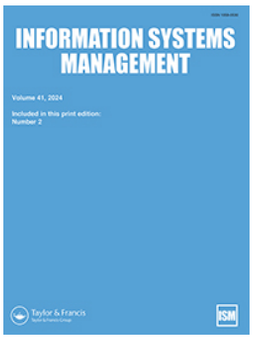

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Modeling Business Capabilities in Enterprise Architecture Practice: The Case of Business Capability Models

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ABSTRACT
Business capability modeling is a narrow domain of enterprise architecture modeling, which currently remains insufficiently explored. This study identifies nine general business capability modeling approaches and corresponding usage scenarios of business capability models most of which have not been systematically described or even mentioned in the existing literature. This study represents arguably the first intentional effort to explore the practical usage of business capability models in organizations for the purposes of aligning business and IT.

KEYWORDS
System Modeling; enterprise architecture (EA); EA modeling; business capability modeling; business capability models (BCMs); usage

Introduction

System modeling represents a broad and important topic for research and practice. The first consistent approaches to system modeling emerged a very long time ago (Colter, 1984; Couger, 1973; Morris & Gotel, 2006). Since then, countless modeling notations and languages have been proposed to address various aspects of information systems, their structure, and behavior (Chen, 1976; Gane & Sarson, 1979; UML, 2015; YOURDON Inc, 1993).

The topic of enterprise architecture (EA) modeling represents a relatively recent domain of system modeling focused specifically on modeling the relationship between information systems and business elements of organizations at the enterprise-wide scale (Kotusev, 2021b; Lankhorst, 2017). EA modeling has its own specifics and differs from traditional system modeling in a number of important aspects, e.g., higher abstraction levels and appeals to a general business audience. Unsurprisingly, many specialized modeling languages have been developed specifically for the purposes of EA modeling including ArchiMate (ArchiMate, 2016; Wierda, 2017), ARIS (Scheer, 1992) and some other less widely known modeling notations (Frank, 2002; Rohloff, 2005).

Business capability modeling, in turn, represents a narrow domain of EA modeling focused exclusively on modeling business capabilities of organizations for the purposes of joint business and IT planning (Bondel et al., 2018; Tiwary & Unhelkar, 2018). Business capability models (BCMs) emerged in the industry some time ago (Greski, 2009; Scott, 2009) and currently are among the most popular and widely used EA artifacts (Khosroshahi et al., 2018; EA on a Page, 2022). Among other benefits, the use of BCMs helps organizations improve their strategic business and IT alignment (Kotusev, 2020; Kotusev et al., 2020, 2022).

However, despite the broad industry adoption of BCMs and their acknowledged importance for EA practices, available information on BCMs is actually rather limited. On the one hand, practitioner literature on the subject is anecdotal and mostly prescriptive (Cantara, Burton, & Scheibenreif, 2016; Nadarajah & Sapkal, 2016; Ulrich & Rosen, 2011). On the other hand, academic literature offers only a small number of studies conducted to understand the development, role and application of BCMs in the overall EA context (Bondel et al., 2018; Khosroshahi et al., 2018; Yilmaz et al., 2021). For this reason, the practical usage of BCMs in organizations still remains an insufficiently explored area in the existing EA literature. In particular, it is not clear (1) what aspects of business capabilities can be reflected in BCMs to facilitate business and IT alignment and (2) how exactly an explicit reflection of these aspects helps organizations align business and IT.

To address this gap, this study explores in detail the practical usage of BCMs in organizations. Specifically, the research question of this study can be formulated as follows: "What business capability modeling approaches are used in practice and how do these approaches help align business and IT?" Although BCMs have many diverse use cases (Khosroshahi et al., 2018), this study

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intentionally focuses on their "main" usage scenarios that facilitate business and IT alignment in organizations. To answer its research question, this study uses multiple case studies approach, which seems particularly suitable for investigating understudied questions of qualitative nature.

This paper proceeds as follows: (1) the topic of EA and business capability modeling is discussed, the extant research on BCMs is reviewed and the research question is introduced, (2) the research design, data collection and analysis procedures are described, (3) the identified business capability modeling approaches are presented and illustrated with graphical examples, (4) the findings of this study are discussed in the context of the existing literature and (5) limitations of this study and future research directions are discussed.

Literature review

This section discusses EA modeling with its specifics, introduces BCMs as a special type of EA artifacts, reviews the existing academic research on BCMs and then explains the motivation and research question of this study.

Enterprise architecture modeling

EA modeling can be viewed as a special branch of a broader family of system modeling approaches. EA modeling has its own unique features and differs from "traditional" system modeling in at least three distinctive aspects. Firstly, EA modeling intends to facilitate higher-level organization-wide planning efforts, rather than the planning of separate information systems and their internal details (Kotusev, 2021b; Ross et al., 2006). For this reason, EA models tend to be much more abstract and conceptual in nature than typical system models, e.g., describe the relationship between different systems constituting the organizational IT landscape, rather than the relationship between different components of a single IT system.

Secondly, EA modeling intends to address the problem of business and IT alignment, rather than a purely technical design of information systems (Ahlemann et al., 2012; Kotusev, 2021b). For this reason, EA models tend to focus on the interrelationship between business and IT elements of the organization, but not on its IT elements in isolation, e.g., describe the relationship between business processes and underlying information systems supporting these processes, rather than only information systems separately.

Thirdly, EA modeling intends to satisfy the information needs of both business and IT audiences, rather than only IT specialists (Kotusev & Kurnia, 2021; Ross et al., 2006). For this reason, EA models tend to look much simpler than typical system models in order to be understandable to ordinary business managers unskilled in modeling and unaware of special graphical notations, e.g., use only primitive "boxes and arrows" instead of sophisticated graphical symbols incomprehensible to business stakeholders (Kotusev, 2021a).

First EA modeling approaches (i.e., approaches for modeling information systems and respective business operations at an enterprise scale) can be traced back to the 1960s (Glans et al., 1968; Hartman et al., 1968; Honeywell, 1968; SOP, 1961) (though the term "enterprise architecture" itself emerged historically much later (Kotusev, 2016, 2021b)). Since then, many comprehensive methodologies and accompanying notations for organization-wide information systems planning have been proposed most prominent of which include IBM's Business Systems Planning (BSP) (BSP, 1975, 1984) and Information Engineering (Finkelstein, 1989; Martin, 1989; Martin & Finkelstein, 1981).

Today, EA modeling is the single most extensively studied topic within EA research (Kotusev, 2017b), virtually countless types of EA models are described in the literature (Bernard, 2020; DoDAF, 2015; TOGAF, 2018; Van't Wout et al., 2010) and multiple formal modeling notations exist that can be used or adapted for the purposes of EA modeling, e.g. ArchiMate (ArchiMate, 2016; Lankhorst, 2017; Wierda, 2017), ARIS (Scheer, 1992), BPMN (BPMN, 2011; Silver, 2012; White & Miers, 2008), VDML (VDML, 2018), IDEF (Marca & McGowan, 2005) and some other less widely known notations (Frank, 2002; Rohloff, 2005).

Business capability models

Business capability models (BCMs, can also be called business capability maps, less often business capability canvases, capability reference models or simply business architectures) are one of the multiple possible types of EA artifacts that can be used in EA practices (Kotusev, 2021b; EA on a Page, 2022). BCMs intend specifically to model organizational business capabilities for the purposes of joint business and IT planning. They provide structured hierarchical views of all business capabilities, where each capability abstracts all the underlying resources required by the organization to fulfill it, e.g. processes, roles, skills, systems, information, physical facilities and other resources (Hadaya & Gagnon, 2017; Tiwary & Unhelkar, 2018).

Table 1. Overview of the existing academic research on BCMs.

Reference	Research method	Key outcomes
Beimborn et al. (2005)	Conceptual reasoning with subsequent case study application	Develop a capability-based modeling paradigm and illustrate its practical utility in the context of banking business
Brits et al. (2007)	Conceptual reasoning	Construct a theoretical framework for business capability modeling
Zdravkovic et al. (2013)	Conceptual reasoning with subsequent case study application	Create a meta-model for capability design and deployment in the cloud and demonstrate its applicability in practice
Aldea et al. (2015)	Conceptual reasoning with a realistic practical example	Propose a methodology for capability-based planning and the respective addition to the ArchiMate language with its practical illustration
Azevedo et al. (2015)	Conceptual reasoning with subsequent illustration in two real-world cases	Design an extension to the ArchiMate language for modeling business capabilities and resources and then showcase its practical usage
Espana et al. (2015)	Conceptual reasoning rooted in practical experience	Introduce different strategies for capability modeling (goals-first, process-first and concept-first), offer their analysis and comparison
Keller (2015)	Conceptual reasoning	Discuss the concept of business capabilities, its role, properties and possible usage scenarios
Toppenberg et al. (2015)	Case study of Cisco Systems	Discuss the role and application of BCMs and capability roadmaps in acquisition processes
Bondel et al. (2018)	Case study of a medium-sized governmental organization	Describe the initiation process of a business capability map and identify business leadership involvement as a major success factor
Khosroshahi et al. (2018)	Expert interviews with 25 organizations	Provide the analysis of the benefits and challenges of capability-based planning and evaluate various use cases of BCMs in practice
Weber et al. (2019)	Conceptual reasoning with subsequent case study application	Develop and evaluate an approach for generating cross-domain value scenarios in the realm of the industrial Internet of Things based on the concept of business capabilities
Yilmaz et al. (2021) and Yilmaz and Matthes (2021)	Multiple case studies	Provide the analysis of possible use cases of BCMs in horizontal inter-organizational collaboration

By virtue of their ability to reflect both business and IT aspects of organizations, BCMs serve as powerful boundary objects between the communities of business managers and architects, thereby enabling collaborative decision-making (Kotusev et al., 2023). However, because business capabilities offer very high-level abstractions of organizational activities, BCMs are relevant primarily to strategic planning, but may not be particularly useful at the level of project delivery and system implementation (Kotusev, 2021b).

Historically, BCMs represent a rather young EA-related innovation that has spread across the industry relatively recently, apparently during the period from the late 2000s to the early 2010s (Khosroshahi et al., 2016). Nevertheless, being one of the most notable and successful inventions in the EA field, BCMs have already established a prominent standing in the EA toolkit. For instance, today they feature among the most popular EA artifacts used in organizations (Khosroshahi et al., 2018; Kotusev, 2017a, 2019a, 2021b) and business capability modeling itself represents one of the core activity areas constituting EA practices (Kurnia et al., 2020, 2021).

One of the distinguishing features of BCMs is that these EA artifacts have not been introduced by any "definitive" sources, but emerged naturally in the industry (Kotusev, 2019b). For example, some of the earliest publications providing more or less consistent descriptions of BCMs date back to the mid to late 2000s (Beimborn et al., 2005; Greski, 2009; Merrifield et al., 2008; Scott, 2009), but these publications describe them as an already existing phenomenon, rather than propose them as something new. Recent comprehensive EA sources and frameworks either do not mention BCMs at all (Bernard, 2020; DoDAF, 2015; Van't Wout et al., 2010), or at best provide only vague suggestions regarding business capability modeling (TOGAF, 2018), while earlier comprehensive EA sources (Spewak & Hill, 1992) described only functional or process decompositions that did not enjoy broad industry adoption (Kotusev, 2019a) and resemble present BCMs only distantly. Even the latest specialized sources on business architecture (Hadaya & Gagnon, 2017; Tiwary & Unhelkar, 2018) provide rather basic and anecdotal descriptions of BCMs.

Existing research on business capability models

In the academic discourse, despite the abundance of publications on EA modeling (Kotusev, 2017b), specifically the subject of business capability modeling and practical use of BCMs received rather limited attention among EA scholars. Furthermore, the respective publications are virtually missing in reputable IS journals and appear predominantly in not so widely known niche sources and conferences. A brief overview of the existing academic research on BCMs is provided in Table 1.

In addition to academic research, various reports on business capability modeling and the use practical of BCMs are issued by Gartner (Burton, 2010, 2012, 2013; Cantara, Burton, & Scheibenreif, 2016; Cantara, Burton, Weldon, et al., 2016; Weldon &

Burton, 2011), other consulting companies and gurus (Gagnon & Hadaya, 2020; Nadarajah & Sapkal, 2016; Swindell, 2014; Ulrich & Rosen, 2011), as well as software tool vendors (LeanIX, 2016).

Research motivation and question

Therefore, at the present moment, BCMs are widely adopted in the industry (Khosroshahi et al., 2018; Kotusev, 2019a). However, as it is evident from the overview of relevant studies (see Table 1), the research on BCMs has been relatively scarce, mostly conceptual and normative. Those limited studies that analyze the situation with BCMs in the industry (Bondel et al., 2018; Khosroshahi et al., 2018; Toppenberg et al., 2015; Yilmaz et al., 2021) focus on diverse aspects of their usage, but do not concentrate specifically on the application of BCMs for improving business and IT alignment. At the same time, the publications incoming from advisories, consultancies, and vendors offer only some anecdotal and haphazard recommendations. For this reason, modeling approaches used in BCMs for alignment-related purposes and the corresponding usage scenarios still remain largely unexplored beyond general basic ideas; little systematic and evidence-based knowledge is available in the literature on the subject.

To address this gap, this study explores in greater detail the practical usage of BCMs in organizations. Although BCMs have many diverse use cases in organizations including, among others, identifying candidate systems for migrating into the cloud, controlling the adherence to compliance requirements and managing capability dependencies (Khosroshahi et al., 2018), this study focuses specifically on the usage scenario that can arguably be considered "central" to the practical use of BCMs: aligning IT investments to organizational needs.

From this perspective, from the existing literature it is not clear (1) what aspects of business capabilities can be reflected in BCMs to facilitate business and IT alignment and (2) how exactly an understanding and explicit depiction of these aspects helps organizations align business and IT. Based on these two gaps, the research question of this study can be formulated as follows: "What business capability modeling approaches are used in practice and how do these approaches help align business and IT?"

Research design

This study is exploratory in nature and examines the practical area that received little attention in previous research. This study is also inductive in its approach since the available literature on business capability modeling arguably does not allow formulating reasonable deductive propositions addressing the intended research question. At the same time, the research question itself is purely qualitative and may not be answered with any quantitative means. Due to these characteristics, this study relied on case studies as the primary research approach appropriate for analyzing the use of BCMs for improving business and IT alignment in organizations.

Data collection

Data for this study was collected as part of a broader research effort intended to explore the usage of various architectural documents, including BCMs, across the industry (Kotusev, 2019a; Kotusev et al., 2015). Eventually, this effort involved 27 organizations practicing EA based in Australia, New Zealand, and Europe. These organizations were selected based on theoretical sampling considerations (Strauss & Corbin, 1998) with the intention to achieve the maximum possible diversity of the sample in terms of size and industry.[1] Accordingly, they employed from tens to thousands of IT staff and represented disparate industry sectors including finance, insurance, food, retail, manufacturing, delivery, education, telecommunication, utilities, natural resources, and public services. All in all, our research approach comprised several opening full-fledged case studies and a larger number of follow-up "mini-case studies"[2] (Kotusev, 2019a), so that new organizations were involved until theoretical saturation on the use of BCMs, among other EA artifacts, was reached. Detailed profiles of the organizations covered in this research are provided in Appendix A.

Our case studies generally included two data collection methods: interviews with EA practitioners working in organizations and documentation analysis. Interviews with architects were indispensable to understand exactly how BCMs are used in organizations for decision-making purposes, whereas documentation analysis was essential to understand their informational contents.

In total, 63 face-to-face and Skype one-hour interviews have been taken with architects of different denominations and architecture managers from the involved organizations. The number of interviews taken in each organization roughly correlated with its size, ranging from one interview in the smallest organizations from our sample (often, they employed only a single permanent architect) to several interviews in the largest ones. The interviews were semi-structured and guided by a standardized interview protocol to ensure the consistency of data collection. First, the

research participants were asked to provide an overall background on their organizations and EA practices, e.g., business structure, staff count, experience with EA and the composition of their EA function. Then, the participants were asked to list key types of architectural artifacts utilized in their EA practices. Finally, the interviews proceeded to the detailed and thorough discussion of these artifacts and their roles in EA practices, e.g., exact informational contents, typical stakeholders, regular usage patterns and scenarios, general meaning and associated benefits. The interview protocol used in this research is provided in Appendix B. The conducted interviews were recorded with the permission of the interviewees for further qualitative analysis. Numerous samples of architectural documents, including BCMs, were captured and analyzed as well.

Data analysis

Since the research question of this study is highly descriptive and atheoretical in nature, no sophisticated theoretical lenses were employed for data analysis due to their acknowledged ability to distort rich empirical findings according to predefined postulates of the chosen theory (Avison & Malaurent, 2014; Hambrick, 2007; Helfat, 2007; Miller, 2007). Instead, to achieve purity, the data analysis in this study was performed via a simple qualitative thematic interpretation approach (Creswell, 2007; Miles & Huberman, 1994).

Firstly, descriptions of informational contents of BCMs in terms of their logical structures, depicted entities and notation legends were extracted from the collected interview transcripts. Secondly, the informational contents of BCMs have also been deduced from their graphical samples provided by the interviewees. Thirdly, different approaches to modeling business capabilities were identified in the interviews and available samples of BCMs. Fourthly, the practical goals, applications and overall meanings of these approaches were extracted from the interviews. Finally, all the identified business capability modeling approaches and their applications were analyzed for their differences and similarities and a number of typical usage scenarios of BCMs were distinguished in the collected data providing an answer to the research question of this study.

Research findings

The findings of this study suggest that BCMs are indeed widely adopted in the industry as a practical instrument for improving business and IT alignment. The reasons and motives for their adoption in organizations mentioned by the interviewees all revolve around the central theme of ensuring a closer and more transparent connection between business goals and IT investments. Namely, these reasons included rationalizing organizational decision-making, deepening strategic dialog between business and IT leaders, driving investment roadmaps, inculcating capability-based thinking on business and IT, launching the right initiatives, and proposing the proper solutions.

In most cases, BCMs are created and maintained in the form of large one-page MS Visio diagrams. The most basic "template" structure of BCMs reflecting the most essential information contained in these artifacts and its typical presentation format, as derived from the

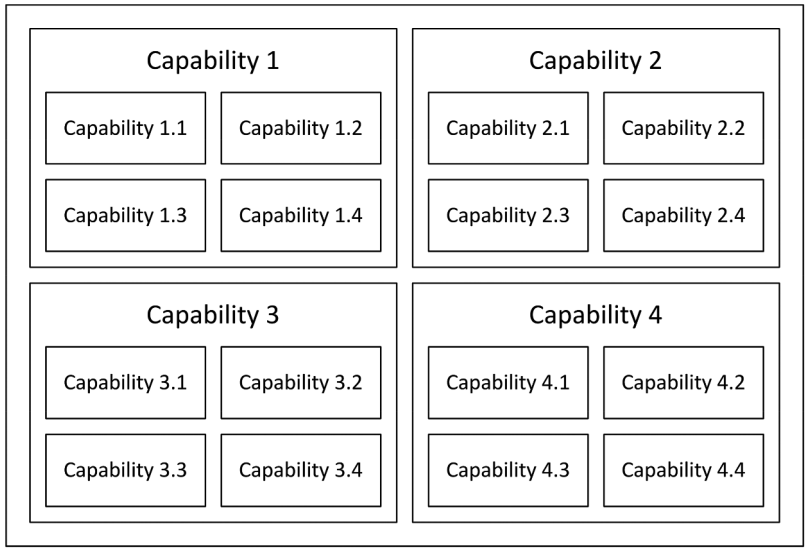

Figure 1. Schematic graphical view of the most basic BCM.

interviews and available graphical samples, is demonstrated in Figure 1.

However, the basic structure shown in Figure 1 provides only a "least common denominator" of BCMs (i.e., represents the essence of all BCMs without which they are not considered to be BCMs), while real BCMs used in most organizations look somewhat more sophisticated in their formats and informational contents. Moreover, BCMs are also highly organization-specific and vary broadly in their characteristics across different organizations.

Generally, the identified BCMs differed from each other along four main "dimensions": (1) granularity and level of detail, (2) highest-level structure of business capabilities, (3) the presence of strategic context and (4) the presence of additional supplementary information. Firstly, BCMs in different organizations can have different granularity in terms of nested capability levels. The number of nested levels of business capabilities may range from two (shown in Figure 1) to four or even five, depending on the size, complexity, and experience of the organization. Secondly, BCMs can differ in the highest-level structure of their business capabilities (often called "level zero"). At the highest level, capabilities in BCMs can be organized according to the activities of the organizational value chain (e.g., inbound logistics, operations, outbound logistics, marketing, and sales, and service), aligned to different business functions or lines of business, depending on the business structure of the organization. Thirdly, BCMs can provide diverse information on the strategic decision-making context. Depending on the needs of the organization, this information may include organizational business strategy, strategic vision, mission, long-term objectives, goals, and relevant KPIs. Fourthly, BCMs can also include diverse information on the overall organizational environment. Depending on the business of the organization, this information may include major suppliers and partners, target markets and customer segments, main groups of stakeholders and users. Hence, the basic structure of BCMs shown in Figure 1 depicts only the most common primary information found in all BCMs, but omits all secondary organization-specific details.

The analysis of various practical applications of BCMs described by the interviewees suggests that BCMs in their simplest form, as a plain structured hierarchy of business capabilities similar to the one shown in Figure 1, though certainly have a number of helpful use cases, still offer only a rather limited value to organizations. For example, they can provide a common vocabulary to decision-makers, facilitate mutual understanding, help managers better comprehend the business of the organization, determine the scope and impact of particular change initiatives and identify their stakeholders, but they arguably do not represent real planning tools. Instead, the genuine value of BCMs as instruments for aligning business and IT lies in using various mapping and color-coding approaches. Mapping implies relating various objects important from the viewpoint of strategic planning to relevant business capabilities, while color-coding implies marking specific business capabilities in different colors to indicate certain properties of these capabilities important from the perspective of strategic planning. These approaches to mapping and color-coding essentially define the corresponding practical applications of BCMs and determine their usage for the purposes of organization-wide information systems planning.

During the data analysis, a number of diverse approaches to mapping and color-coding together with respective applications of BCMs have been identified. Although these approaches always differed in numerous organization-specific details and various combinations of multiple different approaches were routinely used, nine general approaches to the use of BCMs can still be articulated. These general approaches differ in their meaning, intent, and purpose and represent certain "typical" BCM usage scenarios. For explanatory purposes, they can be separated into mapping and color-coding and can also be conditionally grouped into three broad categories: reactive, proactive, and retrospective (though this distinction is not always very clear and the relevance of some approaches to these categories may fairly be debatable). The general approaches to the usage of BCMs identified in organizations are described below and illustrated based on the "standard" template structure of BCMs shown in Figure 1.

Reactive approaches

Reactive approaches to the use of BCMs focus more on the current situation in different business capabilities and facilitate information systems planning by highlighting existing deficiencies in organizations from the standpoint of IT. These approaches can also be viewed as bottom-up approaches since they leverage primarily an understanding of business capabilities incoming from local business owners of these capabilities responsible for their fulfillment. Reactive approaches are characterized by the lack of a definite outlook for the future, but they still inform various planning decisions regarding what the organization needs to do. Four different reactive approaches, starting from simpler ones and ending with more sophisticated ones, are described in detail below.

Business problems (mapping)

The mapping of known business problems to BCMs helps business and IT leaders better understand what existing problems affect the organization, locate these problems and then address them with IT. Current business problems and "pain points" are usually identified by architects during the meetings and workshops with relevant business stakeholders (e.g., managers of different business units or areas), systematically recorded and then placed in BCMs to indicate which business capabilities they belong to (a single problem may relate to multiple business capabilities). A schematic graphical example demonstrating the idea of mapping business problems to BCMs is shown in Figure 2.

After being performed, the mapping of existing business problems to BCMs informs IT investment processes and prioritization procedures. Specifically, this technique allows architects and business leaders to identify the most critical business areas that require improvements, focus future IT investments on these areas, eliminate respective business problems and also leverage synergies between different problems related to a single capability. Of our sample, this approach to using BCMs was practiced only in organizations #1 and #8 (see Appendix A).

Current IT support (color-coding)

Color-coding BCMs according to the current IT support of various capabilities helps managers better understand which business areas are insufficiently enabled by IT and may require IT-driven improvements in the future. The level of current IT support can be understood either as a general extent of IT assistance (e.g., the degree of automation of business operations and availability of necessary information), or more specifically as the extent to which existing information systems meet relevant business requirements (e.g. do not meet current requirements, meet current but not future requirements or meet both current and future requirements). The level of IT support is typically determined by architects through meetings and discussions with business owners of respective business processes and capabilities. Then, different capabilities in BCMs are color-coded to reflect their IT support levels. A schematic graphical example demonstrating the idea of color-coding BCMs based on the current IT support of business capabilities is shown in Figure 3.

After being completed, color-coded BCMs provide valuable input to IT investment processes and prioritization procedures. In particular, this technique allows architects and business leaders to identify the "weakest" organizational areas from the perspective of their IT support (e.g. where business processes are still carried out manually), ensure that future IT investments focus on the capabilities where the payoff from these investments will be the highest and avoid spending additional IT dollars on the capabilities which are already well-automated. Of our sample, this approach to using BCMs was practiced in organizations #4, #6, #8, #12, #18 and #19 (see Appendix A).

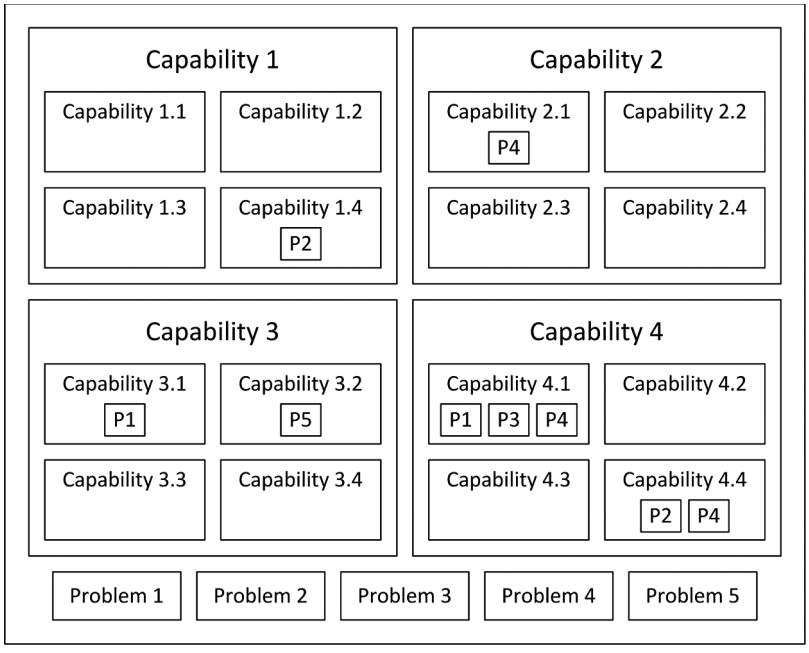

Figure 2. Mapping of business problems to BCMs.

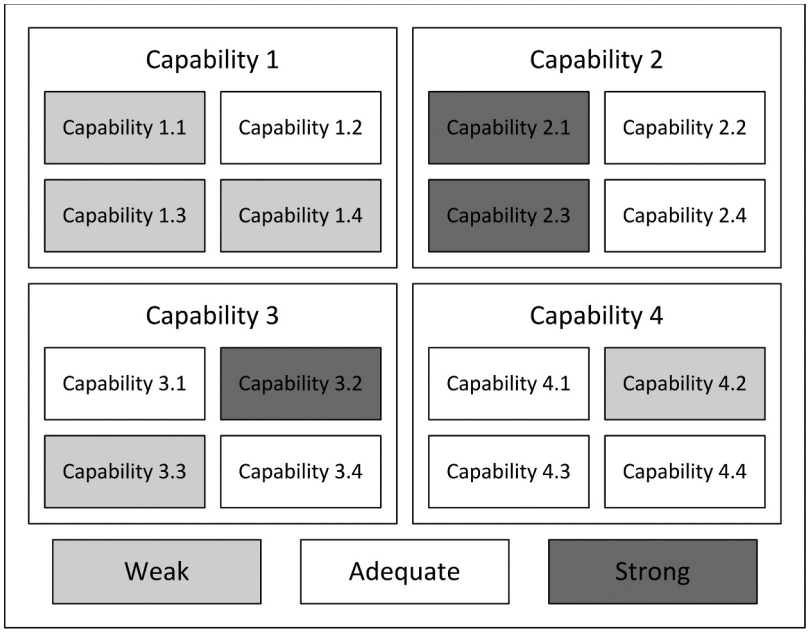

Figure 3. Color-coding of BCMs based on the current IT support of business capabilities.

Current overall maturity (color-coding)

Color-coding BCMs according to the current overall maturity of various capabilities helps decision-makers better understand which business capabilities are underperforming and might need to be uplifted with IT in the future. The maturity levels of different business capabilities are often assessed during the workshops involving architects and relevant business leaders. These maturity levels can be evaluated based on their perceived absolute values (e.g., low, medium or high), relative values in comparison with other organizations from the same industry (e.g. below average, industry-average or above average) or, in some cases, based on a five-point scale loosely aligned to the capability maturity model (CMM) developed by the Software Engineering Institute (i.e. initial, managed, defined, quantitatively managed and optimizing) (SEI, 2010). These maturity estimations may be either based only on perceptions of knowledgeable business leaders (and in these cases, they are often highly subjective), or performed more formally with the

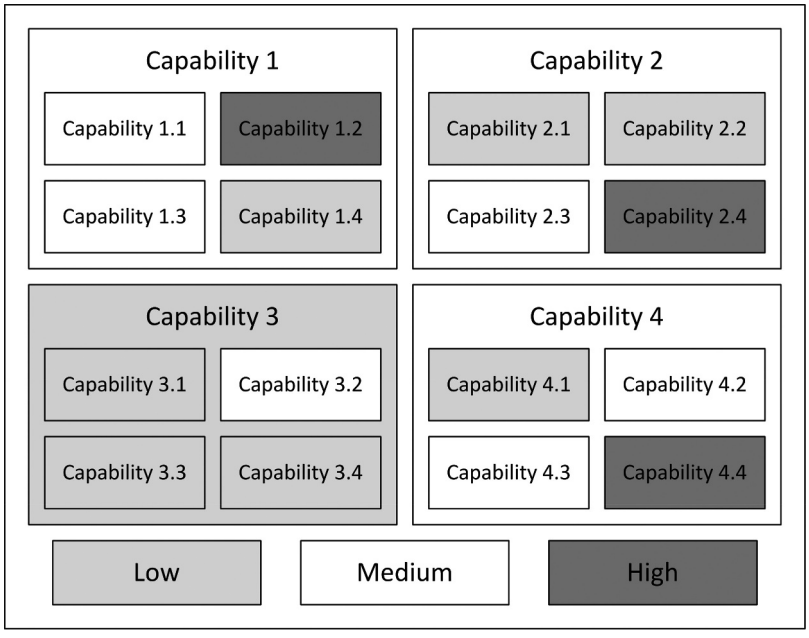

Figure 4. Color-coding of BCMs based on the current overall maturity of business capabilities.

involvement of external consultancies, acknowledged industry experts or certain "objective" industry benchmarks. After the maturity assessment, business capabilities in BCMs are color-coded accordingly to indicate their respective maturity levels. A schematic graphical example demonstrating the idea of color-coding BCMs based on the current overall maturity of business capabilities is shown in Figure 4.

After being completed, color-coded BCMs inform IT investment processes and prioritization procedures. An understanding of the current maturity of different business capabilities allows architects and business leaders to decide which capabilities require more IT investments in the future to increase their maturity levels. However, the most important conceptual difference between highlighting the levels of maturity and IT support in BCMs (see Figure 2) is that business capabilities may be immature due to other reasons unrelated to IT, e.g. current business processes do not leverage the functionality of available information systems or the personnel responsible for performing the capability lacks appropriate skills and adequate training. For this reason, a maturity level of a certain capability may not always be uplifted by means of investing more IT dollars in the underlying information systems. Due to its broader focus on the overall maturity of business capabilities, which encompasses multiple diverse factors, rather than only IT support, this technique facilitates deeper, less IT-centric dialog between business and IT stakeholders and helps them discuss existing business issues in their full complexity. Of our sample, this approach to using BCMs was practiced in organizations #4, #7, #12, #13, #16, #22, and #26 (see Appendix A).

Current maturity of different capability components (color-coding)

Color-coding BCMs according to the current maturity of various components of business capabilities represents a more advanced way of using the notion of capability maturity for information systems planning. Unlike the "simple" general assessment of capability maturity discussed earlier (see Figure 4), this approach is more sophisticated and implies explicitly assessing the maturity of different components constituting business capabilities. Although there is no universal agreement on exactly which elements should be viewed as components of business capabilities, most often these elements can be reduced in some or the other form to people, processes, information, and technology (which is roughly equivalent to the current IT support discussed earlier, see Figure 3). The maturity levels of corresponding capability components are usually assessed during the meetings between architects and competent business stakeholders in a way similar to the assessment of overall capability maturity described earlier. Then, the determined maturity levels of capability components are color-coded inside respective business capabilities. A schematic graphical example demonstrating the idea of color-coding BCMs based on the current maturity of different capability components is shown in Figure 5.

After being completed, color-coded BCMs provide input to all organizational transformation processes, including IT investment prioritization procedures. Since this technique clearly distinguishes different types of required improvements, which are not necessarily related to IT, it has a broader impact on change management in the organization. For example, architects and business leaders can understand which business problems require more IT investments, which areas can be enhanced via leveraging already existing IT assets and which capabilities require coordinated efforts of business and IT to achieve improvements, e.g., installment of new information systems in conjunction with rethinking current business operations and improving the competence of their actors. Of our sample, this approach to using BCMs was practiced in organizations #5, #10, #24, and #27 (see Appendix A).

Proactive approaches

Proactive approaches to the use of BCMs focus more on the desired future situation in different business capabilities and facilitate information systems planning by indicating some goals for the use of IT in organizations. These approaches can also be viewed as top-down approaches since they leverage primarily an understanding of the relative strategic importance of business capabilities incoming from global business leaders responsible for the long-term success of their organizations. Unlike reactive approaches discussed earlier, proactive approaches provide a more or less definite outlook for the future and thereby offer certain guidance for future IT investments. Four different proactive approaches, starting from simpler ones and ending with more sophisticated ones, are described in detail below.

Intuitive importance (color-coding)

Color-coding BCMs according to the perceived importance of different capabilities for executing the business strategy based on an intuitive understanding of business executives provides a relatively simple and easy way of driving organizational transformation processes. This approach represents essentially only an "educated guess" regarding which business capabilities might be critical for the organization in the long run. As part of

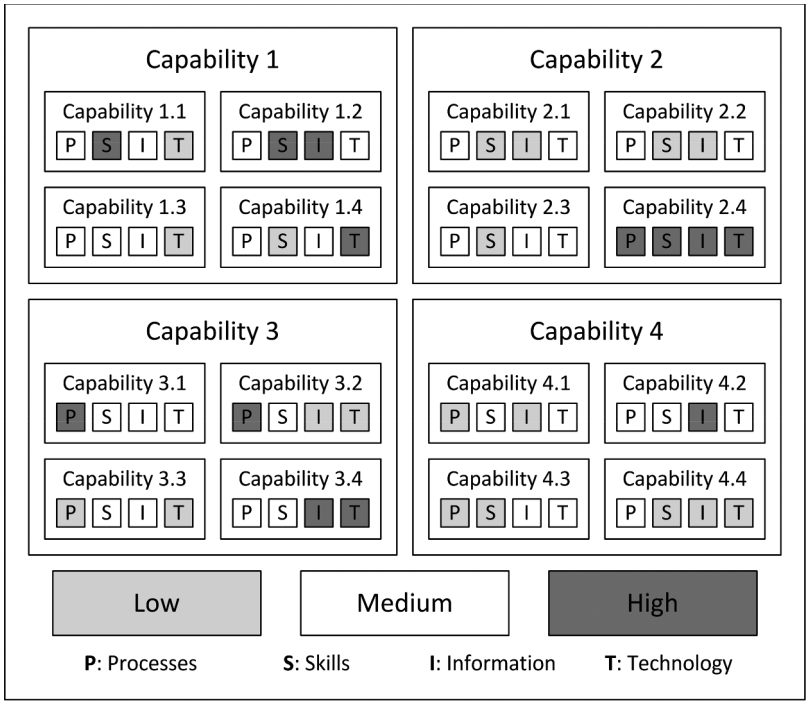

Figure 5. Color-coding of BCMs based on the current maturity of different capability components.

this approach, strategic business capabilities are identified through dialog between architects and business executives without any formal justifications except for the opinions of competent senior managers. As a result of this dialog, business capabilities believed to be important or strategic by executives are color-coded, or "heat-mapped," accordingly in BCMs. A schematic graphical example demonstrating the idea of color-coding BCMs based on the intuitive importance of business capabilities is shown in Figure 6.

After being completed, color-coded BCMs drive organizational change and IT investment processes. Specifically, this technique helps business and IT leaders understand where the organization needs to focus its resources, which areas should become the aims of future improvement efforts and propose appropriate initiatives

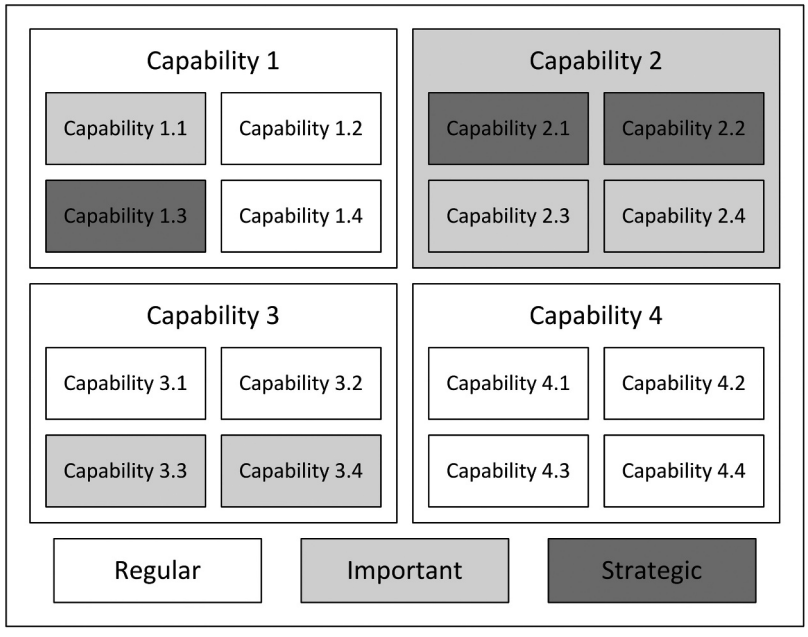

Figure 6. Color-coding of BCMs based on the intuitive importance of business capabilities.

to address these areas. An understanding of the most important business capabilities offered by BCMs also allows business executives to estimate and prioritize local bottom-up initiatives based on their anticipated contribution to the overall strategic direction. Of our sample, this approach to using BCMs was practiced in organizations #1, #5, #6, #9, #13, #20, and #25 (see Appendix A).

Business objectives (mapping)

The mapping of intended business objectives to BCMs helps decision-makers better understand exactly which business areas require improvements in the future to execute the business strategy. Business objectives are usually formulated by senior business leaders and are often derived from the corporate strategy. Then, through intense dialog between architects and business leaders, these objectives are related to respective business capabilities and placed in BCMs to explicitly indicate which capabilities should support their achievement. A schematic graphical example demonstrating the idea of mapping business objectives to BCMs is shown in Figure 7.

After being performed, the mapping of strategic business objectives to BCMs guides future IT investments and informs prioritization processes. This technique helps managers understand where in the organization enhancements should be made, propose candidate IT initiatives necessary to achieve the declared objectives, understand their impact on the organization and also leverage potential synergies in addressing business objectives related to a single or few related business capabilities, e.g. conceive information systems that can contribute to multiple business objectives simultaneously. Of our sample, this approach to using BCMs was practiced in organizations #1, #2, #4, #6, #8, #19, and #25 (see Appendix A).

Target maturity (color-coding)

Color-coding BCMs according to the target maturity of various capabilities helps business and IT leaders concentrate organizational efforts on improving business areas deemed important from a strategic point of view. The desired maturity levels of different business capabilities are often determined during the conversations between architects, local business managers "owning" these capabilities and global leaders understanding their strategic importance for the whole organization. This approach is typically used in conjunction with current maturity assessments (see Figure 4), which provide input and inform discussions regarding the necessary maturity levels of particular business capabilities. After being decided upon, desired maturity levels are indicated by means of color-coding in BCMs in a way analogous to the current maturity levels discussed earlier. A schematic graphical example demonstrating the idea of color-coding BCMs based on the target maturity of business capabilities is shown in Figure 8.

After being completed, color-coded BCMs inform IT investment processes and prioritization procedures. An understanding of the target maturity of different business capabilities allows architects and business leaders

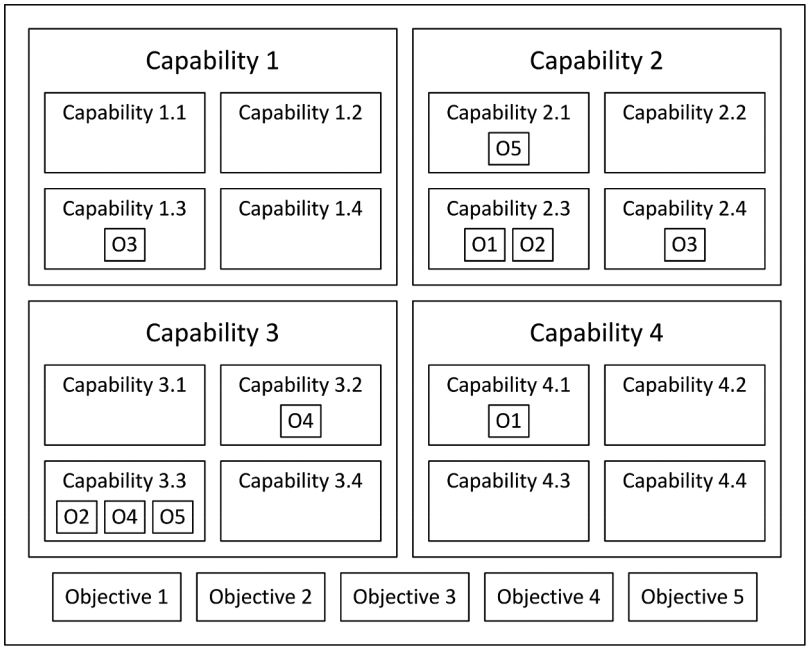

Figure 7. Mapping of business objectives to BCMs.

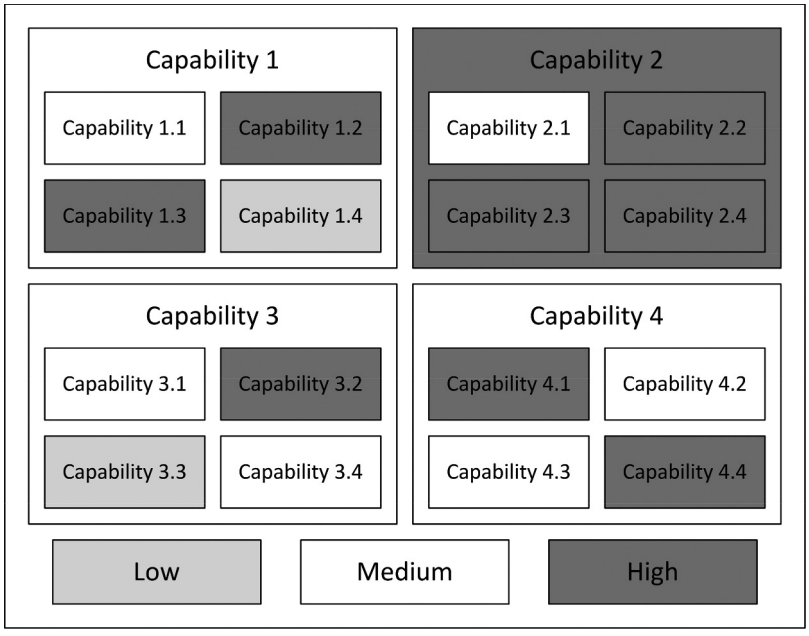

Figure 8. Color-coding of BCMs based on the target maturity of business capabilities.

to focus their future efforts on the right organizational areas and avoid unnecessary expenditures on projects that do not contribute to these areas. Since business capabilities represent multifaceted abstractions including both IT-related and non-IT-related elements, as discussed earlier, uplifting a maturity level of a particular business capability does not always require any IT investments and often may be realized via some changes in the business side of the organization, e.g., streamlining business processes based on the existing IT systems.

Color-coding of BCMs based on the target maturity can also be accomplished in relation to different capability components (e.g., people, processes, information, and technology) analogously to the current maturity levels discussed earlier (see Figure 5). This technique helps managers construct a more detailed and granular view of the desired future state of the organization to guide future initiatives. Generally, target maturity is normally modeled in organizations in the same way in which current maturity is modeled. Of our sample, this approach to using BCMs was widely practiced in organizations #4, #7, #10, #12, #13, #16, #22, #24, #26, and #27 (see Appendix A).

Capability gaps (color-coding)

Color-coding BCMs according to the gaps between the current and desired maturity levels of various business capabilities helps decision-makers better understand how much improvement is required in different business areas and roughly estimate the magnitude of investments necessary to realize these enhancements. This approach is used in conjunction with current maturity assessments (see Figure 4) and target maturity determinations (see Figure 8). Specifically, current and target maturity levels of business capabilities are compared with each other and ensuing capability gaps are "calculated" as the difference, or contrast, between these maturity levels for particular capabilities. Results of this gap analysis are then explicitly indicated in BCMs by means of color-coding, or "heatmapping," different business capabilities according to the volume of identified capability gaps, e.g. negligible gap, medium gap or large gap. A schematic graphical example demonstrating the idea of color-coding BCMs based on the gaps in business capabilities is shown in Figure 9.

After being determined and specified in BCMs, capability gaps provide a very clear and straightforward indication of where future organizational efforts should be focused. This technique offers a simple and powerful way of illustrating in which areas of the organization improvements are necessary and what their magnitude is. BCMs color-coded based on capability gaps provide critical input for all investment prioritization processes and help business and IT leaders identify necessary initiatives to be executed by the organization.

If the maturity assessments in the organization distinguish different capability components (e.g. processes, skills, information and technology, as in the schematic example shown in Figure 5), then capability gaps are also determined based on different elements of business capabilities. In these cases, color-coded BCMs provide

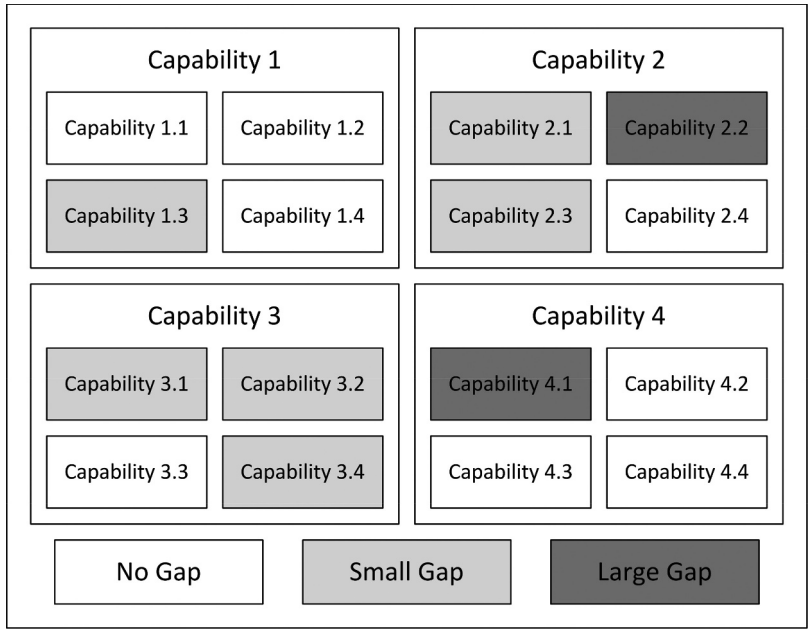

Figure 9. Color-coding of BCMs based on the gaps in business capabilities.

even more detailed guidance regarding necessary organizational improvements and help managers understand what kind of initiatives should be launched in different business areas, e.g., workforce trainings, process optimizations, development of new IT systems or complex initiatives affecting multiple capability components simultaneously. Of our sample, this approach to using BCMs was widely practiced in organizations #4, #7, #10, #12, #13, #16, #22, #24, and #27 (see Appendix A).

Retrospective approaches

Retrospective approaches to the use of BCMs focus on the historical situation in different business capabilities and facilitate information systems planning by informing present decisions based on what has been done by organizations in the past. These approaches can also be viewed as upside-down approaches since they leverage primarily an understanding of business capabilities from the perspective of some previous actions related to these capabilities. Although retrospective approaches are characterized by a backward outlook on the past, they still provide some valuable information useful for decision-makers for the purposes of future planning. However, during the data analysis, only a single articulate approach to using BCMs that can be considered retrospective has been identified: mapping of the amounts of previous IT investments to BCMs.

The mapping of the volume of IT investments made by the organization in the past to BCMs helps executives better understand in which areas the IT budget has been spent and where previous IT spendings have gone. Earlier IT expenditures for a certain period of time (e.g., the last financial year) are typically retrieved from the existing financial documentation and represent rather objective facts, rather than someone's opinions, as in all the approaches discussed earlier. These expenditures are then allocated to relevant business capabilities and the total amount of IT investments for each capability is calculated. The resulting amounts are mapped to respective business capabilities in BCMs. A schematic graphical example demonstrating the idea of mapping the amounts of previous IT investments to BCMs is shown in Figure 10.

After being accomplished, the mapping of earlier IT investments to BCMs helps managers evaluate the past performance of the organization in terms of focusing its IT investments in the right business areas. In other words, this technique allows decision-makers to collect objective "feedback" on how effectively their organization was able to concentrate its resources on strategically important business capabilities. For this purpose, the mapping of previous IT investments to BCMs can be combined with any mapping or color-coding approaches that in some or the other form reflect agreed investment priorities, e.g., based on intuitive importance (see Figure 6), business objectives (see Figure 7) or capability gaps (see Figure 9). The degree of overlap, or correlation, between the intended priority areas and the actual "consumers" of IT investments indicates the overall quality of the organizational investment

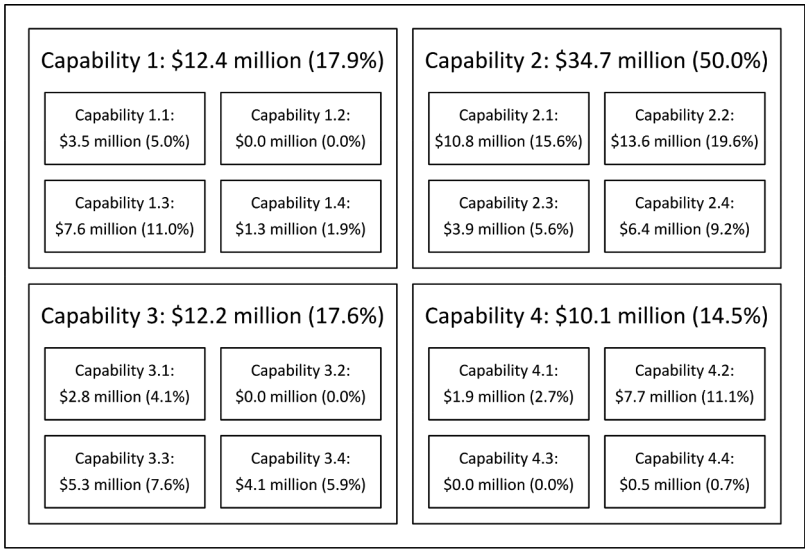

Figure 10. Mapping of the amounts of previous IT investments to BCMs.

portfolio. For example, if most IT investments made during the last financial year did not address the capabilities recognized by business leaders as strategic for the organization, then the effectiveness of its investment portfolio can be considered low.

Importantly, the comparison between declared priorities and actual expenditures is aimed not at increasing the effectiveness of specific IT investments per se, but rather at increasing the effectiveness of relevant decision-making processes that lead to ineffective investments. For example, a systematic dispersion of organizational IT investments away from strategic business capabilities may signify that the established investment prioritization procedures, decision-making responsibilities, and other IT governance arrangements are inefficient and fail to sustain the focus on the right areas. Of our sample, this approach to using BCMs was practiced only in organizations #7, #19, and #20 (see Appendix A).

Summary of the identified approaches

Although the studied organizations adopted various organization-specific approaches to using BCMs in terms of their structure, granularity, format, color-coding styles, and other properties, the conducted data analysis has identified nine distinct general approaches, or archetypes, of the BCMs usage that explain common patterns of their practical application. These general approaches are briefly summarized in Table 2. More detailed information on which approaches have been employed in which organizations can be found in Appendix C.

Because different approaches to using BCMs are not incompatible and potentially even complementary, organizations often benefit from employing more than one approach simultaneously (see Appendix C). In simple cases, it can be achieved by applying multiple different mappings and possibly one color-coding scheme to the same BCM. For example, in organization #8, business capabilities were color-coded based on the current level of their IT support (see Figure 3) and, at the same time, business objectives (see Figure 7) and business problems (see Figure 2) were also mapped to them. In more complex cases, several versions of BCMs with different mappings and color-coding schemes can be created replicating the same basic structure of business capabilities. For example, in organization #12, a number of color-coded versions of BCMs were maintained in parallel to reflect the level of IT support, current maturity, target maturity and identified gaps in business capabilities.

Discussion of findings

This study provides arguably the first broad, empirical, and systematic analysis of business capability modeling approaches and respective uses of BCMs adopted in the industry for the purposes of joint business and IT planning and aligning business and IT. The nine identified general approaches to business capability modeling (see Table 2) extend our understanding of BCMs and their practical application. The findings of this study fit into the context of the existing literature on BCMs and their usage.

Table 2. Summary of the identified approaches to using BCMs.

Category	Type	Focus	Brief description	Example
Reactive (bottom-up)	Mapping	Business problems	Existing business problems are mapped to BCMs to identify problem areas to be addressed with IT	Figure 2
	Color-coding	Current IT support	Different capabilities are color-coded in BCMs according to their current IT support to understand where future IT investments can contribute the most	Figure 3
	Color-coding	Current overall maturity	Different capabilities are color-coded in BCMs according to their current maturity to understand where improvements might be required	Figure 4
	Color-coding	Current maturity of different capability components	Different capability components are color-coded in BCMs according to their current maturity to understand where and what kind of improvements might be required	Figure 5
Proactive (top-down)	Color-coding	Intuitive importance	Different capabilities are color-coded in BCMs according to their intuitive importance to understand where future IT investments should go	Figure 6
	Mapping	Business objectives	Strategic business objectives are mapped to BCMs to identify the areas that should be improved to achieve these objectives	Figure 7
	Color-coding	Target maturity	Different capabilities are color-coded in BCMs according to their target maturity to understand the priorities for future improvement efforts	Figure 8
	Color-coding	Capability gaps	Different capabilities are color-coded in BCMs according to their capability gaps to understand where improvements should be made and what their magnitude is	Figure 9
Retrospective (upside-down)	Mapping	Amounts of previous IT investments	Amounts of made IT investments are mapped to BCMs to understand whether the organization was able to concentrate its resources on high-priority areas	Figure 10

Industry adoption of business capability models

The findings of this study confirm the earlier observations of Khosroshahi et al. (2018) regarding the widespread industry adoption of BCMs. However, the relative popularity of BCMs across the organizations analyzed as part of this study was somewhat lower than in the study of Khosroshahi et al. (2018). In particular, out of the 27 organizations involved in this research only 19 used BCMs, while Khosroshahi et al. (2018, p. 4606) reported that "of the 25 surveyed organizations, 23 use BCMs." This lower adoption rate of BCMs can arguably be attributed specifically to the insufficient maturity of EA practices in some of the studied organizations (Kotusev, 2021b). In light of these findings, BCMs can fairly be viewed as one of the most popular EA artifacts used in the industry.

Usage scenarios of business capability models

The approaches to using BCMs identified in this study generally resemble various usage scenarios described previously in anecdotal industry publications on BCMs (Greski, 2009; Hadaya & Gagnon, 2017; Scott, 2009; Tiwary & Unhelkar, 2018). However, none of these publications clearly articulates different approaches to using BCMs or describes any of these approaches in great detail. For example, Greski (2009) claims that BCMs can help business leaders to visualize the impact of business strategy and its changes on business capabilities, but does not explain how exactly it can be done and does not describe corresponding modeling approaches. Likewise, Scott (2009, p. 3) asserts that BCMs can help "focus business investments where they have the greatest impact" and "illuminate where the organization needs to focus to implement its strategies." However, he does not explain what specific modeling approaches might be appropriate for these purposes. Hadaya and Gagnon (2017) provide a "template" example of BCMs analogous to the one shown in Figure 1 and argue that BCMs can help bridge the gap between the business strategy and the design of its building blocks as well as facilitate further IT planning, but they do not describe the capability modeling approaches that can be helpful for these purposes. Finally, Tiwary and Unhelkar (2018) describe current maturity assessment, future maturity determination and gap analysis procedures, as well as provide respective schematic graphical examples similar to the ones shown in Figures 4, Figures 8 and 9, but arguably fail to provide a comprehensive and systematic description of their roles in the overall strategic decision-making context. Therefore, the approaches to using BCMs identified in this study highly correlate with the earlier descriptions of the BCMs usage found in the literature, but expand these descriptions by providing a more detailed empirical analysis of different usage scenarios of BCMs and their applications.

At the same time, some of the approaches to using BCMs identified in this study seemingly have never been mentioned in the existing literature before and, thus, represent completely new findings. Namely, the color-coding based on the maturity of different capability components (see Figure 5), as well as the mappings of business problems (see Figure 2) and business objectives (see Figure 7) to BCMs, are arguably newly identified approaches for which no descriptions are available in the literature.

Also, the findings of this study generally confirm the earlier observations of Khosroshahi et al. (2018) and Yilmaz et al. (2021) regarding the diversity of approaches and use cases of BCMs adopted in the industry. Moreover, the findings clearly indicate that there is no single "right" way to model business capabilities and use BCMs, but rather a number of different approaches that range in their sophistication and might be applicable to different situations and organizational contexts.

Differences from the earlier findings

Although the findings of this study empirically confirm many of the prior discussions and prescriptions on using BCMs, some of our observations differ from the suggestions of previous academic research (see Table 1). Most importantly, some authors (Aldea et al., 2015; Azevedo et al., 2015) argue for a formalized approach to modeling business capabilities and propose to employ specialized graphical notations for denoting business capabilities and related entities, in particular, special elements of the ArchiMate language (now included in the official ArchiMate specification). However, none of the studied organizations adopted this approach and used ArchiMate or any other non-trivial modeling notation for visualizing business capabilities. By contrast, most companies created simple, intuitively understandable and largely informal BCMs that were typically plain Visio, or even PowerPoint, diagrams with (rounded) rectangles and other primitive elements.

Other authors (Brits et al., 2007; Zdravkovic et al., 2013) advocate using rather rich meta-models and other sophisticated conceptual frameworks for modeling business capabilities. However, none of the interviewees reported the explicit adoption of any particular meta-models or frameworks for creating their BCMs, though some simplistic meta-models still might have been used by architects implicitly. The interviewees also did not mention expressly any specific capability modeling strategies similar to the ones discussed by Espana et al. (2015).

Conclusion

This study investigated the practical usage of BCMs for improving business and IT alignment in organizations. As a result, it identified nine distinct approaches to using BCMs for aligning IT investments with business demands (see Table 2). Most of these approaches have not been adequately described in the existing literature on the subject.

Limitations of this study

Despite its wide coverage and broad industry focus, this study has a number of important limitations that should be clearly acknowledged. First, this study aimed specifically at the usage scenarios of BCMs that arguably represent its core purpose in organizations: helping align IT investments to organizational needs. However, the practical applications of BCMs are not limited only to aligning business and IT. For instance, Khosroshahi et al. (2018) identified 14 diverse use cases of BCMs most of which are not directly related to business and IT alignment or prioritization of IT investments, e.g., identifying harmonization potential and compliance issues, determining candidate applications for migrating into the cloud and even evaluating the staffing of project teams. Because of the intentionally narrow focus of this study, various use cases of BCMs unrelated specifically to business and IT alignment have not been analyzed as part of this research (though such use cases have certainly been mentioned by the interviewees, e.g., identifying stakeholders for particular change initiatives, candidate IT systems and business processes that can be safely outsourced, etc.). The same reasoning also applies to the mappings of various entities to BCMs, e.g. processes, systems, technologies, and projects (Khosroshahi et al., 2018). Hence, the analysis presented in this paper covers in detail actually only a rather limited subset of all possible applications of BCMs in organizations.

Second, the data for this study was collected as part of a broader exploratory research effort addressing the usage of various EA artifacts in organizations, not only BCMs. Although significant attention was paid to BCMs as one of the least understood type of EA artifacts, the data collection has not been focused exclusively on BCMs. For this reason, some aspects of the practical usage of BCMs might not have been explored in sufficient detail.

Lastly, this study makes no strong claims regarding the generalizability of its findings (Lee & Baskerville, 2003; Seddon & Scheepers, 2012). On the one hand, none of the identified approaches to using BCMs seems to be organization-specific or idiosyncratic. All of them can be potentially utilized in various companies irrespective of their industries and, in this sense, seem universal. On the other hand, these approaches cannot be considered exhaustive as they are unlikely to reflect all possible uses of BCMs for aligning business and IT invented in the industry. Also, due to the relatively small size of our sample, our conclusions about the popularity of different approaches are not statistically significant. Moreover, most organizations visited as part of this

research were Australian and, thus, the identified usage scenarios of BCMs might be somewhat Australia-specific and inspired by local EA consultancies.

Directions for future research

This study also suggests a number of directions for further research on BCMs and their practical usage. Firstly, BCMs have been found useful in most of the studied organizations, but not in all of them. Moreover, a few organizations tried using BCMs in the past, but then abandoned these efforts for some or the other reason. For example, in one of these organizations, BCMs were not accepted warmly by business leadership and its architecture manager decided to use value chains for similar purposes instead, which were more familiar to business managers. For this reason, the use of BCMs can hardly be viewed as a universal practice equally helpful for all organizations. However, the limits of their applicability are rather unclear, potential factors facilitating or inhibiting their adoption remain unknown and the reasons why organizations may opt not to use BCMs are barely understood. All these gaps offer fruitful directions for future research on business capability modeling and BCMs.

Secondly, many other well-recognized usage scenarios of BCMs still remain insufficiently studied and understood. The most popular, and also arguably the most important one, of these use cases is the mapping of existing applications to BCMs and then color-coding these applications based on some of their important properties, e.g., lifecycle phases, technical quality or adequacy for the business (Khosroshahi et al., 2018). Although different variations of this approach were widely used in the studied organizations, their details, benefits, advantages, and disadvantages are barely understood. Furthermore, besides applications, Khosroshahi et al. (2018) also identified nine other types of information that can be mapped to BCMs: responsibilities, processes, projects, costs, business objects, technologies, services, business demands, and user stories. Unfortunately, little or no meaningful information is currently available on these mappings. Therefore, the analysis of other usage scenarios of BCMs unrelated directly to business and IT alignment, and especially the mapping of applications to respective business capabilities, represents another important direction for further research.

Notes

1. Importantly, organizations were selected for inclusion in our sample before we had a chance to know whether they actually used BCMs in their EA practices. As it turned out later, many of them did not use BCMs (see Appendix C). Although the inclusion of organizations not using BCMs may seem irrelevant to the purposes of this study, their inclusion allowed judging about the prevalence of BCMs across the industry and also raise the question of the limits of their practical applicability, as discussed later
2. Under "mini-case studies" we mean targeted studies of organizations that do not fully meet the criteria of full-fledged case studies, e.g. multiple interviews and comprehensive documentation analysis (Yin, 2017)
3. These numbers indicate permanent IT staff count plus an unknown, variable or hard-to-estimate number of partners, vendors and outsourcers.

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No potential conflict of interest was reported by the author(s).

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Appendix A: Profiles of the Involved Organizations

This appendix provides an overview of our sample of organizations. Detailed profiles of the organizations involved in this research are summarized in Table A1.

Table A1. Detailed profiles of the organizations involved in this research.

Country	#	Industry sector	Total staff	IT Staff	EA experience	Interviews
Australia	1	University	>7000	>500	>3 years	9
	2	Bank	>40000	>3000	>8 years	7
	3	University	~5000	~250	~2 years	1
	4	Bank	>40000	>5000	>10 years	4
	5	University	>5000	>200	~3 years	1
	6	Transport	~2000	~300	>5 years	1
	7	Retail	>80000	>1000	>4 years	3
	8	Public Service	~2100	~60	~1 year	1
	9	Telecom	>4000	>500	>6 years	7
	10	Public Service	>17000	>300	>5 years	1
	11	Diversified	~2600	~120	~2.5 years	1
	12	Finance	~250	~40	~3 years	1
	13	Marketing	~2500	~600	~2 years	1
Europe	14	Resources	~80000	>3000	>10 years	1
Australia	15	Bank	~7000	~500	~5 years	1
	16	Government	~2500	~100	~1 year	1
	17	Utilities	~2500	>25 (+)[3]	~4 years	1
	18	Retail	>20000	>500	>5 years	2
	19	Delivery	>30000	>500	>5 years	5
	20	Insurance	~20000	~1500	>5 years	1
	21	Food	~1600	>15 (+)	~1 year	1
	22	Manufacturing	~3500	~4 (+)	~3 years	1
	23	Telecom	>30000	>3000	~2 years	5
	24	Government	~2500	~400	~4 years	1
	25	Resources	~6000	~550	>6 years	2
New Zealand	26	Resources	~2000	~200	>5 years	2
	27	Delivery	~8000	~500	~5 years	1

Appendix B: Interview Protocol

All the interviews taken in this study were guided by a standardized protocol. However, due to the semi-structured nature of the conducted interviews and the overall exploratory attitude of this research, this protocol was used more as an overall framework for driving and structuring conversations, than as a verbatim questionary.

Respondent Background

(1) What is your position in the organization?
(2) How long have you been working in the organization?
(3) Could you briefly describe your responsibilities?

Company Background

(1) What is the nature of the business of your organization?
(2) How many people does your organization employ?
(3) How many IT staff does your organization employ?
(4) What is the high-level structure of your organization?

Enterprise Architecture Function Background

(1) How long has your organization been practicing EA?
(2) How does your EA function fit into the organizational structure?
(3) What types of architects does your organization employ (enterprise, domain, solution, etc.)?
(4) To whom does your EA function report?
(5) Does your organization employ any EA methodology or framework to organize its EA practice?

Enterprise Architecture Artifacts (Main Section)

(1) What are the main types of EA artifacts used in your organization?
(2) Could you briefly describe these types of EA artifacts?
(3) What information do these types of EA artifacts contain?
(4) What is the typical volume of EA artifacts of each type (number of pages, diagrams, etc.)?
(5) Which architects develop each of these types of EA artifacts?
(6) What stakeholders work with these types of EA artifacts?
(7) How do these stakeholders use EA artifacts?
(8) What information do these stakeholders seek in EA artifacts?
(9) What is the purpose of these types of EA artifacts?
(10) What is the value of these types of EA artifacts?
(11) Could you describe how business decisions get translated into specific IT projects through these EA artifacts?

Additional Questions

(1) What tools are used in your organization to develop, store and distribute EA artifacts (MS Office, MS Visio, ARIS, Troux, Casewise, Mega, alphabet, etc.)?
(2) What modeling languages are used in your organization for creating EA artifacts (ArchiMate, UML, ARIS, BPMN, IDEF0, etc.)?

Appendix C: Approaches Adopted in Different Organizations

This appendix clarifies which of the identified approaches to using BCMs have been described by interviewees from which organizations. However, due to the limitations of this study related to the lack of exclusive focus on BCMs explained earlier, not all approaches employed in a particular organization may have been mentioned by its representatives. For this reason, the provided "statistics" should be interpreted essentially as a "lower estimate" of the utilized approaches. Different approaches to using BCMs adopted in different organizations are shown in Figure C1.

Figure C1. Different approaches to using BCMs in different organizations.