "Internal Environmental

Knowledge", "Ends", and "Means" are perspectives, providing a detailed description of a capability with its components [9]. Overall, the conceptual framework provides a "very detailed and not very intuitive description of each business capability embodied by its components" [8]. The constructed capabilities are then fed to a "Capability Construction Feedback Loop", where business capabilities are constantly refined and constructed [9]. The construction feedback loop consists of the 5 components "Constructed Capabilities", "Knowledge Repository", "Innovative Feedback Loop", "Organizational Analysis", and "Object Repository" [9]. The object repository stores all information about objects like business entities. The innovative feedback loop receives and tests objects and returns information and knowledge about the objects, which are stored in the knowledge repository. Organizational analysis constantly monitors the organization's products and supply services, whereas the constructed capabilities component stores all potential business capabilities, which can be applied to specific business situations which allows quick adaption to changes [9].

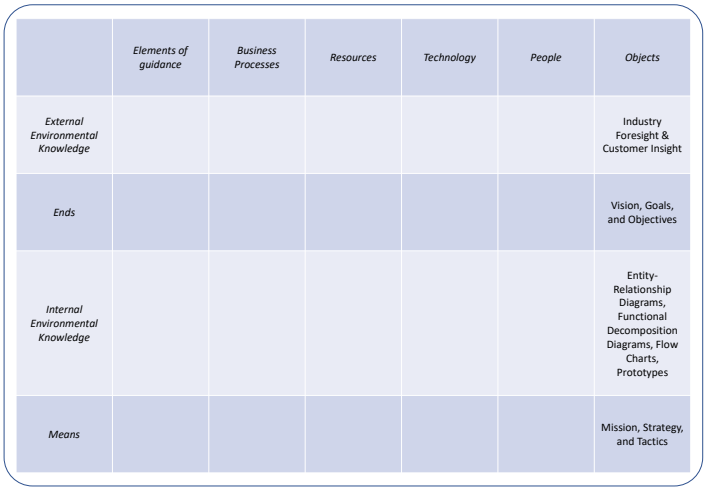


Figure 3.1: Conceptual framework for modeling business capabilities by Brits et al .[9]

Bondel et al. created and implemented a business capability map to improve business/IT alignment in a single enterprise as part of a research group [8]. They refer to the definition of business capabilities as proposed by TOGAF, stating "a business capability is a particular ability that a business may possess or exchange to achieve a specific purpose" [8, 45]. In addition to TOGAF's definition of BCs, the TOGAF guideline for BCM creation provided a basis for their procedure. After defining the expected outcomes ("a BCM repre-

senting the current business architecture, a heat map highlighting business capabilities requiring action, as well as a list of action recommendations to address identified gaps" [8]), essential roles ("the managing director and the vice-managing director of the organization as well as all eight department heads"[8]), and the schedule were defined by conducting several interviews with the head of department IT and head of department strategy. After that, they started the modeling approach with a physical kick-off workshop. As the people involved in the modeling approach were business and IT leaders, this workshop should provide a basic understanding of the concept of a BCM, present the expected outcomes, and coordinate future action [8]. At the same time, the composition of the modeling team suggests the use of a top-down modeling approach, as it is recommended by TOGAF [45]. Hence, a top-down approach was chosen. The managing director, vice-managing director, and head of department strategy developed a draft BCM and description template with the support of one member of the research group, which was used in interviews with each of the stakeholders to identify the current business capabilities. That resulted in a BCM and descriptions of each BC, including "the name of a business capability, the person responsible, the higher level capability it is part of, its description, its desired business outcome, its dependencies to other business capabilities, as well as important decisions with regard to its description" [8]. The last point serves as a wild-card to document noteworthy decisions. Using the TOGAF guideline, the BCs were grouped in the proposed categories core, strategic, and support capabilities [45]. Through conducting several workshops, the results of the interviews were discussed and merged. In case of conflicts while merging the results and change requests, the modeling team held discussions until consensus was reached. As earlier decisions were affected by decisions made later and hence needed revision, their modeling approach was of iterative structure. In the end, a BCM with a granularity of two levels and extensive descriptions of each capability were created [8].

Aldea et al. conducted research on the capability-based planning (CBP) methodology [2]. Their research defines a capability as "the ability of an organization to employ resources to achieve some goal", based on the definition by Iacob et al. [2, 22]. In CBP, strategic business capabilities are planned, constructed, and delivered to the enterprise [2]. According to the authors, CBP covers the three activities mapping of capabilities, assessing capabilities, and planning of capability increments [2]. In the first phase, capabilities are identified and linked. The authors state that the definition of capabilities should use a common language that is understandable by all stakeholders. Furthermore, capabilities can be defined depending on the preferences of the organization, in particular,

"capabilities can be defined down any lines that an organization wishes to improve, such as process, function, organizational" [2]. The linking phase relates BCs to KPIs, whereas in the next phase, capabilities are assessed using metrics. Capabilities are further analyzed to identify gaps in the performance. Eventually, the capabilities are modeled in a business capability map. Summarizing this research, Aldea et al. propose different starting points for capability identification, depending on the organization's preferences. Examples are processes or functions. Using a common vocabulary consisting of general and high-level terms is proposed. Business capabilities are modeled in a BCM which provides a basis for further business analysis by creating a heat map. Still, the identification and modeling of the business capabilities are explained rather vaguely.

Beimborn et al. introduce a capability-based modeling approach of an enterprise [6]. In their research, a capability, based on a definition by Wade and Hulland, is a subset of resources [6]. Furthermore, capabilities are "capacities or abilities within a firm, which can be linked together as business processes, in order to enable a specific purpose or outcome. They consist of one or more workflows and routines that manage the interaction among a firm's resources" [6]. Regarding the components, a capability "abstracts and encapsulates involved people, workflow, technology, information, and service level expectations" [6]. Here, resources except technology and information are not included in the components of a capability. In their concept of capability modeling, a business capability map is created starting with modeling five generic capabilities which occur in almost every organization: "developing products and services", "client interaction", "fulfilling customer demands", "managing and controlling the enterprise", and "collaborative activities" [6]. In the next step, the top-level capabilities are decomposed into industry-specific, lower-level capability groups, which is repeated until the desired granularity is reached. The granularity depends on factors like company size or demand for analysis. IDs are allocated to allow clear identification of the capabilities and their hierarchy, e.g. 2.1.1 is a lower-level capability of 2.1. Furthermore, inter-connections of the capabilities like incoming or outgoing links, which are not limited to the hierarchical layers, are modeled as uni-directional edges called "process flow connectors" [6]. The basis for capability identification are the company's processes. Using process models or documentation, process steps can be transformed into capabilities, with connectors visualizing the "process-internal sequences" and workflows [6]. Connectors can be further specified as support or control connectors, depending on the incoming and outgoing links. In the course of a case study, additional information about the capability and its relations was captured, including "description,

connections to other capabilities and related inputs and outputs, superior capability, sub-capabilities", as well as hierarchical information and "information about the implementation, e.g. is the capability operated manually or automatically, inhouse or outhouse" [6]. Moreover, KPIs are captured in terms of "strategic and operational measures".

Wißotzki presents an approach for capability identification and management which results in a capability catalog [51]. A capability is defined as "the ability of an enterprise to join resources and information in order to support a strategic goal. This combination is applied in consideration of the specific context and executed in a defined and repeatable activity or process for which certain roles resp. actors take responsibility in order to produce a desired outcome" [51]. Wißotzki considers the required information, roles, processes, and resources in the capability definition. The approach consists of the three so-called "building blocks" preparation phase, capability identification and refinement phase, and a maintenance phase, and is not limited to business capabilities but also addresses EAM capabilities and IT capabilities [51]. The preparation phase comprises four steps, namely "Scope & Application Area", "Terms & Concept Identification", "Capability Context Definition", and "Capability Strategy Definition" [51]. These steps start with the identification of stakeholders, the application area, and goals. Moreover, the concept of capabilities and important terms are presented to the stakeholders to set a common understanding, which is accompanied by a detailed documentation handed out to the involved parties. Already existing capability approaches should be included in this step. The context of the capability is identified and analyzed in the next step to define context objects and discover the actual type of the capability, depending on "descriptive elements such as roles, information, or resources" [51]. Therefore, roles, information, and resources are analyzed as well. Capability strategy definition distinguishes between the development of a new capability catalog and extending an existing one, resulting in different organizational units and stakeholders to be involved. Wißotzki points out that informing the relevant stakeholders about the undertaking is crucial to get the required support and resources [51]. The capability identification and refinement phase is composed of the three steps "Capability Candidate Identification", "Structuring & Combining", and "Relationship Identification" [51]. Capability candidate identification is based on a capability identification matrix, consisting of context objects in both the X-axis and Y-axis. For example, the business object 'market' on the X-axis intersects with the management process 'analysis' on the Y-axis, resulting in the capability 'market analysis' [51]. After analyzing the initial capability suggestions, the next step removes duplicated capabilities, aggregates or decomposes capabilities depending on

their coherence, and categorizes them. The involved stakeholders should reach consensus in the performed actions. Questions and comments should be documented and used in the refinement phase to revise the capabilities by conducting additional iterations. Next, the relations between the capabilities should be identified and documented, which might necessitate adjustments to the capabilities. The third phase consists of the steps "Catalog Content Layer Definition", "Capability Content Engineering", and "Develop & Test Views" [51]. The first step defines the content and the associated depth to create a final structure and order the capability catalog. This is followed by the creation of a comprehensive description of the capabilities as part of the capability content engineering. Wißotzki points out that throughout these steps, the capability catalog can be adjusted and refined [51]. Similarly, the descriptive elements are refined. The last step links capabilities to logical elements like goals, or views like cost models which can be presented to different stakeholders. The last phase consists of the four steps "Evaluation Concept", "Catalog Evaluation & Analysis", "Catalog Deployment & Communication", and "Catalog Maintenance". The first two steps deal with the analysis and evaluation of the capability catalog using quality criteria like maturity models and can cause another iteration of the second phase. Catalog deployment as the third step covers the implementation in the enterprise, which depends on both the quality of the catalog as well as the fulfillment of the stakeholders' requirements. By conducting intermediate or final presentations, the stakeholders' satisfaction can be affirmed. The maintenance of the catalog as the last step is an iterative process, which can start at the second phase and add new descriptive elements, change evaluation criteria, or reorder configurations. The complete process is shown in Figure 3.2.

Ulrich & Rosen describe the creation process of a business capability map while examining its role in business/IT alignment [46]. A business capability is defined as "a particular ability or capacity that a business may possess or exchange to achieve a specific purpose or outcome" [46], based on an earlier definition by Ulrich Homann [20]. The creation process of a business capability map consists of 10 steps. First, obtaining a template from the industry or consulting agencies can work as a starting point for the own business capability map. In the second step, the organization should develop a draft BCM with organization-specific, level 1 capabilities. The draft can be based on the template or, if no template is used, consist of "commonly found capability categories" [46]. Examples would be customer management, product management, or industry-specific categories like claims management [46]. Additionally, organization charts, information asset definitions like products or accounts, and high-level views of the business can be used as input.

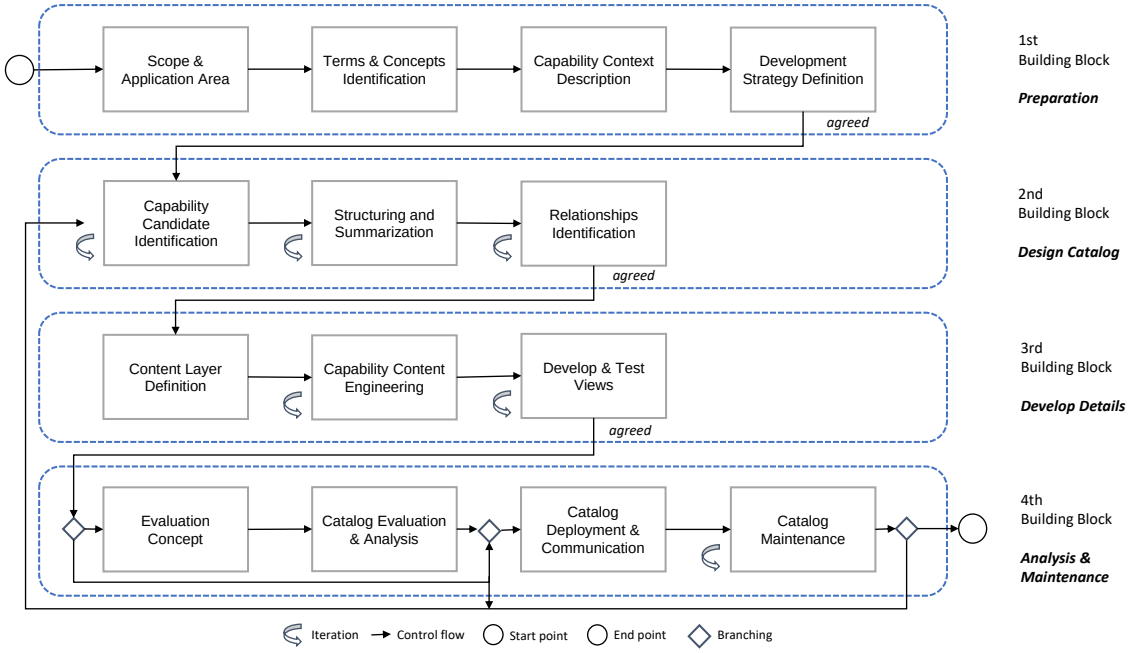


Figure 3.2: The Capability management process according to Wißotzki [51]

The third step finalizes the top-level BCM. To do so, business representatives of all areas should be part of that session and be involved in the establishment of common capability definitions and capability related terms, e.g. the capability definition of 'customer management' should be similar to the definition of 'customer' [46]. The modeling team should also make sure in this step that the top-level BCM covers all capabilities. To collect feedback and questions, the BCM is published within the organization in the fourth step. Next, the BCs are prioritized for their decomposition in step five, with the decomposition then being performed in step six. To do so, again the domain experts of preferably all lines of business should be included to provide extensive knowledge about each domain. Input can be organization information assets, charts, and other high-level business views. Ulrich and Rosen state that the decomposition to level 2 and level 3 capabilities can be accomplished concurrently with the same teams, but requires validation by business professionals regarding the details [46]. Otherwise, step 5 and 6, the prioritization and decomposition of the capabilities, need to be performed as separate steps 7 and 8. To evaluate the BCM, each participant should be able to provide feedback throughout the whole construction process of the BCM. It should be published in the organization and the resulting feedback should

be incorporated by a reassembled team [46]. Eventually, Ulrich and Rosen point out that the BCM should be published even if not finished, that the BCM does not necessarily need to get a granularity higher than one, or that all capabilities are decomposed until actually required [46].

Klinkmüller et al. conducted research on the visualization of business capabilities in the context of business analysis [26]. A business capability is defined as a representation of an enterprise's potential, outlining "what it is able to accomplish" [26]. Figure 3.3 shows the proposed information model for business capabilities without cardinalities. A BC abstracts

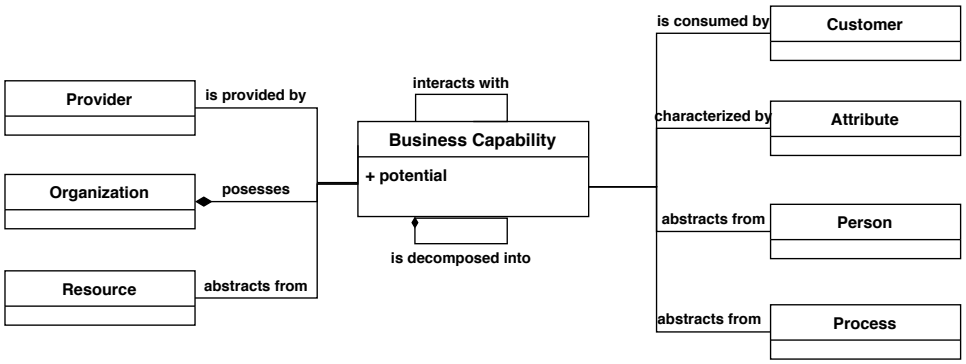


Figure 3.3: The business capability information model based on the proposition of Klinkmüller et al. [26]

from people, processes, and resources. It is consumed by the customers, and characterized by attributes which can be used to compare business capabilities. Furthermore, they are possessed by the organization and can be provided by several providers. The presented approach for business analysis using business capabilities can be seen in Figure 3.4 and consists of four steps. In the first step, a BCM is created. The relevant information about the business capabilities is collected from past BCMs as well as by conducting "interviews with the organization that is examined" and "interviews with organizations that possess domain knowledge" [26]. Klinkmüller et al. name five common top-level capabilities that can be found in almost every organization: "Develop products or services", "Generate demand for those products or services", "Produce or deliver the products/services", "Plan & manage the business", "Collaborate with constituencies" [26]. These top-level capabilities are then decomposed and after the desired granularity is reached, horizontal relations are added "through careful inspection of the business capabilities", business units, and pro-

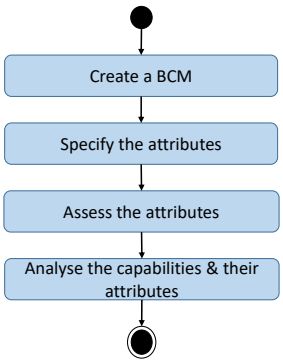


Figure 3.4: Steps for business analysis using business capabilities according to Klinkmüller et al. [26]

cesses [26]. In the second step, attributes of the business capabilities are specified and ordered using an ordinal scale with unique numerical values. It is pointed out that attributes "can be defined individually for each analysis with regard to the aspects of interest" [26]. As an example, the business capabilities which have a gap regarding IT support, attributes would be "business value, IT support and monthly usage" [26]. In the third step, a table with capabilities on the vertical axis and the attributes on the horizontal axis is created. To identify the object at the intersection, the authors propose to analyze gathered data or conduct interviews [26]. In the last step, the capabilities are assessed "with regard to these attributes based on a further inspection of the business units and business processes" [26]. The attributes are aggregated based on weighted additive indices to reduce complexity. The research of Klinkmüller et al. continues with a visualizing method for business capability. This visualizing metaphor sees business capabilities as nodes and includes the vertical and horizontal relations as edges. In order to reduce crossing edges and to guarantee the separation between vertical and horizontal relations, the business capabilities and their relations are projected on a hemisphere. An example can be seen in Figure 3.5. The organization as root is placed on top of the hemisphere. Top-level and sub-level capabilities are then aligned on "a circle on the surface of the hemisphere that is parallel to the equator" [26]. The vertical hierarchy is represented by the distance to the pole, where high-level capabilities are placed closer to the apex and lower-level capabilities closer to the equator. While vertical relations are projected on the surface, horizontal relations are drawn inside of the hemisphere. The research of Klinkmüller et al. continues with the assessment of business capabilities using the spherical representation, and an exemplary

use case of the approach. Due to the scope of this thesis, it will not be further mentioned. Overall, the authors provide a method for identification and modeling of business capabilities in the form of a BCM, as well as a detailed and complex visualization of the business capabilities for business analysis.

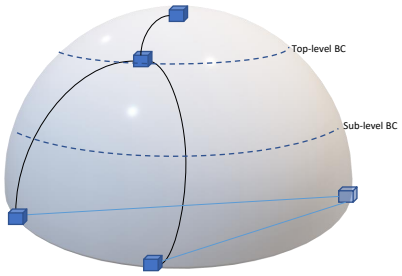


Figure 3.5: Business capabilities visualized by a hemisphere according to Klinkmüller et al. [26]

Koç conducted a systematic mapping study on methods for capability design and development [27]. Koç states that the main purpose of this work was "analyzing the state of the research in fields of capability modeling as a subset of enterprise modeling, in particular where processes, procedures, steps or methods are proposed to develop or design business capabilities" [27]. Several research topics for capability design methods are identified: The "Resource Based View" (RBV) was related to almost half of the analyzed literature, followed by "IT Value" [27]. Other topics are "changing environment", "E-commerce", "IS development & Tools", "IS management", and "Outsourcing" [27]. As a result of this research, Koç states that the capability-driven development (CDD), classified as part of IS development, provides "the most comprehensive methodological support to design enterprise-grade capabilities", as it "exploits enterprise models to develop capabilities by explicitly defining the important concepts and notations to represent them", "assumes different starting points to develop capabilities", and "takes the contextual factors into account" [27]. Therefore, literature on CDD will be mentioned in Section 3.2.

3.2 Capability Driven Development

The capability-driven development (CDD) methodology gained much attention in literature [8], and even though capabilities are "investigated on a level of application function-

ality" [8] and are viewed slightly different in CDD than in EAM [28], literature regarding CDD introduces starting points and approaches for business capability modeling [27]. As mentioned before, organizational components that can be analyzed for identifying and modeling capabilities are listed [27]. The 'Capability as a Service' project is the basis for CDD [39]. The CDD methodology involves enterprise models, goals, processes, the underlying resources, as well as concepts [28]. The capability design is an iterative process where the involvement of stakeholders is desired [19]. CDD also focuses on the application context in delivering the capabilities to allow a fast reaction to changes [42, 57]. Furthermore, analyzing the context improves the alignment of business and IT, as "business-centric concerns can be represented in goal models whereas their actual implementation can be addressed in context models" [27]. The analysis of the capability's application context is performed in the last method component of CDD and is responsible for capability delivery, whereas the previous capability design perspective proposes detailed approaches for capability modeling. Hence, literature on capability design based on the CDD methodology will be briefly covered in this section.

Koç & Sandkuhl propose a method for capability modeling based on business processes [29]. The capability-driven development approach is the underlying methodology and can use goals, business processes, concepts, or patterns as input for capability modeling. The business-process based method, which is the subject of Koç & Sandkuhl's research, starts with selecting the service and defining the scope of capability design. Similarly, the abstraction level of the process identification is specified. In the next method component, business process models are analyzed to ensure they are up-to-date. The capabilities should be addressing the business goals, which necessitates KPIs to monitor the goals' fulfillment. Goal models and KPIs are analyzed and also updated in this second step. Furthermore, goals, business processes, KPIs, and capabilities are put into relation. The application context is analyzed in the third method component using the three activities "find variations, capture context element, and design context" [29].

Zdravkovic et al. conducted research on modeling business capabilities and delivery using cloud services [57]. It is based on a meta-model for capability-driven development proposed by Stirna et al. [42]. The design, which is, next to the delivery, one of the two perspectives in capability-driven development [57], starts with modeling the enterprise. To do so, the goals with their underlying processes and required resources are analyzed. This is accompanied by the usage of KPIs to measure their achievement. Existing enterprise or architecture models should be used. The further focus of this research is placed

on the modeling of the application context and the capability delivery and is therefore not further covered.

The capability design in CDD is examined by Henkel et al. [19]. In line with Koç & Sandkuhl, Henkel et al. state that the CDD methodology proposes three strategies as a starting point for capability design: "goal first, process first, and concept first" [19, 29]. Each strategy consists of the four general phases 'Scoping', 'Identification', 'Interlinking', and 'Contextualize & adapt'. Starting with business goals, the business visions and goals are analyzed in the scoping phase to identify goals and the required capabilities supporting them. By specifying KPIs and connecting them to the goals, the goals can be monitored. The identification phase reveals capabilities supporting or enabling the goals by defining the capabilities based on the analysis of the goals. This includes the relations between capabilities and goals. The interlinking phase puts capabilities and the underlying processes into relation. In the last phase, the context affecting the goals is identified. The process-first strategy starts with identifying the scope of business process selection. For example, processes with high costs can be selected. Capabilities are then defined based on the processes. Other way round than the goal-first strategy, the interlinking phase in the process-first strategy now analyzes goal models and KPIs and puts them in relation with the capabilities. If no goal models are already existing, the designer should develop them. The contextualize and adapt phase analyzed the business processes to identify the delivery context of the capabilities. The concept-first strategy uses conceptual models to gain information about actors, products, or events. In the scoping phase, existing conceptual models of the enterprise are collected and analyzed. If not available, then they can be created "based on existing databases, or even based on the user interfaces of existing IT systems", and selected based on the "current desire for change" [19]. In the identification phase, the concepts are analyzed to identify the organization's capabilities, and used in the interlinking phase to relate goals and processes to the capabilities. Business processes can either be found in existing documentation or extracted from the events. Another way to identify the processes which will be related to the capabilities is the analysis of used resources in the events. Finally, the context is identified using conceptual models.

España et al. conducted research on modeling strategies for business capabilities based on the capability-driven design and development [15]. Business capabilities are defined as "the ability and capacity that enable an enterprise to achieve a business goal in a certain context", which is based on a definition from Bērziša et al. [7]. The three CDD-specific strategies for capability modeling are presented, which are all composed of three steps:

'Capability Design', 'Capability Evaluation', and 'Capability Delivery'. Capability evaluation and delivery don't differ in the strategies, whereas capability design is different in each strategy. The starting point for capability design can either be business goals, business processes, or business concepts, where each approach requires the involvement of different stakeholders. In case the of business goals and visions as the starting point, the existing business goals and visions should be analyzed, and recommendable be monitored by KPIs regarding their fulfillment. The goals can be arranged in a "goal hierarchy" with "strategic goals on the top and more operational goals below" [15]. Using the goals, capabilities supporting each goal are identified and defined including their relationship to the goals. The identified capabilities should be mapped to the whole goal hierarchy to identify possibilities for leveling, e.g. "if a capability is deemed to support several sub-goals in the same goal hierarchy, then it might be more appropriate to associate it with their top-goal"[15]. Similarly, the capabilities are mapped to the existing business processes in the next step. Finally, the application context affecting the capabilities should be identified, next to process variants and modeling of delivery adjustments. The process-first strategy starts with defining the scope and granularity in advance of the following business process identification, which can be supported by using and refining business process models. Further, the business capabilities are identified and named using processes, activities, and tasks. Again, goals and KPIs should be used to align the capabilities with the organization's goals and measure their fulfillment. If the goals are not available, the capability designer should develop the capability-related goals. Eventually, the designer identifies and models the application context and delivery adjustments. The concept-first capability design focuses on existing concepts of the organization and starts with analyzing the existing knowledge like "product structures, organizational structures, customer profiles, material, as well as information used and produced by the business processes" [15]. These concepts are used to identify capabilities which realize them. Additionally, the "dependencies between the identified capabilities and existing business processes and business goals" should be analyzed [15], before again examining the context and delivery adjustments.

Overall, the results of the literature review provided profound knowledge about the modeling strategies of business capabilities in a single organization.

4 Related Work

This chapter will present related work on the topic of business capability modeling in an inter-organizational context.

4.1 Related Work on inter-organizational Business Capability Modeling

To find relevant literature on inter-organizational business capability modeling initiatives, methods, and strategies, a literature review was conducted. It was limited to title, abstract, and keywords, and covered the following academic literature platforms: IEEE Xplore, AISeL, ACM DL, Scopus, ScienceDirect, and EBSCOhost. The search string was composed of the following keywords, each combined using an *AND* operator:

- ((("cross" *OR* "inter") AND ("company" *OR* "enterprise" *OR* "organization")) *OR*"collaborative")
- ("business capabilit*" *OR* "capability-based" *OR* "capability-driven")
- ("definition" *OR* "creation" *OR* "planning" *OR* "modeling" *OR* "development" *OR* "design*")

Additionally, a forward and backward search as recommended by Webster and Watson [48] helped to identify further relevant literature. Due to the novelty of the topic, only a handful of literature that mention business capabilities in an inter-organizational context was found. The results are presented in the following.

A capability-based approach for enterprise architecture in business networks is proposed by Bakhtiyari et al. [4]. They introduce the concept of "novation requirements" to capture correspondences between artifacts of the networking organizations. Services, resources, or data repositories are potential artifacts. The artifacts are then mapped to the internal capabilities of the individual partner organizations. This is followed by the creation of a global business capability map, encapsulating the individual organizations'

capabilities. Member organizations use that BCM to align their capabilities with those in the global map, before specifying the novation requirements to the global capabilities. This reveals novation opportunities between the artifacts of network partner organizations and can be used to adapt the EA. In this approach, a global BCM comprising the individual members' capabilities should be constructed, but there is no precise description of the process or description for its creation.

In the research of Weber et al., the business capabilities of different companies across various domains are used to generate added value in the context of the internet of things [47]. In their research, a capability is defined as "a particular ability that a business may possess or exchange to achieve a specific corporate goal", which is a definition proposed by Offerman et al. [36, 47]. Developing new business capabilities through inter-organizational collaboration is important for companies to be successful [47]. Therefore, Weber et al. conducted a case study with partners from different domains to create new value-adding scenarios in the context of the industrial internet of things, based on business capabilities [47]. The case study consisted of the following steps: "Partner selection", "Business Capability identification", "Value Scenario generation/selection", "Value scenario concretization", "Definition proof of concept", "Roll definition", "Business Model definition" [47]. After selecting the partners, which is not further explained in this thesis, their business capabilities were identified. The authors name three methods to identify business capabilities: The "portfolio method", "cluster analysis", or "self-assessment". The latter one is chosen by the authors and used to identify "three to six company-specific business capabilities" [47]. How the capabilities are identified is not further described in this step. The next step compares the target BCs to the actual BCs, revealing additional BCs to be developed through the collaboration. These BCs are then used to generate scenarios for value-creation in the collaboration by combining the capabilities of individual actors. The further course of their research focuses on generating new value-creating scenarios and will therefore not be further presented. Still noteworthy, Weber et al. state that "the companies had difficulties in identifying their Business Capabilities merely following a brief introduction" [47], and as a consequence propose a three-step approach to identify the business capabilities: "Identification of company-specific core processes", "Identification of company-specific Business Capabilities based on the core processes", and "Combination of the Business Capabilities and generation of new value scenarios" [47]. As a result, their research confirms that business capabilities play an increasingly important role in collaboration projects with various use cases, that companies have problems identifying their capabilities, and proposes that

business processes can be a starting point for capability identification. Despite these findings, the research of Weber et al. does not focus on the inter-organizational identification and modeling of business capabilities but on the combination of each company's individual capabilities to construct new business capabilities. Furthermore, this thesis focuses on horizontal collaboration initiatives, whereas the companies involved in their research operate in different industries.

Lachenmaier et al. put the focus on interoperability in the design of enterprise architecture in inter-organizational collaborations [30]. By conducting a literature review and case studies, they develop proposals and priorities to support interoperability between different enterprises in the development of EA. Using capability-based planning, business capabilities are analyzed to find relevant architectural components that are necessary for the provision of a common service. Similarly, the required roles and responsibilities are identified. Exemplary business capabilities that support interoperability are data acquisition, data exchange, and data analysis [30]. Despite using capabilities in an inter-organizational collaboration, a way of how they are identified or modeled is not further examined.

Tepandi et al. develop an inter-organizational reference architecture for the European Once-Only Principle Projekt (TOOP) [44]. TOOP has the aim of simplifying public administration processes for enterprises and citizens in Europe by having the user supply information only once, with the information then being reused and shared among competent authorities. Their reference architecture is based on the TOGAF enterprise modeling framework and the once-only principle and is structured in the three layers of business, information systems, and technology layer. The business layer focuses on two major business concerns: business interactions and a capability map. While the business interactions show the actual collaboration between the actors, the capability map illustrates the responsibilities of each actor. It points out which business capabilities are necessary for each actor and helps to classify their role. Tepandi et al. describe the usage of the capability map and its role in the project, but do not further examine the identification of the capabilities or the creation of the BCM.

Jiang & Zhao examined the forming process of inter-organizational e-business capabilities based on e-commerce processes in the supply chain [24]. Their research falls into the resource-based view, which is one of the two dominant literature streams regarding business capabilities [24, 36]. Offerman et al. state that e-business capabilities have no dominant definition, yet the definitions are closely related to the definition of business capabilities with the focus lying on the internet [36]. Zhu describes e-commerce capabilities

as "a firm's ability to deploy and leverage e-commerce resources", which includes abilities like "provide information, facilitate transactions, offer customized services and integrate the back end fulfillment" [58]. Jiang & Zhao consider e-business capabilities more as IT capabilities [24]. In addition to the differences regarding business and e-business capabilities, with the research focus of Jiang & Zhao being limited on the creation and improvement of capabilities in a single firm which is only integrating the resources of collaboration partners, and the focus lying on the supply chain environment and the e-business domain, their research area and objective differs from the one in this work.

Fleischer et al. conducted research on using business capabilities for configuration and evaluation of value-added networks, considering internal and external constraints [16]. A value-added network consists of suppliers, partners, and the organization's own sites, where possible nodes of the network can be described by BCs, resources, and technologies. Fleischer et al. define business capabilities as "the ability of an organization, system or process to generate a defined output without having to define the applied technologies and resources", where resources, processes, and technologies are not visible at first [16]. Furthermore, they use the term "Value Added Module (VAM)" to describe the combination of business capabilities and the underlying resources and technologies of the specific node [16]. Similar to business capabilities, VAMs can be aggregated and decomposed on a hierarchical level. The process for configuration and evaluation of value-added networks consists of the phases "Preparation", "Core Business Capabilities", "Support BCs/VAMs", and "Assessment & Decision", comprising 11 steps in total [16]. An overview of this process can be seen in Figure 4.1. First of all, the desired granularity of the breakdown has to be decided. In the preparation phase, the horizon of the system, the target system, and requirements and restrictions are defined. The multi-objective target system, which includes the restrictions, allows the evaluation of the configured alternatives. In the second phase, the core business capabilities are derived from the value-added performance like products and services, and form a so-called "Core Business Capability Chain" (Figure 4.2), depicting the logical order [16]. A BCM spanning the capabilities of a node is developed and compared against the BCMs of potential nodes. This allows the mapping of business capabilities to the potential nodes. Based on decomposing the core capabilities and on the value-added network's configuration, the supporting capabilities are derived and arranged in a support business capability chain, which can be seen in Figure 4.2. The support BCs are depending on the configuration of the network and hence cannot be determined before. Support BCs include additional information like processes, coordination,

and communication, and should be available in the network's nodes. They are added to the BCM and mapped to the individual business capabilities of the nodes. If a chosen node cannot provide the support BC, another iteration is initiated. Distinguishing between core and support BCs allows to "adequately describe all demands that arise within the desired added value" [16]. By combining business capabilities with the technology and resources in each node, the value-added modules of the individual nodes can be formed. To align the desired output with the one from the network, the VAMs of a node are analyzed to find "transformation functions", which are visualized and compared to the total capacity of the nodes [16]. This allows to define different allocations and configurations of the network. In phase 4, the developed configurations are compared by focusing on their weak points, which allows to choose the optimal alternative. In this research, the identification and modeling of business capabilities are described in an inter-organizational context but the focus lays on deriving the BCs from the added value of a single enterprise and its outsourced capabilities. It does not describe the collaborative identification and modeling of the BCs of the entire network.

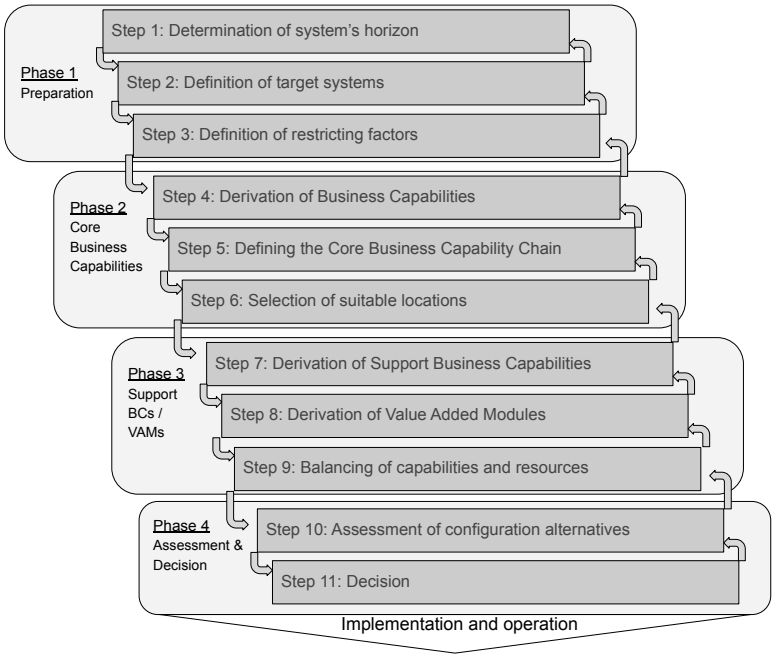


Figure 4.1: Steps of the configuration method according to Fleischer et al. [16]

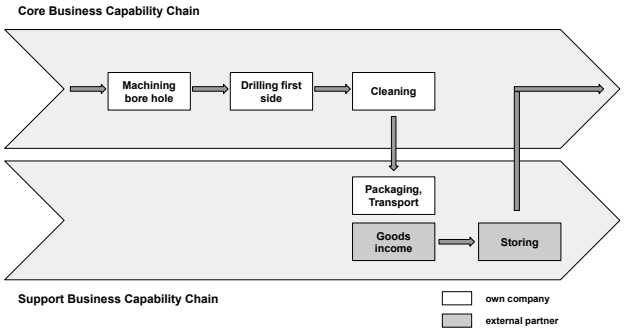


Figure 4.2: Core and support business capability chain according to Fleischer et al. [16]

5 Case Study

As the second research question is based on a multiple case study, this chapter gives an introduction to the design of the case study and presents the four case study partners. According to Runeson & Höst, a case study is an "empirical method aimed at investigating contemporary phenomena in their context", with a literature review often conducted in advance [38]. Furthermore, case studies are exploratory and have a high degree of realism [38]. Additionally, in this thesis, multiple sources of evidence are merged, with theoretical propositions gained through a literature review as a guideline. These are characteristic of case studies according to Yin [55]. Due to these factors and since this thesis investigates the collaborative modeling process of business capabilities as it is currently performed by organizations, conducting a case study is an appropriate research methodology. The case study consisted of the three phases 'Design', 'Collect', and 'Evaluate', which are explained in the sections below and illustrated in Figure 5.1.

5.1 Case Study Design

5.1.1 Design and Plan

The main objective of this thesis is the identification of general steps in the process of modeling business capabilities in inter-organizational collaborations with organizations operating in the same industry. The design phase defined the objectives of the case study, resulting in the research questions which can be seen in Section 1.2. To plan the case study, it was necessary to build profound knowledge in the area of business capability modeling, hence the literature review as described in Chapter 3 and Chapter 4 was conducted following the proposals by Runeson & Höst [38] and Yin [54]. Additionally, the questions on available data sources were answered as protocols and documents, enriched by surveys and semi-structured interviews.

5.1.2 Collect and Analyze

In this phase, the actual data was collected and analyzed using the documents and protocols provided by the case study partners. By using multiple data sources, the side-effects that can occur from interpreting only one data source can be limited [38]. While analyzing the data, a draft reference process for inter-organizational business capability modeling was developed.

5.1.3 Evaluate and Conclude

To both enrich and evaluate the findings, semi-structured interviews with members of case studies 1, 3, and 4 were conducted. Similarly, a survey with members of the modeling team of case study 4 provided additional information and feedback concerning the reference process. The feedback was incorporated, and the revised reference process was again evaluated by conducting interviews.

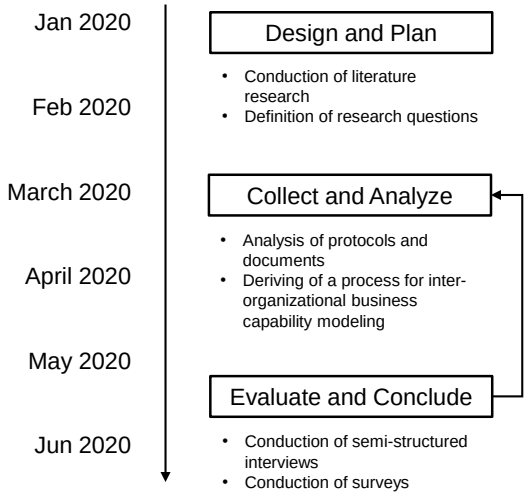


Figure 5.1: Case study design according to Runeson & Höst [38]

5.2 Case Study Partners

As this research used different case studies as a basis for collecting information, the case study partners are presented in this section. All case studies are horizontal collaborations,

meaning the members are operating in the same industry and therefore could also be competitors [35].

In the first case study, the involved organizations are 12 public service media companies from one European country and 1 public service media company from another European country, cooperating in a working group, as defined by Wenger et al. [49]. The collaboration goal was to provide a basis for further collaboration projects by revealing the used technology and similar capabilities, and was not limited to the BCM.

The companies in the second case study are four public service media companies from several European countries with a community of practice as identified collaboration form according to Wenger et al. [49]. Their reasons for cooperating within their industry are to reach harmonization as well as to establish a reference architecture, respectively.

Case study 3 is an inter-organizational collaboration consisting of 10 members active in the lottery and gambling operation. The interviewee is a university research assistant with a focus on enterprise architecture management. The interviewee was responsible for planning, consulting, and implementing the project as well as collecting, merging, and distributing information like capability descriptions. Due to legislative changes, the organizations were no longer independent of each other. The collaboration was initiated to identify possibilities for merging and acquisitions and potential synergies. In addition to the collaborative creation of a BCM, other projects were running in parallel in different areas. The BCM was therefore also designed as an additional tool to create a common understanding.

The fourth case study was carried out with an association of more than 30 organizations operating in the banking and finance industry. The interviewees were enterprise architects and project leaders of involved companies and were members of the business capability map modeling group of said association. The collaboration goal was to provide industry-specific enterprise architecture frameworks, which are not only limited to a business capability map. A summary of involved organizations can be seen in Table 5.1. The results of the case study analysis are presented in Section 6.2

	Case Study Partner 1	**Case Study Partner 2**	**Case Study Partner 3**	**Case Study Partner 4**
Industry	Broadcasting	Broadcasting	Gambling	Banking and Finance
Source of Information	Documents, protocols & semi-structured interview	Documents & protocols	Semi-structured interview	Semi-structured interview
Collaboration Form	Working group	Community of practice	Working group	Community of practice
Collaboration Goal	Basis for further collaboration projects	Reference architecture	Identify synergies & create taxonomy	Reference architecture
Companies involved	13	4	10	>30
Modeling Team Composition	• Enterprise architect • Head of department • Project manager • Portfolio manager	• Enterprise architect	• Enterprise architect (Research assistant) • Business leader • Head of department	• Enterprise architect • Project manager
Meeting Structure	Physical	Virtual & physical	Physical	Virtual

Table 5.1: Case study partners

6 Business Capability Modeling

In this chapter, the approaches resulting from the literature review are summarized and presented in Section 6.1, answering how business capabilities are modeled in a single organization. In Section 6.2, the proceedings of the case studies are introduced and the resulting reference process is presented. Finally, in Section 6.3, both findings are compared.

6.1 Single Organization

This section summarizes the results of the literature review. Throughout the review, the composition of the modeling team or the internal roles of the capability designers in a single organization were not mentioned in detail. Additional people to be included in the modeling process are domain experts and stakeholders, providing domain-specific knowledge. To reduce complexity, the scope of the capability identification can be defined in advance. To identify business capabilities, analyzing the business processes and functions seems to be of large use and was mentioned by the majority of the literature. Similarly, business visions and goals are good starting points for capability identification. Business concepts were mentioned less often but can be used for capability design as well. These three strategies are also proposed by the CDD methodology. The best-fitting strategy is depending on the desired goal of the project and the available information. If an enterprise already has process models, they can be used as input for the capability identification. Business rules and policies were only proposed once as a starting point, hence their relevance seems to be minor. Other major starting points for capability identification are generic top-level capabilities. By using a template set of business capabilities occurring in almost every company, the modeling team and the stakeholders can get familiar with the concept and already have a foundation to start from. The capabilities are then further decomposed until the desired level of granularity is reached for each capability independently. Identified business capabilities should also receive a detailed description which includes an ID, their interrelations to other capabilities, as well as connections to or descriptions of their components like processes, resources, goals, responsibilities, and

if needed, the underlying technology. To identify the relations between capabilities, business processes can provide valuable information. Especially addressing the goals, KPIs for monitoring them can be set up. The usage of enterprise-specific or predefined vocabulary was not mentioned often, indicating that in a single organization, a common taxonomy is already established. Still, some research mentioned the introduction of stakeholders to the vocabulary or usage of well known terms to facilitate the understanding. Creating a business capability map or other visualization methods are helpful to illustrate the relations of the business capabilities. Furthermore, the visualization can be the foundation for further business analysis methods. The identification and definition of business capabilities involves multiple stakeholders and domain experts and therefore is an iterative process, as the capabilities are evaluated and refined through collecting and incorporating feedback. The application context of the capabilities to allow flexibility and adaptability was mostly mentioned in literature on the CDD methodology. It is not necessary for modeling the capabilities but can still provide an additional benefit and point of view and can be performed depending on the company's desire.

6.2 Inter-Organizational

This section presents the results of the case study analysis. It starts with the reasons and expectations for the inter-organizational collaboration before moving on to the composition of the modeling team and structure of the meetings. This is followed by summarizing the processes for identification and modeling of the capabilities. Furthermore, a reference model for inter-organizational business capability modeling is presented.

6.2.1 Reasons and Expectations

To identify possible influencing factors of the modeling processes carried out by the case studies, the individual motivation and expectations of the case studies' members for participating in the collaboration need to be analyzed. This guarantees a holistic view of the projects.

The first case study developed the common BCM as a basis for mapping their application portfolio to the business capabilities. By mapping the BCs and the applications, the organizations can identify and visualize which groups of capabilities use which applications. At the same time, similarities and differences in certain BC areas with regard to the application portfolio, and potential for standards and consolidation should be revealed.

The reason for the second case study to participate in the inter-organizational collaboration of modeling business capabilities was to establish an industry-specific reference business capability map. Additionally, the exchange of knowledge and consolidation were reasons for the initiative.

The third case study's aim was to identify similar and overlapping capabilities, create a common vocabulary, and to reveal the potential for merging & acquisitions and synergies.

In the fourth case study, the involved companies wanted to create a reference model that can be used by enterprises operating in the same industry.

6.2.2 Structure of the Modeling Team & Meetings

The modeling team of the first case study was composed of enterprise architects, heads of department in IT and EA, and project leaders of IT- and EA projects. Each member of the team had to name a stand-in who was kept up to date. Department heads and project leaders represent the organizations appropriately as they provide fundamental knowledge about the own organization, its infrastructure and architecture, and can ensure high quality of the result regarding the own companies' expectations. Choosing IT leaders as members of the modeling team might be influenced by the overall goal of the collaboration, where the BCM should be mapped to the application portfolios, which necessitates in-depth IT knowledge. Nevertheless, the business leaders, executives, and other stakeholders were involved in the process, as feedback and impressions from the business point of view were collected in between the meetings through internal presentations and discussions in the respective organizations. This was confirmed by the second and fourth case study. The relevance of getting a cross-section of stakeholders, especially from the business side, was pointed out by the fourth case study. Meetings in the first case study should take place every quarter with extra meetings arranged when needed, and were physical as all organizations were located in the same country. In each meeting, the feedback which was collected by the team members in between the meetings, as well as the deliverables produced by sub-groups of the modeling team, were presented and discussed. In a physical workshop, visualization methods were used to improve the general understanding and involvement. The members could pin notes representing capabilities on a board, which allowed them to provide feedback to be discussed and visualize their ideas and change requests, e.g. rearrangement of capabilities.

The modeling team of the second case study consisted of enterprise architects, possessing knowledge about enterprise architecture concepts like business capabilities. As the

organizations were operating in different countries, the meetings were mostly virtual, except for a physical workshop in the last third of the project, and were scheduled every two weeks. In the workshop, the capabilities and the capability map were visualized and assessed using notes. Like in the first case study, the members contributed feedback from their organization, collected through internal discussions, which was revised by members responsible for this capability.

The modeling team of the third case study was composed of mostly business leaders and heads of department. This was caused by the case study initiative being driven by strategic business goals like revealing the potential for synergies and acquisitions. It underlines the relevance of the business perspective in business capability modeling. Noteworthy is the role of the interviewee in the third case study. As an enterprise architect, the interviewee was responsible for coordinating and leading the project as most of the members lacked knowledge about enterprise architecture and business capabilities due to their business background. To collect more knowledge and information about the working process of the companies, the research assistant visited the member organizations. In the meetings, the members contributed information and ideas and held discussions, e.g. about change requests. Similar to the case studies 1 and 2, workshops were conducted where each participant could share his ideas, and whiteboards were used to visualize and change the arrangement of the BCs. The feedback was directly incorporated in a draft version of the BCM, visualized on a whiteboard, which was working as a basis for discussions. The overall workshop contributions were collected and aggregated by the research assistant, incorporated, and evaluated through interviews and presentations in the group.

The fourth case study's modeling team was composed of enterprise architects and project managers. The interviewees pointed out that the stakeholders were a mixture of people with business and IT background, who contributed valuable knowledge about different perspectives and areas of the individual enterprises. The meetings were mostly virtual meetings every week despite some physical meetings on a quarterly basis, where members could attend voluntary depending on their location.

As for the structure of the meetings, there was no hierarchy of the members in the case studies. In the first case study, responsibilities and tasks were allocated to the members. As an example, the identified business capabilities as well as the BCM were implemented in an agreed-upon tool by one of the participants. As for the second case study, certain members were collecting and implementing the feedback which was contributed by the individual participants and their stakeholders. The forming of sub-groups to execute spe-

cific tasks was not confirmed by case studies 3 and 4. Moreover, a moderator was chosen to coordinate the meetings of case study 1,2, and 3. In addition to coordinating and guiding the meetings which provides a clear structure, a moderator serves as a contact person for the members. Overall, it is not important whether the regular meetings are virtual or physical, which was confirmed by case studies 3 and 4 as the meetings of case study 3 were mostly physical interviews and workshops, whereas the meetings of case study 4 were mostly virtual. Conducting physical workshops seems to be beneficial for the development of the BCM. It should be highlighted that the involvement and collection of feedback, ideas, and knowledge from business stakeholders and desirably all areas of the organizations are crucial in the identification, modeling, and evaluation of BCs. The modeling teams therefore included heads of departments and domain experts, but enterprise architects are at least equally important as they are familiar with the concept of EA and BCs and can introduce and guide the stakeholders.

6.2.3 Modeling of the Business Capabilities

Draft business capability models were used by the case studies to get a better understanding of the desired outcome, to use it as a foundation for their own modeling approach, or just to use it as a guideline. The drafts can be either obtained from external sources or provided by members. During the evaluation, the interviewees mentioned that it is important to present a draft capability in the beginning so that stakeholders get familiar with the concept, but also to not use a finished BCM with multiple levels already. Instead, it was recommended to present a "good representative set off of level one capabilities in a map" to get everyone involved. Case study 1 used a BCM from a company operating in the same industry, yet not participating in the project, as a draft. Case study 2 used an external framework, i.e. the capability framework created by Jörgen Dahlberg [12], to reveal the appropriate level of abstraction, which also worked as a basis for the own BCM. Furthermore, case study 2 and also case studies 3 and 4 used existing BCMs contributed by members. In case study 3, the BCM provided by one of the members was even used as a foundation and got extended in the project to create the inter-organizational BCM. Additionally, external drafts were used at the beginning of case study 3. The maps contributed by the members of case study 4 worked as a foundation first, but because of overlapping, duplication, and the lack of following any particular standard, the group decided to start from scratch without using a template in order not to be biased. Despite that decision, the initiative was additionally collaborating with and using the methodology of the Busi-

ness Architecture Guild, an association developing best-practices and guides for business architecture. Overall, using existing BCMs from either the members or external sources can introduce and provide a common understanding of the desired outcome for the stakeholders and modeling team. Moreover, it works as a direct starting point for the business capability identification and modeling, e.g. in case studies 2 and 4.

The case studies started modeling domains or general business capabilities first, before adding more granularity through lower-level capabilities. One reason for this might be the usage of templates and draft models as these usually depict an industry-independent, generic high-level architecture of an organization and its capabilities. The TOGAF guide also recommends starting with high-level capabilities first [45]. On the other hand, in the context of collaboration, with a conglomerate of various organizations, it is easier and more reasonable to find common top-level capabilities which can be further decomposed if needed, than precise and specific low-level capabilities. Furthermore, the goal of case studies 2 and 4 was developing an industry-specific reference model, where the needed degree of granularity is not high, as it should be applicable to most organizations, even though they are operating in the same industry. At the same time, a reference BC model is not used for business analysis in contrary to a BCM in a single organization, where a detailed model is needed for profound analysis. The interviewees confirmed this lack of necessity for detail due to the mentioned reasons. The fear of revealing valuable insights of the own organization, which might cause losing the competitive advantage over the other members who are still operating in the same industry, was no reason for both modeling general, high-level capabilities first and for the less granularity. As business capabilities abstract from the underlying processes and technologies, the modeling of low-level capabilities would not reveal many details. Case study 1 developed a rather comprehensive BCM with various levels, which might be caused by the collaboration goal of mapping the BCM with the application portfolios. However, the other case studies developed more abstract BCMs. According to the interviewees, if the desired capability modeling level or arrangement was different for the participants, the members discussed until they came to an agreement. In case study 3, a BCM from one of the members was not only used as a guideline but worked as a foundation for the shared BCM and got extended by the capabilities of the other members. By color-coding the capabilities, consensus regarding the new business capability map was reached. In all of the case studies, potential member-exclusive capabilities were no problem while modeling the BCs and the BCM. The capabilities were grouped in up to six categories, but it was pointed out by the interviewees that grouping is

not that important and only improves the orientation in the BCM. Case studies 2 and 4 see them more as proposals and explicitly allow enterprise-specific re-grouping of the capabilities. This was additionally underlined as not all case studies grouped the capabilities. Examples for categories occurring in the BCMs are core, strategic, and support capabilities, which are also proposed by The Open Group Architecture Framework [45]. Concurrently to the modeling of BCs in the BCM, case study 1 created a description of the capabilities including the outcome of the capabilities, an ID, the level, and a reference to the capabilities on the capability map like IDs of sub-level capabilities or the corresponding domain. Similarly, case study 2 included an ID, the name, a description, and how the overall quality can be assessed, in the core description. Furthermore, so-called 'Context' items like KPIs, resources like investment or information-input, processes, business requirements, and possible risk factors were written down. Each member committed their version of the capability description for the corresponding capabilities. As case study 2 had the goal of developing a reference architecture, the extensive descriptions for each capability were rather abstract and only used in the beginning of the initiative to support the identification and arrangement of the capabilities, but were not part of the reference architecture. The capability description of case study 3 included the name of a business capability, the person responsible, its parent capability, a description, the desired business outcome, and dependencies to other business capabilities. Case study 3 included the person responsible for the BC in the description, which can be explained by the process of the BCM creation in this case study. As already mentioned, the initiative used the BC descriptions and BCM from one member as a foundation and only added the capabilities of the other members. Therefore, a capability could end up having 5 people marked as being responsible. The interviewee stressed out that this was currently discussed and reviewed. The other case studies did not include roles or responsibilities in their BC definition. This appears natural in a conglomerate of multiple enterprises, where each company has individual people responsible for the BCs, and different skills and tasks enabling them. Furthermore, the interviewee of case study 3 mentioned that the extensive description of the capabilities was helpful for the general understanding, but regarding the collaboration goal of case study 3, it may have been too much. Overall, except case study 4, the modeling teams developed comprehensive descriptions of the capabilities, but apart from case study 1, the descriptions were abstract, e.g. 'Product' and 'Concept' as 'Information-input' items in case study 2, and didn't include many details. Additionally, they were not covering all of the capabilities.

Business capability modeling in a single enterprise can be based on different starting points, as described in Section 6.1. By making use of the organization's business processes, a single organization can identify its capabilities. By analyzing the business processes through the business process chains, business capabilities were identified in case study 1. The processes were not further modeled or added to the capability descriptions. During the evaluation, it was stressed out by the case studies 3 and 4 that the internal structure and business processes were too different in each organization to be analyzed or embedded in the capabilities. Hence, case studies 2,3, and 4 did not involve the business processes in the capability identification. Case study 3 analyzed business functions instead, and organizational charts were also utilized. The technology of the organizations played a negligible role, which is again caused by the differences in the internal structure and processes resulting in a broad range of technologies. An exception was case study 1, where the technology was analyzed and related to the capabilities. As case study 1 had the additional collaboration target of mapping the application portfolios to the BCM, it is presumably caused by the scope of the project. In contrast to single organizational BC modeling, the organizations' visions and goals were not analyzed for BC modeling at all. At the same time, the developed BCMs were throughout illustrating the as-is state of the current BCs and did not include a should-be view where goals might be relevant. The organizations' visions and goals might be affecting the final usage of the developed BCM inside each member, but did neither influence the inter-organizational modeling of the BCs nor the creation of the BCM.

Creating a shared vocabulary is essential to guarantee a common understanding. Case studies 2 and 4 both had a shared dictionary, which was even one of the goals to be achieved through the BCM in case study 3. In case study 1, a glossary and naming convention was introduced in the first meetings to set a common and consistent language. The description of the BCs followed the naming convention and used the vocabulary. The interviewees of case study 4 explicitly mention the importance of differentiating the names of BCs and the names of the service domains to prevent confusion in the group, as the BCs were further mapped to the service domains. Overall, creating a common vocabulary seems to be crucial as its value was mentioned by all interviewees.

Merging these findings, the resources, technologies, or responsibilities were not embedded in the capabilities in general. In some cases, they were added to the capability description. Only case study 1 analyzed the used technology and put it into relation to the capabilities, which was caused by the background of the initiative. There were challenges

	Case Study 1	*Case Study 2*	*Case Study 3*	*Case Study 4*
Draft used:	External Draft	External & internal drafts	External & internal draft	Internal drafts
Business capabilities identification based on:	Business Processes	Drafts	Organization charts, business functions, drafts	Drafts (in the beginning)
Components of capability description:	ID, domain, level, name, comments, sub-level capabilities, description, outcome of capability	ID, description, overall quality, KPI, risk, outcome, information in & out, investment, process, business requirement	Name, person responsible, parent capability, description, desired business outcome, dependencies to other BCs, important decisions	-
Shared vocabulary or naming convention:	Yes	Yes	Yes	Yes
Level of granularity:	High	Medium	Low	Low
Modeling Approach:	Top-Down	Top-Down	Top-Down	Top-Down

Figure 6.1: Case study results on modeling business capabilities

in case study 1 that arose due to too much focus on the business processes. Still, using business processes can be helpful to identify and evaluate the BCs. A strict dependence on processes should however be avoided. Also noteworthy is that only case study 3 included responsibilities in the BC description, which is currently discussed again. Interviewees of case study 4 stressed out that responsibilities, technologies, and business processes should not be modeled in the BC description and the BCM if not needed for the collaboration goal. Important starting points for BC modeling are drafts and BCMs contributed by the members, as it was done in case studies 2 and 4. Figure 6.1 briefly summarizes the results for business capability identification in the underlying case studies of this thesis. In all of the initiatives, the identified business capabilities, their descriptions, composition and arrangement, as well as their relations were constantly evaluated. The evaluation was done by presenting these deliverables and the BCM to the stakeholders of the individual organizations to collect feedback. Additionally, use cases and activities were committed by the members in case study 2 and used to validate the capabilities. The evaluation resulted in changes like further decomposition of a former high-level capability, aggregation of sub-level capabilities, or changes of names. Case study 1 had to rearrange their BCM after a few iterations, as the definition of sub-level capabilities necessitated the rearrangement of top-level capabilities. The modeling team of case study 2 focused mainly on modeling one core capability at once until all participants agreed on the naming, description, and sub-capabilities. As the point of view got shifted and extended, already completed capabilities had to be revised. Overall, the iterative structure in each case study evaluated and validated the capabilities and the BCM and guaranteed that the final results were meeting the

expectations of each organization. The analyzed projects had a high level of support and involvement of the business leaders and stakeholders. Due to the context of collaboration, business leaders and stakeholders might feel more obliged to participate. In an example from one interview, the prior project of creating a BCM in a company was solely driven by the IT department and did not have the support of the business leaders. In the end, the project failed due to this lack of participation and willingness to help.

6.2.4 Reference Process for Inter-organizational Business Capability Modeling

A reference process for inter-organizational business capability modeling was derived throughout the course of the case study analysis. The reference model, which can be seen in Figure 6.3, illustrates the steps and components of the process. It was further revised and evaluated by three interviews with the case study partners, resulting in the current version. Figure 6.2 illustrates the steps for developing the reference model. The first draft was derived from the results of the case study analysis, which was then evaluated in an interview with one case study. After incorporating the additional information and feedback from the interviewee in the updated version of the process, another interview was conducted. After conducting three interviews, the result was the current version of the reference process.

By using this reference process as a guideline, an inter-organizational collaboration of companies operating in the same industry first composes the modeling team. Enterprise architects should be members of this team as they provide knowledge about enterprise architecture and corresponding artifacts like business capabilities and business capability maps. Furthermore, enterprise architects have a broad view of the enterprise and are not narrowed down to a specific department. By including domain experts, heads of departments, and project leaders, the modeling team has access to in-depth knowledge and expertise regarding industry-specific, as well as internal, domain-specific knowledge. This composition ensures that the modeling team is both 'doing the right thing' as well as 'doing the thing right'. However, the size of the modeling team should be reasonable. In a large collaboration, domain experts and heads of department do not have to be members of the team. Still, the modeling team should have access to the in-depth information by holding discussions and consulting with them. The modeling team can assign responsibilities to individual actors, like a moderator for the meetings, who can also act as the contact person for this project, or someone to incorporate the feedback provided by the members. Regarding the meetings, their structure, for example physically or virtually,

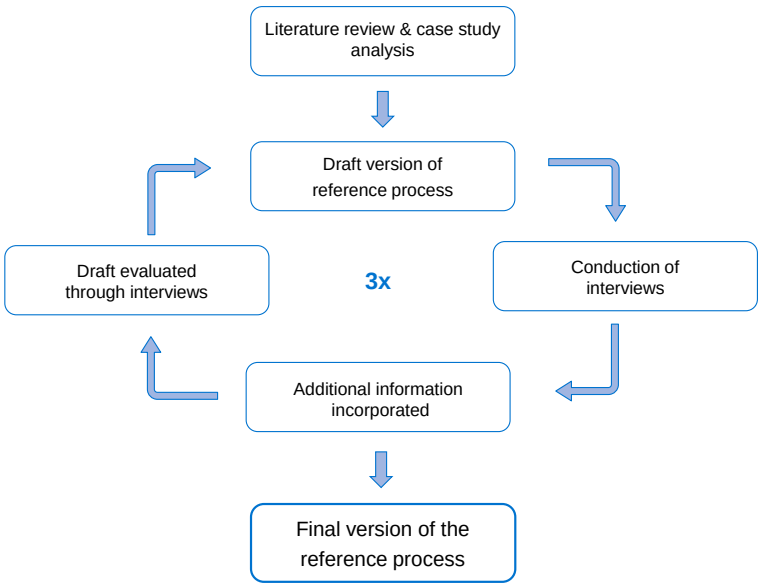


Figure 6.2: The steps for evaluating the reference process

and their regularity depend on the individual project. Therefore, the model does not include and address the meetings. Developing and using a common vocabulary is crucial, as the members are coming from various organizations that might be operating in different countries. Hence, a difference in their internal vocabulary and terminology can be assumed and could be avoided by this step. Additionally, the project-specific glossary can work as a reference book for the involved stakeholders and increase their understanding. Therefore, a common vocabulary is also beneficial beyond the project. The identification and modeling of the capabilities in the next step can be supported by using a draft business capability model, either obtained from an external source, or contributed by one of the members. This draft can also introduce stakeholders and members of the modeling team who are not familiar with the concept of BCs and a BCM to the subject and illustrate the target. With this common vocabulary and preferably a draft model, the modeling team analyses the organizational components like organization charts, business processes, business functions, or business objects. If a top-down approach is chosen, which is recommended in this reference model due to the involvement of multiple stakeholders and the inter-organizational context, the top-level capabilities are identified. These capabilities should be written down with a description using the common vocabulary, but should not include the underlying business processes, the responsibilities, or goals. In an inter-

organizational collaboration, embedding these components does not seem to be useful or even possible. The description can include further items like dependencies to other capabilities or expected outcome. This depends on the collaboration goal. Further suggestions can be found in the case study analysis in Section 6.2.3. In addition to describing the capabilities, they should be displayed in a BCM to visualize the position in the organization as well as relations between the capabilities. Using categories to group the BCs, it might improve the stakeholders' understanding as they can focus on important groups. Additionally, if the initiative has a specific target group of capabilities that should be further analyzed or decomposed, grouping allows them to focus on those capabilities. This work proposes the three categories 'Core Capabilities', 'Support Capabilities', and 'Strategic Capabilities', as proposed by TOGAF and several literature sources [8, 18, 46]. As mentioned in 6.2.3, the grouping is only for visualization purposes, hence these three categories are only proposals.

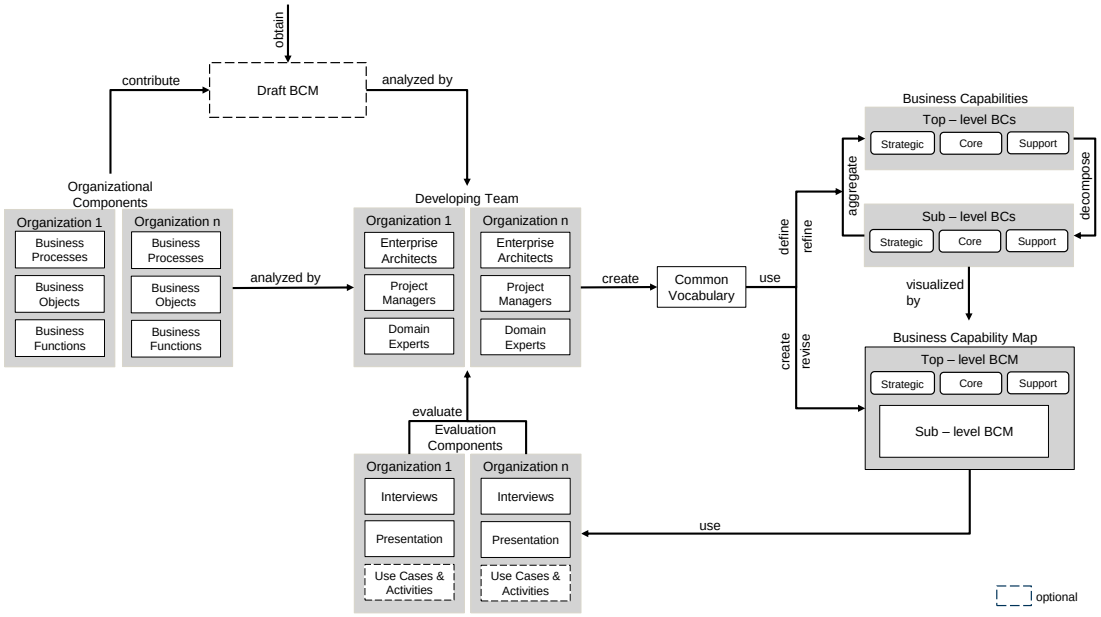


Figure 6.3: The derived reference process for inter-organizational business capability modeling

The first version of the business capabilities, their descriptions, and the BCM are then presented to the stakeholders and domain experts in each organization individually to collect feedback through interviews or internal presentations, evaluating the first version.

Additionally, the BCM can be presented to the business leaders and top level management to increase their understanding and support. After incorporating the feedback by the modeling team, the top-level capabilities can be further decomposed or, if a bottom-up approach was chosen, vice versa, the lower-level capabilities can be aggregated. Due to the complexity arising with multiple organizations, the bottom-up approach can bear a challenge. As for most of the initiatives, the top-down approach was sufficient as the needed degree of granularity is lower. Hence, the approach depends on the collaboration goal. The constructed capabilities should again include descriptions and relations. This step is repeated until the desired level of granularity is reached, which can vary for each BC. This iterative process is repeatedly involving the stakeholders, and discussions should be held by the modeling team while incorporating the feedback until a consensus is reached. Use cases and activities from the actors can also be used for further evaluation in the process. Overall, changes of relations or the composition in other layers can occur in the course of this iterative process. Using a BCM to provide a holistic view of the capabilities and their arrangements and relations is therefore important. As the set of capabilities might change, e.g. a former top-level capability is decomposed or vice versa, the BCM should allow adjustments as well. When the composition, the relations, and the desired degree of granularity is reached for the BCs, the organizations should inform the members about changes in their enterprise, as this may result in adjustments of the BCs and the BCM. But as business capabilities are relatively stable to changes, this is not likely to happen.

6.3 Differences of modeling Business Capabilities in a single Organization and a Collaboration

This section compares the results of the previous sections and reveals differences as well as similarities of business capability modeling in a single organization and in collaboration. Table 6.4 visualizes the major differences. The modeling process in a single organization as well as the collaborative one uses draft models as a foundation or to create a common understanding among the modeling team and their stakeholders. The modeling team in both cases involves enterprise architects and domain experts. In an inter-organizational collaboration, business leaders tend to be more supportive than in single-organizational modeling initiatives. Whereas business processes are helping to identify the capabilities in both a single organization as well as in collaboration, the single organization can make use of the enterprise's visions and goals, business concepts, and business rules to identify

	Single Organization	Multiple Organizations
Use draft model	✓	✓
Analyze business processes/ functions	✓	✓
Analyze vision & goals	✓	-
Analyze concepts	✓	-
Analyze business rules	✓	-
Analyze resources	✓	-
Analyze responsibilities / roles	✓	-

	Single Organization	Multiple Organizations
Model relations	✓	✓
Set up KPIs	✓	-
Analyze context	✓	-
Define common vocabulary	-	✓
Create BCM	✓	✓
Capability evaluation & refinement	✓	✓
Degree of granularity	High	Low

Figure 6.4: Differences and similarities in the modeling of business capabilities

capabilities. Additionally, responsibilities are generally not part of the capabilities when collaborating with multiple companies. The relations of the capabilities to either the capabilities themselves or to their outcomes or underlying processes are modeled in both approaches, however the processes are less relevant in an inter-organizational context. As the approach in a single organization can be based on a company's visions and goals, setting up KPIs to measure them seems logical. Accordingly, it is not the case for multiple organizations, unless desired. Especially in the field of Capability Driven Development, a single organization analyzes the capability context to facilitate flexibility in capability delivery. That is not found to be relevant in a collaboration. To define a common vocabulary and shared taxonomy was crucial in the inter-organizational modeling initiatives. In a single organization, the internal vocabulary is already sufficient, hence defining it was not mentioned in most literature. Creating a business capability map is important in both approaches since it provides an overview of the arrangement, the relations, and a better understanding of the capabilities. A major aspect of modeling business capabilities is the iterative structure of the process. The constructed capabilities are in both cases subject to continuous evaluation and refinement, mostly by conducting interviews with stakeholders or domain experts. Eventually, the degree of granularity in a single organization tends to be higher than the one in collaboration as the majority of single organizations want to use the modeled BCs for further analysis of the enterprise, which requires more details in order to solve a particular business problem. For this reason, the inter-organizational BCs are defined and modeled less detailed.

7 Discussion & Limitation

This chapter reviews the findings of this work regarding business capability modeling in a single company and in inter-organizational collaboration. Further, the differences are discussed. In Section 7.2, the limitations of this thesis are addressed, together with proposals for future work.

7.1 Key findings

This section presents the key findings of this thesis. To find information about methods for business capability modeling in a single company, a literature review was conducted. Similarly, a literature review was conducted on inter-organizational BC modeling which revealed the lack of research on this topic. Therefore, multiple case studies were analyzed to derive the steps and develop a reference process for inter-organizational BC modeling, which was evaluated in three iterations by conducting interviews. This resulted in the following:

- **RQ1: How is the process of Business Capability (BC) modeling in a single organization structured?**
  - Draft models can be used as a starting point
  - Business processes, business visions & goals, concepts, and business rules can be analyzed to identify business capabilities
  - Resources required by the processes underlying the business capabilities can be included in the modeling
  - Responsibilities are part of the capability description when defining capabilities in a single organization
  - Relations between the capabilities and to other components like processes are modeled
  - KPIs are set up to measure the fulfillment of the business goals

  - The context of the capability can be analyzed to allow adaptability and flexibility in capability delivery
  - Visualizing the business capabilities in a business capability map is helpful
  - Constructing business capabilities in a single enterprise is an iterative process with continuous refinement and evaluation
  - Business capabilities are analyzed and defined in detail to facilitate business analysis

- **RQ2: How do companies from the same industry proceed in modeling common BCs?**
  - Draft models are helpful as a starting point
  - A shared vocabulary is crucial and should be established
  - Business processes, business objects, and business functions can be used to identify business capabilities
  - Constructing capabilities in an inter-organizational collaboration is an iterative process with continuous evaluation and refinement through feedback collected from the individual organizations
  - The description of capabilities should use the common vocabulary

- **RQ3: How does the process of modeling inter-organizational BC's differ from the process in a single organization?**
  - Draft models are helpful in both approaches
  - Business processes can be used to identify BCs
  - Business visions and goals, rules, and concepts are only used in the context of a single organization
  - The underlying processes, resources, responsibilities, and roles are only modeled or put in relation to the capabilities in a single organization
  - In both cases, the relations of the BCs are modeled
  - KPIs are only set up in a single enterprise
  - The context of the capabilities is analyzed in a single organization but not in an inter-organizational collaboration

- A common vocabulary is established in the collaboration but not necessarily in a single organization
- Visualizing the BCs through a BCM is part of both approaches
- Both processes are of iterative structure and include continuous evaluation through the stakeholders
- While the degree of granularity seems to be high in a single organization, the result of a collaboration tends to be less detailed

7.2 Limitation & Future Work

This thesis analyzed case studies to extract information. Case studies have general limitations such as validity and reliability [38]. To construct validity, the interviewees were employees from different enterprises with the necessary background. This ensures that interview questions are interpreted correctly. Coping with external validity, the derived process is based on multiple case studies from different industries with individual collaboration goals, and therefore, the process can be applied to most collaboration projects. Addressing reliability, the interviews were following a guideline, which was reviewed by a second researcher. Still, the results of the interviews are subjective. Therefore it would be of great value to conduct more case studies and interviews to further deal with those limitations. As this thesis was not conducting a systematic literature research, it might be possible that potential relevant literature was not found. By using the asterisk in the search query, applying the search query to several important academic literature databases, and conducting a backward and forward search, this work tried to reveal as much relevant literature as possible. Based on the results of this work, future studies could examine the composition and size of the modeling teams in inter-organizational BC modeling, especially in up-scaled initiatives where numerous people could be involved. In the case studies, problems were solved and feedback incorporated by discussion in the modeling group. Future research could be conducted on how this consensus is reached, and provide ideas for improvement, as a compromise is often not the optimal solution. Another possible research area is the inter-organizational modeling of business capabilities that are not possessed by the individual organizations on their own, but only in the scope of collaboration. Furthermore, this thesis focused on the modeling process of business capabilities in an inter-organizational collaboration and derived a reference process based on merging

the results of multiple case studies. Evaluating the findings of this thesis would be beneficial. Moreover, studies could be conducted on the actual usage of the constructed BCs and BCM and propose possible use-cases, as this was not covered in this work.

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