Enterprise Strategic Alignment Method

A cross-disciplinary capability-driven approach

Adina Aldea

ENTERPRISE STRATEGIC ALIGNMENT METHOD
A CROSS-DISCIPLINARY CAPABILITY-DRIVEN APPROACH

Adina Ioana Aldea

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DISSERTATION

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on account of the decision of the graduation committee,
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by

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List of Acronyms

ACM Association for Computing Machinery.

ADM Architecture Development Method.

ADR Action Design Research.

AEA Association of Enterprise Architects.

APM Application Portfolio Management.

ARR Accounting Rate of Return.

BCG Boston Consulting Group.

BITAM Business IT Alignment Method.

BMC Business Model Canvas.

BoS Blue Ocean Strategy.

BSC Balanced Scorecard.

CAD Computer-Aided Design.

CBP Capability-based planning.

CEO Chief Executive Officer.

CFO Chief Financial Officer.

CIO Chief Informations Officer.

CMM Capability Maturity Model.

COO Chief Operating Officer.

CPMM-EA Consumer Preference Metamodel for Enterprise Architecture.

CSLC Capability Systems Life Cycle.

CSO Chief Strategy Officer.

CTO Chief Technology Officer.

DEMO Design and Engineering Methodology for Organisations.

DEPEST Demographic Environmental Political Economic Sociocultural Technological.

DoDAF Department of Defence Architecture Framework.

DSIF Dutch Student Investment Fund.

DSRM Design Science Research Methodology.

EA Enterprise Architecture.

EAF Enterprise Architecture Framework.

EPM Enterprise Portfolio Management.

EPS Earnings per share.

ESAM Enterprise Strategic Alignment Method.

EVA Economic Value Added.

FEAF Federal Enterprise Architecture Framework.

FFF Five Forces Framework.

HORA Hoger Onderwijs Referentie Architectuur.

HR Human Resources.

IAF Integrated Architecture Framework.

IBM International Business Machines corporation.

IEEE Institute of Electrical and Electronics Engineers.

IM Information Management.

INSTAL Intentional Strategic Alignment.

IRR Internal Rate of Return.

IS Information Systems.

IT Information Technology.

JSTOR Journal Storage.

KPI Key Performance Indicator.

MCDA Multiple-Criteria Decision Analysis.

ME Method Engineering.

NAF Nederlands Architectuur Forum.

NATO North Atlantic Treaty Organisation.

NPV Net Present Value.

PAR Participatory Action Research.

PEST Political Economic Sociocultural Technological.

PESTEL Political Economic Sociocultural Technological Environmental Legal.

PI Profitability Index.

PM Portfolio Management.

PPM Project Portfolio Management.

QSPM Quantitative Strategic Planning Matrix.

RBV Resource-Based View.

ROA Return on assets.

ROE Return on equity.

ROI Return on Investment.

SA Strategic Alignment.

SAM Strategic Alignment Model.

SAMM Strategic Alignment Maturity Model.

SBOT Stichting ter Bevordering Ondernemerschap in Twente.

SD ScienceDirect.

SDev Standard Deviation.

SEAM Systemic Enterprise Architecture Method.

SIS Single Instance Strategy.

SLR Systematic Literature Review.

SM Strategic Management.

SMART Specific, Measurable, Achievable, Relevant, Time-bound.

SME Small and Medium Enterprises.

STEEPLE Sociocultural Technological Environmental Ethical Political Legal Economic.

SWOT Strengths Weaknesses Opportunities Threats.

TOGAF The Open Group Architecture Framework.

TOWS Confrontation Matrix.

TTCP The Technical Cooperation Program.

TTF Task-Technology Fit.

UML Unified Modeling Language.

UTAUT User Acceptance of Information Technology.

VP Vice President.

VRIN Valuable, Rare, Inimitable, Non-substitutable.

WoS Web of Science.

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Part I

Introduction to the topic

Chapter 1

Introduction

Nowadays, the external environment of organisations is intensifying in terms of competition and globalisation of markets (Amagoh, 2008). This, combined with constant technological advancements creates a more dynamic and unstable environment for organisations. In order to adapt to these changes, organisations need to design and implement planned change at a quicker rate (Burke, 2013). Organisations that rely on past success and persist with strategies that have worked previously have shown a decline in performance in situations of radical environmental change (Audia et al., 2000).

Therefore, organisations need to be able to successfully manage the different aspects of the strategy process. The strategy process, as it is most commonly known in Strategic Management (SM) literature, is composed of strategy formulation and strategy implementation (Mintzberg, 1990). Even though both of these aspects of the strategy process are deemed to be highly relevant to master for organisations, most of the SM literature is solely focused on strategy formulation, while literature about strategy implementation is lacking by comparison (Cater & Pucko, 2010). Furthermore, the topic of strategy formulation has raised quite some controversy over the years, with authors either arguing that it is a deliberate process or an emergent process. In more recent years, a common understanding has emerged which argues that an ideal situation would be one in which organisations use formal strategic planning, but also recognise that strategic initiatives can emerge from within the organisation (Andersen, 2004).

With this progression in the understanding of strategy formulations, scholars have begun to focus on the relationship between strategy formulation and strategy implementation, within the strategy process. Mintzberg (1990) argues that a division between strategic thinking (strategic formulation) and strategic action (strategic implementation) is not beneficial nor practical. Furthermore, such a clear distinction and ordering implies that a strategy is formulated without taking into account the organisational structure. Mintzberg (1990) argues

that the strategy and structure of an organisation are equally important and that there should not be an established precedence between the two, but they should be intertwined.

Based on these ideas of Mintzberg (1990), Henderson & Venkatraman (1999) have introduced the concept of strategic alignment. Strategic alignment is the ability to create synergy between the position of the organisation within the competitive environment and the design of the appropriate structure to support the execution (Baker & Jones, 2008). This should be done in such a way that a strategy is developed while considering the supporting structure, and that operational goals and actions are in line with the overall strategy. As proposed by Henderson & Venkatraman (1999), strategic alignment is an alignment between the business strategy, the business structure, the Information Technology (IT) strategy, and the IT structure. Therefore, it can also be seen as an alignment between strategy formulation and strategy implementation.

Strategic alignment is an ideal state in which an organisation goes through a process of continuous adaptation and change (Henderson & Venkatraman, 1999). Therefore, gaining and maintaining strategic alignment can prove very difficult for organisations (R. S. Chen et al., 2008). Multiple studies have analysed strategic alignment, and more specifically the problems organisations experience while trying to achieve it. C. Bradley et al. (2013) have found that 65 percent of organisations struggle with strategic alignment, while other studies have shown that approximately 50 percent of organisations consider they experience problems during strategy formulation, and between 50 percent and 90 percent of organisations consider they experience problems with implementing strategies (Kaplan & Norton, 2005; Economist Intelligence Unit, 2004; Sull, 2007; Franken et al., 2009).

In a recent study that investigates problems organisations experience with strategic alignment, we found similar results: 56.5 percent of respondents consider their organisations experience problems during strategy formulation while 74.6 percent experience problems during strategy implementation (Roelfsema et al., 2016). The top 10 issues identified by respondents range from conflicting priorities regarding reaching strategic goals, strategy formulation and implementation are seen as separate processes, the strategy is unsupported by existing information systems, and many problems related to communication of the strategic intent to employees.

But how can poor strategic alignment influence an organisation in practice? In order to illustrate the effects of misalignment, we have selected two well-known examples of organisations that have struggled with this issue: Kodak and Nike.

Kodak is a good example of an organisation that struggled with one aspect of strategic alignment, namely not adapting to change brought on by new technology. The once very popular brand that dominated the market for cameras for nearly a century began to struggle with adapting to the digital revolution (Lucas & Goh, 2009). Instead of focusing their strategic efforts on adapting to

the digital trend and doing what they were renowned for, they chose to make big investments in other markets such as pharmaceuticals, batteries, healthcare imaging, and many others. Most of these big investments proved to be unprofitable for Kodak. This, combined with their very late adoption of the digital trend, ultimately led to Kodak filing for bankruptcy in 2013. The organisation neglected to see that by sticking to their traditional ideas about photography, they would eventually lose their core market to the organisations that adopted digital technologies (Lucas & Goh, 2009).

According to the Strategic Alignment Model (SAM) by Henderson & Venkatraman (1999), Kodak experienced a problem with alignment on the competitive potential perspective. In this perspective, the alignment is focused on the exploitation of emerging IT capabilities in order to influence key aspects of the business strategy. In terms of the alignment types defined by Baker & Jones (2008), Kodak experienced problems with the contextual alignment, which states that the resources and abilities of the organisation should be in line with the competitive context of the organisation.

As we could see in the example of Kodak, formulating a consistent competitive strategy can prove to be a challenging task for an organisation, but implementing that strategy correctly can be even more difficult (Li et al., 2010). An iconic example of a problematic implementation of a strategy is the case of Nike. Since the 1970's, Nike has achieved exponential growth which has led to an increased complexity in their supply chain. As part of their Single Instance Strategy (SIS), they decided to invest in a new supply chain management system for demand planning (Arora & Aggarwal, 2012). The SIS is focused on having centralised information in one big database and simplification of the processes (Koch, 2004). The implementation of the new supply chain system was riddled with problems: the system was slow, not well integrated, contained lots of bugs, and was used by planners that were not properly trained to use the system before it went live. All these problems were caused by Nike underestimating the time, effort, and planning needed to implement this new system. These issues could have been avoided by Nike having a better understanding of what their supporting infrastructure could do, and by adjusting their implementation planning accordingly.

According to the SAM by Henderson & Venkatraman (1999), Nike experienced a problem with alignment on the service level perspective. This perspective focuses on how to create a successful IT service organisation by designing appropriate IT infrastructure and processes, to support the services of the organisation. In terms of the alignment types defined by Baker & Jones (2008), Kodak experienced problems with the IT alignment, which states that an organisation should ensure that the IT resources and abilities are in line with the IT strategy.

As we can see in the example of Nike, information technology (IT) is getting a more central role in an organisation. IT has become an important enabler of business strategies (H. M. Chen et al., 2005). In order to successfully

implement planned change, organisations need to align their formulated strategy with their supporting processes and IT infrastructure (Fritscher & Pigneur, 2011). This is known in literature and practice as the fit between Business and IT, and it represents one specific type of strategic alignment (Luftman, 2003). In literature, the Business and IT alignment, is the most studied type of alignment with many researchers focusing on how it can be improved (Luftman, 2004; Dobni, 2003; Li et al., 2010; Higgins, 2005; Vagadia, 2013), the main inhibitors (Hrebiniak, 2006; Steiner, 1979; Beer & Eisenstat, 2000; Thompson & Martin, 2010; Ali & Hadi, 2012), or how the alignment can show the value of IT investments (Fritscher & Pigneur, 2015).

However, not all research fully emphasises the role of IT in strategic alignment. Baker & Jones (2008) and Bergeron et al. (2004) consider strategic alignment as the ability to create synergy between strategy, structure, technology, culture, environment, resources, capabilities, and others. In the context of the strategy process, strategic alignment can be achieved when strategy formulation and strategy implementation are an intertwined and continuous process. Therefore, when strategic alignment is achieved, strategy implementation is in line with the Business and IT structures, and the Business and IT strategies are developed to match the organisational environment.

In practice, we can also observe organisation such as Amazon, Uber, and Airbnb which no longer question the role and importance of IT. For these types of organisations, which are frequently identified as digital enterprises, IT plays a very central role in their business model. In some cases, it allowed these organisations to reinvent the traditional business models usually associated with their respective industries. Even though, these types of highly digital enterprises do not struggle with all of the same questions as organisations pursuing Business and IT alignment, we consider that they could still benefit from other aspects of Strategic alignment, such as creating a fit between strategy, structure, culture, environment, resources, capabilities, and others.

One of the cornerstone propositions of the SAM is that in order for strategic alignment to be possible, the cross-domain relationships need to be recognised (Henderson & Venkatraman, 1999). This implies that when discussing strategy implementation we need to extend our view beyond that of only SM and also include complementary disciplines, such as Enterprise Architecture (EA), Capability-based planning (CBP), and Enterprise Portfolio Management (EPM). These three disciplines (EA, CBP, and EPM) have been chosen based on to the increasing body of literature that identifies them as ways to improve the Business-IT alignment (Kurniawan et al., 2013; Malta & Sousa, 2010; Danesh & Yu, 2015; Stirna et al., 2012; Meskendahl, 2010). Figure 1.1 illustrates how the four disciplines can be linked to each other.

Figure 1.1: The link between the four disciplines

1.1 Problem statement

Strategic alignment is a topic that has been the focus of the scientific community for decades, but to this day still remains a vague concept for many organisations. The most influential research on this topic is the work of Henderson & Venkatraman (1999) which introduced the concept of strategic alignment. Throughout the past decades, strategic alignment has taken many forms, of which the most well-known is the Business-IT alignment. The alignment between Business and IT has been documented since the late 1970's in the papers of McLean & Soden (1976). Unfortunately, to this day, achieving and sustaining a Business-IT alignment is still a challenge for organisations. However, strategic alignment goes beyond the Business-IT alignment, and is an indicator of the organisational performance being realised by a fit between factors such as strategy, structure, technology, culture, and environment (Baker & Jones, 2008; Bergeron et al., 2004). In the context of the strategy process, strategic alignment can be achieved when strategy formulation and strategy implementation are an intertwined and continuous process. Therefore, when strategic alignment is achieved, strategy implementation is in line with the business and IT structures, and the business and IT strategies are developed to match the organisational environment.

Based on the recent developments in literature, we identify several challenges that can serve as starting points for developing a method for improving strategic alignment. For each of these challenges, we explain the main concerns, exemplify them with sources from literature, and identify the specific parts of the ESAM which will help solve these concerns. Figure 1.2 illustrates an overview of these challenges and their respective implications for the ESAM.

Figure 1.2: Challenges which the ESAM should help address

Challenge 1: A method to improve strategic alignment based on cross-domain knowledge. While the SAM of Henderson & Venkatraman (1999) proposes that cross-domain relationships are needed in order for strategic alignment to be possible, the majority of literature on strategic alignment comes from the SM field. Furthermore, only a few studies focus on the relationships between two or more domains.

For example, from the SM field, scholars have been trying to adapt the existing strategy techniques and methods to accommodate the needs of the IT domain. An example of this is the Balanced Scorecard (BSC) which has been adapted to use IT measurements (Schelp & Stutz, 2007). Decoene & Brugge-man (2006) and Asli et al. (2013) argue that the BSC and the Strategy map can be used by organisations to improve strategic alignment. Moreover, Fritscher & Pigneur (2011) propose a model transformation between the BMC and ArchiMate as a solution for improving Business-IT alignment.

Malta & Sousa (2010) suggest the development of EA, a discipline for designing, planning and implementing organisational change, as a solution for managing the alignment between Business and IT. Supporting this statement, recent literature reveals that, for example, in EA modelling language ArchiMate, several strategic concepts have been included in order to facilitate the modelling of strategy. This has manifested itself in the form of the Motivation extension being added to the ArchiMate standard (Engelsman et al., 2011), mapping of the BMC with the help of the ArchiMate standard (Iacob et al., 2014; Fritscher & Pigneur, 2011), and propositions for further extension of the ArchiMate language with the concepts of Resource and Capability (Iacob, Quartel, & Jonkers, 2012), and Value (Bakhtiyari et al., 2015; de Kinderen et al., 2012), amongst others.

Other studies have suggested that the development of dynamic capabilities is strongly linked to the improvement of strategic alignment in organisations (Harguem et al., 2014; Danesh & Yu, 2015). Furthermore, capabilities are seen as a means to align Business and IT (Danesh & Yu, 2015; Stirna et al., 2012; Miklos, 2012). This view is in line with the current developments in EA, but also with SM literature which has identified capabilities as a way for organisations to gain and maintain competitive advantage in a turbulent environment (Teece & Pisano, 1994; Eisenhardt & Martin, 2000). Given this increased interest in capabilities, both in theory and in practice, it comes as no surprise that this concept has recently surfaced in EA. EA frameworks such as the The Open Group Architecture Framework (TOGAF) standard (The Open Group, 2011), have already introduced basic notions of capabilities and CBP, and their role in designing, planning and implementing organisational change. Although CBP is gaining more interest in the academic world, the literature available on this topic is very limited.

Another proposed solution to improving strategic alignment is the usage of Portfolio Management (PM) (Meskendahl, 2010). Project Portfolio Management (PPM) is a commonly used technique to align a portfolio of projects with strategic goals. Successful PPM can lead to an effective strategy implementation as long as there is an alignment between the organisational structure and the needs of PPM (Kaiser et al., 2015). Another facet of PM is Application Portfolio Management (APM) which focuses on the data collection, analysis, decision-making, and optimisation of application portfolios (Simon et al., 2010). Both project portfolios and application portfolios can lead to increased complexity in an organisation due to sheer size of these portfolios. It is suggested that EA can be used as a solution to manage this complexity (Riempp & Gieffers-Ankel, 2007).

As it can be seen, most of these studies propose extensions of established methods, models, standards with cross-domain knowledge. However, currently, there is no method available which builds up on this knowledge on a larger scale, such as the whole strategy process, which is essential for ensuring strategic alignment within organisations. Furthermore, most of these studies are still very specialised and focused on one or two domains, while not paying too much attention to further connections. This can lead to having a fragmented picture of an organisation, by not fully addressing the cross-domain requirement for strategic alignment. Therefore, with the Enterprise Strategic Alignment Method (ESAM) we propose a method to improve strategic alignment based on knowledge from multiple domains, such as SM, EA, CBP, and partially EPM.

Challenge 2: A method that can guide the strategy formulation process.

The strategy process can be seen as the way in which organisations formulate and implement their strategies (De Wit & Meyer, 2010). The need for a method which can help organisations with the strategy formulation process has become more apparent in recent literature. In a recent study, we found that

56,5 percent of respondents consider that their organisations experience problems during strategy formulation (Roelfsema et al., 2016). Studies have shown that organisations which integrate their formal strategic planning process with flexible responses to their changing environments can achieve the best performance (Grant (2003); Dibrell et al. (2014)). Furthermore, it is important for organisations to have a clear, unambiguous strategy backed up by sufficiently detailed plans (Acur & Englyst, 2006).

One way to assist organisations with strategy formulation is with the help of strategy techniques. Strategy techniques are recognised as helpful and even necessary in streamlining strategy development and execution (Nohria et al., 2003). Throughout the years, a myriad of models and techniques have been created for the sole purpose of helping managers master the strategy process (Nohria et al., 2003). Organisations nowadays have absorbed standard and iconic strategy techniques which they are using for multiple purposes (Hughes et al., 2009). Therefore, it is surprising how few studies have investigated how these strategy techniques can be combined with each other, or how they can be used in the strategy process. Moreover, even if some of these strategy techniques are considered to help improve the Business-IT alignment, only a few studies look into how they can be linked to other disciplines outside of SM, such as EA.

Much of the research in the past decades address only the strategic or conceptual perspectives of strategic alignment while only little research is focused on providing practical guidance or methods to improve the alignment H. M. Chen et al. (2005). In the research presented in this dissertation, we aim to design a method that can guide organisations with the strategy formulation process, by making the process explicit and supporting it with the help of recognisable strategy techniques. Furthermore, we demonstrate the usage of this method for supporting strategy formulation with the help of a serious board game, in which several phases of the method are included.

Challenge 3: A method that can help with the implementation of strategies. In the same study, we have found that 74,6 percent of organisations experience problems during strategy implementation (Roelfsema et al., 2016). Similar results have been found by other studies, which have shown that between 50 percent and 90 percent of surveyed organisations experienced difficulties during strategy implementation due to IT strategies not reflecting their business strategy, employees did not understand the business strategy or were unaware of it, or the strategy not being sufficiently translated into clear actions that will achieve their objectives (Kaplan & Norton, 2005; Economist Intelligence Unit, 2004; Sull, 2007; Franken et al., 2009).

Out of the top 10 most significant problems with strategic alignment identified in our study, six of them were related to communication within the organisation (Roelfsema et al., 2016). Respondents identified the following issues with communication: unknown individual responsibilities; the majority of the organisation does not understand the strategy; unknown impact of the strategy

on the employees; no clear understanding of expected actions of employees; no easy access of employees to information about strategic plans; unclear communication of the strategy.

According to Ulrich & Rosen (2011), capabilities can be used for the purpose of communicating and discussing strategic decisions with many different types of stakeholders within an organisation. The main reason for this is that capabilities are usually expressed in a common language that all stakeholders can understand (Gils & van Dijk, 2014). They can be used as a foundation for strategic discussions in terms of business outcomes (increased output, better quality, lower costs, revenue growth or improved market share) and also for providing a connection between strategy, processes and resources.

Furthermore, capabilities present a good start for EA and are an expression of what an organisation can do. Each capability has a specific set of organisational resources, competences, information, processes that help realise it (The Open Group, 2011). Thus with capabilities, we can link what an organisation can do with how it does it. If we consider these resources, competences, information, processes as part of the architecture of an organisation, we can use them to express how a specific capability is being realised, in great detail.

Moreover, with the help of CBP organisations can determine the impact of strategic plans on the EA. Capabilities can be linked to both strategic plans and the implementation of these plans via EA (The Open Group, 2011) or other methods. Any change in strategic plans might yield a change in business capabilities. In turn, this means there might be changes to the architecture of an organisation. Thus by having this connection between strategic plans and EA via capabilities, we can determine how a change in strategy can influence the architecture of an organisation. This can help have a more clear idea of how your organisation might change in different scenarios.

Additionally, capabilities can be used to create a more flexible organisation that easier adapts to change. They provide a more abstract approach to planning change by focusing on what the organisation can do, rather than how. Typically in organisations, the processes, people, technologies, etc. are frequently subject to change, which makes it rather difficult to make decisions based on this. By planning changes based on what the organisation can do, it can be easier to determine what needs to change, plan how to change it, and also track changes, since capabilities are relatively stable over time (Fay et al., 2001; Ulrich & Rosen, 2011).

Last but not least, capabilities are identified as the way to improve Business-IT alignment (Danesh & Yu, 2015; Stirna et al., 2012), to link business outcomes to IT (Miklos, 2012), and all-in-all as a solution for improving the business and IT alignment (Lee & Song, 2011; Zdravkovic et al., 2013).

Even with this increased interest, there is little research into how to design, assess, implement and monitor capabilities (Miklos, 2012). One of the applications of capabilities is in the context of CBP which focuses on the planning, engineering, and delivery of strategic business capabilities to the enterprise

(The Open Group, 2011). However, the available literature on CBP is mostly focused on the defence sector or is highly specialised for certain types of organisations, such as manufacturers. Even though EA frameworks, such as the TOGAF standard, propose CBP as a way to improve Business-IT alignment, no real guidelines, methods, models, techniques are presented to support the implementation of CBP.

In the research presented in this dissertation, we propose a method for CBP that can help organisations to translate their high-level strategic goals into implementable actions. Furthermore, we connect this method to the strategy process and EA. Moreover, we use the HubWays game to demonstrate how the predicted changes of implementing a new digital strategy and business model, defined with the help of the ESAM strategy techniques, can be simulated in a real-life case.

Challenge 4: A way to connect strategic decisions to the Enterprise Architecture. Another problem with strategic alignment identified by the respondents of our survey is that strategy is unsupported by existing information systems (51.1 percent). Furthermore, in the same survey, 55.4 percent of respondents identify that considering strategy formulation and strategy implementation as separate processes is a problem in their organisation.

While the scientific work of Henderson & Venkatraman (1999) has shaped the research on the topic of strategic alignment, it also has some shortcomings. Namely, it did not mention how organisations can correct misalignment, or how an organisation can connect their strategies to the supporting architecture (H. M. Chen et al., 2005). The architecture of an organisation, in terms of EA, is seen as a tool to guide the (re)design, migration, implementation and governance of business processes, organisational structures, information systems and the technical infrastructure of an organisation according to a vision (Engelsman et al., 2009). Furthermore, the EA can be aligned with the business model, strategy, processes, etc. of an organisation. Since this type of alignment is considered crucial for improving the performance of organisations, this can be considered a big limitation of the SAM of Henderson & Venkatraman (1999).

Several recent developments have been made to EAFs, such as TOGAF, which have helped close the gap between strategy and EA, with a focus on the Motivation elements and Business Architecture. Furthermore, the ArchiMate modelling language accompanying the TOGAF standard has also undergone several improvements. A few examples of this are the Motivation extension being added to the ArchiMate standard (Engelsman et al., 2011), model transformations between the BMC and the ArchiMate standard being proposed (Iacob et al., 2014; Fritscher & Pigneur, 2011), and also several propositions for further extension of the language with the concepts of Resource and Capability (Iacob, Quartel, & Jonkers, 2012; Azevedo et al., 2015), etc.

Nevertheless, EA in its current state of development is not sufficiently mature to support strategic alignment. More specifically, the ArchiMate modelling language does not include all the necessary concepts for modelling strategy and

value-related concepts. Furthermore, there is only limited information regarding how EA and CBP can be related to each other.

In the research presented in this dissertation, we propose a way to support the modelling of strategic, value and capability-related concepts in one of the most used languages for EA, namely the ArchiMate standard.

Challenge 5: A method that can help organisations improve their strategic alignment. Strategic alignment is a complex concept, with many definitions and interpretations, that has been the focus of SM literature for decades. When organisation improve their strategic alignment, this can have a positive influence on their overall performance. Multiple researchers throughout the years have studied this relationship and have shown that strategic alignment leads to better organisational performance (Schwarz et al., 2010; Sabherwal & Chan, 2001; Cragg et al., 2002; Rivard et al., 2006) in the form of increased sales revenues (Kunnathur & Shi, 2001; Kearns, 2005), improved operational efficiency (Oh & Pinsonneault, 2007), cost reductions (Chang et al., 2008; A. M. Johnson & Lederer, 2010), and can enhance customer value (Celuch et al., 2007).

However, improving strategic alignment can prove very problematic for organisations, as it relies heavily on their ability to create a fit between factors such as strategy, structure, technology, culture, environment, resources, capabilities, and others (Bergeron et al., 2004; Baker & Jones, 2008). These factors, also called influencers, can influence strategic alignment in a positive (enablers) or negative (inhibitors) manner. In a recent study, C. Bradley et al. (2013) have found that 65 percent of executives struggle with strategic alignment. These results are also confirmed by other studies, such as the ones by Alexander (1985); Hrebiniak (2006), and many more.

Furthermore, these kinds of studies have inspired researchers, such as Luftman (2004); Preston & Karahanna (2009); R. V. Bradley et al. (2012); Kearns & Sabherwal (2006); Segars & Grover (1998); Chan et al. (2006); Reich & Benbasat (2000); Charoensuk et al. (2014); Sabherwal & Kirs (1994), and others, to further investigate the influencers of Strategic alignment. As a result, multiple studies, both qualitative and quantitative in nature, have identified enablers and inhibitors of strategic alignment. One of the most notable ones is the Strategic Alignment Maturity Model (SAMM) of Luftman & Kempaiah (2007), which proposes six criteria for assessing the Business-IT alignment maturity, such as Communication, Competency/Value Measurements, Governance, Partnership, Scope & Architecture, and Skills. For each of these categories, Luftman & Kempaiah (2007) proposes five items that can be used to determine the Business-IT alignment maturity. Even though these items are focused on the Business-IT side of Strategic alignment, most of the enablers and inhibitors identified by other studies can also fall within the six criteria identified by Luftman & Kempaiah (2007).

Therefore, any technique, model, method, methodology, or framework aimed at helping organisations with improving strategic alignment should support at least some of the enablers of strategic alignment identified from literature. Fur-

thermore, it should help improve on (some of) the criteria identified by Luftman & Kempaiah (2007).

In order to design the method presented in this dissertation, we have taken into consideration the criteria proposed by Luftman & Kempaiah (2007) and the influencers identified from literature. Furthermore, as identified in the study of Moody (2009), we have used visual representations supported by notations with high cognitive effectiveness, such as ones provided by the ArchiMate modelling language. These types of notations can help practitioners to communicate in a uniform and unambiguous manner about the strategy, architecture, etc. of an organisation.

Moreover, in order to evaluate whether our proposed method can help organisations with improving their strategic alignment, we have designed an evaluation instrument, based on the SAMM by Luftman & Kempaiah (2007). This instrument has been applied in the three case studies used for the validation of our method, as a means for the representatives from the participating organisations to evaluate how our method has helped them with improving their strategic alignment.

As a conclusion of all the aforementioned challenges, a solution for improving strategic alignment should provide, first and foremost, a combined approach which incorporates cross-domain knowledge and should facilitate cross-domain relationships (Henderson & Venkatraman, 1999). Second, it should help organisations with strategy formulation by providing a flexible and objective process which can be supported by linked strategy techniques (Grant, 2003; Dibrell et al., 2014; Acur & Englyst, 2006). Third, it should help organisations with strategy implementation by using several capability-based techniques for communication, and, as intermediaries, between strategy and execution (Ulrich & Rosen, 2011; Danesh & Yu, 2015; Stirna et al., 2012). Fourth, it should help organisations with translating the strategic intent into EA by means of the ArchiMate modelling language to facilitate impact analyses, planning and monitoring of change, and the links between strategy techniques and EA (R. S. Chen et al., 2008; Kurniawan et al., 2013; Iacob et al., 2014; Fritscher & Pigneur, 2011). Fifth, it should help organisations with strategic alignment by improving communication, facilitating better partnerships, supporting improved governance, promoting an integrated architecture, and insuring an alignment between the different types of measurements an organisation can have (Luftman & Kempaiah, 2007; Preston & Karahanna, 2009; R. V. Bradley et al., 2012; Kearns & Sabherwal, 2006; Segars & Grover, 1998; Chan et al., 2006; Reich & Benbasat, 2000; Charoensuk et al., 2014; Sabherwal & Kirs, 1994).

1.2 Research questions

The main goal of this dissertation is to propose our method, named the Enterprise Strategic Alignment Method (ESAM), as a cross-domain solution which

can assist organisations with formulating and implementing strategies, while at the same time translating strategic intent into their EA. Based on this goal, the main question of our research can be formulated as follows:

How can organisations improve their strategic alignment by relating Strategic management, Capability-based planning and Enterprise Architecture?

In order to answer the main research question, several sub-questions are formulated. By answering these sub-questions the main deliverables of the research are generated. Each of these sub-questions are identified as a knowledge question (K) or as a design question (D). A knowledge question can be answered by investigating the state of the art regarding a topic or an artefact, whereas a design question can be answered by identifying design criteria, investigating possible solutions for the research problem, and analysing trade-offs between solutions (Wieringa, 2009).

SQ1: What is the current thinking regarding strategic alignment? (K)

The main goal of this sub-question is to investigate the state of the art theories, models, methods, and techniques regarding strategic alignment. Furthermore, we investigate the currently available solutions for improving strategic alignment and present their limitations. Moreover, we focus on three areas of research, namely EA, SM, and CBP, to build the basis for our proposed solution.

SQ1.1: What is the current thinking on business strategy? (K) This sub-question serves a similar purpose to sub-question SQ1. We investigate the developments and trends in the field of business strategy. Based on this we present the current thinking on the strategy process. Furthermore, we identify the most relevant strategy techniques and discuss their role in improving strategic alignment. Some of the presented strategy techniques are also incorporated in our proposed solution.

SQ1.2: What is the current thinking on Enterprise Architecture? (K) The purpose of this research question is to identify the current developments and trends in EA. We identify the most relevant EA frameworks and go into more depth into our chosen EA framework for the ESAM. Based on these insights we can determine if and how EA can be used as part of a solution for improving strategic alignment, namely the alignment between strategy development and strategy implementation.

SQ1.3: What is the current thinking on Capability-based planning? (K)

Similarly to the previous two sub-questions, we investigate the state-of-the-art regarding planning with the help of capabilities. We investigate the different approaches to CBP, assess them, and discuss their limitations. Based on these insights we propose a CBP method that can help improve strategic alignment,

while addressing the aforementioned limitations.

SQ2: *Why is there a problem with strategic alignment?* (K) In order to answer this research question, we look at both literature and practice. First, we investigate what the literature identifies as problems with strategy alignment. Second, we use the results of the literature review as a basis for a targeted investigation with practitioners. This can provide us with enough insights in order to design our method to address specific problems identified from both literature and practice.

SQ3: *How can strategic alignment be improved?* (D) This research question is divided into three parts, which represent the main artefacts of this research: the method, the serious games, and the software tool. For each of these deliverables we have formulated a sub-question that needs to be answered. Each of these sub-questions include the development, demonstration and evaluation of these artefacts, which correspond to three activities of the DSRM.

SQ3.1: *How to design an effective method to improve this alignment?* (D) The main deliverable of this research question is our cross-domain method (ESAM) for improving strategic alignment by guiding organisations through strategy formulation and implementation. The design of the ESAM is based on the results of the previous research questions and includes several guidelines, phases, and techniques, accompanied by formal modelling.

SQ3.2: *How can a software tool be used to support this method?* (D) The method is accompanied by a metamodel which determines the language, concepts, corresponding symbols, and relationships. This metamodel is used for designing an accompanying software tool for modelling and analysis. This software tool, is intended to be used by practitioners alongside the method, in order to extend the way the method can be used with the help of Computer-Aided Design (CAD).

SQ3.3: *How can serious gaming be used to support and disseminate this method?* (D) Based on the guidelines of the method, two serious games are designed. These serious games, similarly to the software tool, can be used both as practical applications of (parts of) the method. The main purpose of these serious games is to help participants experience the method in a safe environment, where they can experiment with it without real-life consequences.

1.3 Outline of the dissertation

This dissertation follows the guidelines of the Design Science Research Methodology (DSRM) by Peffers et al. (2007) which includes the following steps: prob-

lem identification and motivation, define the objectives for a solution, design and development, demonstration, evaluation, and communication. We have used the DSRM by Peffers et al. (2007) to guide our research and also to structure this dissertation, as presented in the following paragraphs. Furthermore, we use the DSRM to help answer the research questions formulated for our research (Section 1.2). Moreover, we group these chapters into three parts consisting of an introduction to the topic, the proposed solution to the research problem, and the validation and evaluation of the proposed solution, according to the DSRM proposed by Wieringa (2009).

Problem identification and motivation. The research problem needs to be defined and the value of the proposed solution needs to be stated. In this thesis, the summary of the problem identification and motivation activity can be seen in Chapter 1, while the main investigation is performed in Chapter 3. This DSRM activity helps provide a partial answer to SQ1 and SQ2. Chapter 2 contains a more detailed presentation of the research methodology which is used throughout this dissertation.

Defining the objectives for a solution. The objectives of the research need to be set based on the problem definition. These objectives can be considered as quantitative when they express how the proposed solution can surpass existing ones, or can be considered as qualitative when they express how the proposed method can support solutions for problems that weren't addressed before. According to Peffers et al. (2007), the resources needed in order to perform this activity include knowledge of the current state of research and the proposed solutions. This can be seen in Chapter 3 where the currently available literature is reviewed, which helps provide in-depth answers for all the knowledge research questions (SQ1, SQ1.1, SQ1.2, SQ1.3, and SQ2).

Design and development. Within this activity, the method that is proposed as a solution to the problem is developed. This includes determining the functionality and the architecture of the method, based on the literature review. In this dissertation, the design and development activity can be seen in Chapter 4 where the design of the proposed method is presented, together with its guidelines, phases, techniques, and formal modelling support. This DSRM activity helps answer the design research question SQ3.1.

Demonstration. The proposed method needs to be demonstrated in order to show its usability. There are several options to doing this: experimentation, simulation, case study, proof, and others. In this dissertation, the demonstration activity can be seen in Chapter 7, where the method is applied to three distinct case studies. This activity is also present in Chapter 5 where practical application of the method as a software tool is illustrated. Similarly, Chapter 6 presents the practical application of the method in the form of two serious games. This DSRM activity helps answer, in part, all of the formulated design research questions (SQ3.1, SQ3.2, and SQ3.3).

Evaluation. The proposed method needs to be evaluated in order to see how well it supports the problem. This entails comparing the objectives of

the research with the observed results of the demonstration activity. Chapter 8 contains the evaluation of our proposed method based on an analysis of method design, a qualitative assessment performed by the representatives of the case study organisations, and the cross-case analysis of the results of the three case studies. This DSRM activity helps answer the main design research question (SQ3).

Communication. This entails communicating the identified problem and the proposed solution in the form of a research publication, such as this dissertation and several scientific articles. A full overview of our published work and other contributions can be seen in Appendix A.

Table 1.1 illustrates a summary of the main chapters of the dissertation, mapped to the activities of the DSRM, in relation to the main topics covered in the research, and the research questions that are answered.

Table 1.1: Outline of the dissertation

	Chapters	Main topics	RQs
Introduction to the topic	Introduction	Problem statement	SQ1, SQ2
	<i>DSRM: Problem identification</i>	Research questions	
	Research methodology	Research design & methods	
		Validity threats	
	Literature review	Strategic alignment	SQ1, SQ2
	<i>DSRM: Objectives for the solution</i>	Business strategy	SQ1.1
		Enterprise Architecture	SQ1.2
		Capability-based planning	SQ1.3
Solution to research problem	Design of the ESAM	Strategy formulation with models	SQ3.1
	<i>DSRM: Design and development</i>	Strategy implementation with CBP	
		Strategic intent to EA with ArchiMate	
	Tool support for the ESAM	Management dashboards	SQ3.2
	<i>DSRM: Demonstration</i>	Canvases	
		Strategy design	
Validation & Evaluation	Serious gaming	Strategy process board game	SQ3.3
	<i>DSRM: Demonstration</i>	HubWays online multiplayer game	
	Validation of the ESAM	Case study I - Insurance company	SQ3
	<i>DSRM: Demonstration</i>	Case study II - Public university	
		Case study III - Investment fund	
	Evaluation of the ESAM	Method design evaluation	SQ3
	<i>DSRM: Evaluation</i>	Case study evaluation	
		Cross-case analysis	
	Conclusions	Discussion, Limitations and Further research	

1.4 Research contribution

We consider that our proposed method has several theoretical and practical contributions. The main theoretical contribution is the integration of several disciplines which combine the knowledge, theories and ideas from different fields of research, more specifically SM, CBP, and EA. Based on these different disciplines we propose a method that would help organisations align the pursuit of certain goals and strategies to the design of the appropriate structure to support the execution while monitoring and evaluating the strategic alignment.

Furthermore, we propose a unique way of combining strategy techniques to support the strategic planning process. These models are by no means new, but the novel way they are semantically linked together can help organisations have a more structured approach to strategy development with the help of models they might already be familiar with.

Moreover, we propose a CBP method that can be used by organisations to design and plan their transformation in a more flexible manner, by planning in terms of what the organisation can do instead of how it can do it. While several CBP methods have already been developed by the defence sector, they cannot be directly translated for usage by organisations.

Additionally, we investigate if and how the ArchiMate modelling language can support the modelling of strategic and capability related concepts. Based on our findings we propose several improvements to the language, and we demonstrate these with the help of an anonymised case.

From a practical standpoint, the proposed method provides clear guidelines and techniques for practitioners to follow and use in their pursuit of strategic alignment. The techniques and guidelines are also supported by a software tool which includes management dashboards, computer-aided canvases, and a spreadsheet-based tool for designing strategies.

Furthermore, we argue that the software tool can help organisations by offering advanced functionality support for strategy techniques and techniques that are familiar to them. Functionality such as the dragging-and-dropping of elements, the ability to link elements, colour-coding and attributes for elements, and the layering of multiple BMCs, to name a few, can be used for automated reasoning/analysis of models, which is not possible with normal paper-based alternatives.

Moreover, the strategic planning process aspect of the method is supported by a serious game which incorporates several strategy techniques. This game can be used to practice the usage of the strategy techniques in an environment that is risk-free. Therefore, participants can experiment with more types of decisions without fearing the consequences of real-life situations. Similarly, the HubWays online multiplayer game allows players to experience in a very realistic environment the benefits of a specific strategic decision, namely becoming a digital enterprise.

Additionally, the improvements proposed to ArchiMate modelling language

can enable EA practitioners to model the strategic intent of organisations. This could facilitate aspects such as impact analyses of strategic intent on the EA of an organisation, more relevant planning and monitoring of change, and also with emphasizing the strategic value of EA.

Finally, the CBP method can support organisations with bottom-up decision making, with clearly observing the impact of strategic decisions on their structure, with improving communication between top management and EA practitioners, and with having a more accurate performance assessment and monitoring.

1.5 Summary and Conclusion

Within this dissertation, we present the results of our research relating to strategic alignment. Strategic alignment is a continuous process of adaptation and change (Henderson & Venkatraman, 1999) in which organisations try to create synergy between their position within the competitive environment and the design of the appropriate structure to support the execution (Baker & Jones, 2008). In many cases, gaining and maintaining this alignment can prove very difficult for organisations (R. S. Chen et al., 2008), as shown by many studies (C. Bradley et al., 2013; Economist Intelligence Unit, 2004; Roelfsema et al., 2016). When organisations fail in these respects, the impact can prove devastating for some, as can be seen in the example of Kodak which had to file for bankruptcy. In other cases, the impact can be smaller, as seen in the case of Nike, with organisations being able to recover and continue their operations.

However if organisation improve their strategic alignment, this can have a positive influence on their overall performance (Schwarz et al., 2010; Sabherwal & Chan, 2001; Cragg et al., 2002; Rivard et al., 2006) in the form of increased sales revenues (Kunnathur & Shi, 2001; Kearns, 2005), improved operational efficiency (Oh & Pinsonneault, 2007), cost reductions (Chang et al., 2008; A. M. Johnson & Lederer, 2010), and can enhance customer value (Celuch et al., 2007), as many studies have shown.

The most researched type of strategic alignment is the Business-IT alignment, due to IT becoming a more important enabler of business strategies (H. M. Chen et al., 2005). From this perspective, in order to successfully implement planned change, organisations need to align their formulated strategy with their supporting processes and IT infrastructure (Fritscher & Pigneur, 2011). In the literature regarding the Business-IT the focus lies on how alignment can be improved (Luftman, 2004; Dobni, 2003; Li et al., 2010; Higgins, 2005; Vagadia, 2013), the main inhibitors (Hrebiniak, 2006; Steiner, 1979; Beer & Eisenstat, 2000; Thompson & Martin, 2010; Ali & Hadi, 2012), or how the alignment can show the value of IT investments (Fritscher & Pigneur, 2015). The most well-known proposal for Business IT alignment comes from Luftman & Kempaiah (2007), which introduces the SAMM.

However, not all literature is solely focused on the role of IT in strategic alignment. Baker & Jones (2008) and Bergeron et al. (2004) consider strategic alignment as the ability to create synergy between strategy, structure, technology, culture, environment, resources, capabilities, and others. In the context of the strategy process, strategic alignment can be achieved when strategy formulation and strategy implementation are an intertwined and continuous process. One of the cornerstone propositions for strategic alignment come from Henderson & Venkatraman (1999), in the form of the SAM. The SAM introduces four perspectives which can be used to guide the strategic alignment efforts of organisations, by focusing on the different ways alignment can occur within an organisation.

Based on a review of the available literature and the results of our own survey we are able to identify five challenges that a solution for improving strategic alignment should address. First, it should provide a combined approach which incorporates cross-domain knowledge and should facilitate cross-domain relationships. Second, it should help organisations with strategy formulation by providing a flexible and objective process which can be supported by linked strategy techniques. Third, it should help organisations with strategy implementation by using several capability-based techniques for communication and as intermediaries between strategy and execution. Fourth, it should help organisations with translating the strategic intent into EA by means of the ArchiMate modelling language in order to facilitate impact analyses, planning and monitoring of change, and the links between strategy techniques and EA. Fifth, it should help organisations with strategic alignment by improving communication, facilitating better partnerships, supporting improved governance, promoting an integrated architecture, and ensuring an alignment between the different types of measurements an organisation can have.

In order to address these challenges we turn to three disciplines (SM, CBP, and EA) which have been more or less linked to solutions for the aforementioned challenges, and specifically to improving strategic alignment. Based on this we formulate the main research question which relates to helping organisations improve their strategic alignment by means of the three selected disciplines. Furthermore, we formulate several sub-questions, on the one hand, aimed at gathering knowledge regarding strategic alignment, the three disciplines, and the problems with strategic alignment, and on the other hand, focused on designing a solution for improving strategic alignment in the form of a method, accompanied by software tools and serious games.

For the purpose of our research, we choose to use the DSRM, according to Peffers et al. (2007), which is also reflected in the structure of this dissertation. Figure 1.3 illustrates the structure of the dissertation in relation to the research questions and main deliverables of each chapter.

Figure 1.3: The structure of the dissertation in relation to the research questions and main deliverables of each chapter

In Chapter 1, we present the current problem with strategic alignment and define our research questions. The current problems with strategic alignment are grouped in five categories of challenges which should be addressed in our research. To guide our research process we have selected the Design Science Research Methodology (DSRM), which is presented in Chapter 2. Here we also detail aspects about the research design, the research method, the data collection methods, and an analysis of possible validity threats to the research. The first part of the research concludes with Chapter 3 in which we investigate, in more detail, the current state of available literature, from the point of view of strategic alignment, the problems with strategic alignment, and the three disciplines. This knowledge forms the basis for the design of our solution to

the research problem, which is presented in the following three chapters.

In Chapter 4 we present the design of our proposed solution, in the form of a method. This method combines the cross-domain knowledge gathered in Chapter 3 into eleven phases which are supported by multiple strategy techniques and ArchiMate models. In the following two chapters, Chapter 5 and Chapter 6, we illustrate the software tool and serious games that have been developed as a support for our method. These two can be seen as practical applications of the method that can demonstrate its usefulness beyond a conceptual exercise, and finalise the solution to the research problem.

Continuing, within Chapter 7 we present the validation of our method with the help of three distinct case studies. We investigate how our method can be applied in practice, and also in some cases, how the software tool support can complement it. The results of the case studies are evaluated in Chapter 8 with the help of a cross-case analysis. Additionally, in this chapter, we evaluate the design of the method from the point of view of the requirements we defined for it. Finally, we conclude in Chapter 9 by discussing how we addressed the research questions, what are the limitations of our research, how these could be addressed in future work.

Chapter 2

Research methodology

This chapter introduces the research approach that has been taken, together with the research methods that have been used. We motivate why these methods have been chosen and we specify which data collection methods have been used.

2.1 Research design

The research design establishes how the research will be conducted, what research methods and data collection methods will be used, and also addresses the concerns regarding validity and reliability.

2.1.1 Design science

Design science is a research methodology that emphasises the connection between theoretical knowledge and practical application by showing that scientific knowledge can be produced by designing useful things (Wieringa, 2009). This research methodology is typically used in Information Systems (IS) research where the goal is the design of innovative artefacts that can help solve a certain problem (March & Storey, 2008). With the help of design science, a researcher can address important unsolved problems in unique or innovative ways or can solve them in more effectively or efficiently (Hevner et al., 2004).

We have chosen to follow the design science research methodology because of its alignment with the purpose of this dissertation, namely to solve a specific problem (strategic alignment problem - Chapter 1 and Chapter 3) by designing an artefact (ESAM - Chapter 4).

Researchers have proposed multiple ways to structure the process of the DSRM. Notably, Wieringa (2009) proposes the following three phases: problem investigation, solution design, and solution validation. We follow these three

phases to structure the dissertation into three parts: Part I - Introduction to the topic, Part II - Solution to the research problem, Part III - Validation and evaluation of the solution, as also seen in Section 1.3.

Peffers et al. (2007) propose a slightly different process to design science. The authors identify six main phases, which can be considered a further specification to the ones proposed by Wieringa (2009): problem identification and motivation, defining the objectives for a solution, design and development, demonstration, evaluation, and communication. We have chosen to follow these six phases proposed by Peffers et al. (2007) to structure the chapters of the dissertation. An illustration of the activities of design science research methodology can be seen in Figure 2.1.

Figure 2.1: Design Science Research Methodology phases according to Peffers et al. (2007)

Hevner et al. (2004) investigate design science from the perspective of strategic alignment, and propose their own framework for understanding, executing, and evaluating IS research by combining behavioural science and design science. In this framework, the authors identify the importance of identifying the business need which should be used as a basis for developing the artefacts with design science. Secondly, they argue that the resulting artefacts need to be justified and evaluated in order to assess and improve the artefact, and also to contribute to the knowledge base by complementing, proving, or disproving the current knowledge base. Hence, Hevner et al. (2004) argue that behavioural science (which has the goal of uncovering the truth) and design science (which has the goal of creating utility artefacts) are inseparable and highly influential to each other. Furthermore, the authors provide several guidelines to performing design science, which can be seen in Table 2.1.

We follow these guidelines provided by Hevner et al. (2004) throughout whole the dissertation, by producing several artefacts (in the form of a method for enterprise strategic alignment, two games, and the software tool) which are based on technologies from multiple domains (SM, CBP, EA, and EPM) to solve the business need for strategic alignment. Furthermore, we demonstrate

Table 2.1: Guidelines for Design Science Research, according to Hevner et al. (2004)

Guideline	Description
Guideline 1: Design as an Artefact	DSRM must produce a viable artefact, such as a construct, model, method, or an instantiation
Guideline 2: Problem Relevance	The main objective of DSRM is to develop technology-based solutions to relevant business problems
Guideline 3: Design Evaluation	The utility, quality, and efficacy of an artefact must be rigorously demonstrated via evaluation methods
Guideline 4: Research Contributions	DSRM must provide contributions to the areas of the design artefact, design foundations, and/or design methodologies
Guideline 5: Research Rigour	DSRM relies on the application of rigorous methods in both the construction and evaluation of the artefact
Guideline 6: Design as Research Process	The search for an effective artefact requires the utilisation of available means to reach desired ends while satisfying the rules of the problem environment
Guideline 7: Research Communication	DSRM must be presented effectively to both technology-oriented and management-oriented audiences

the benefits of our artefacts by means of case studies, test sessions, and questionnaires. Moreover, with the artefacts we develop in this dissertation we provide multiple contributions to both theory and practice on strategic alignment, serious gaming, and software tool development for SM and CBP. Additionally, we conduct a Systematic Literature Review (SLR) on strategic alignment and related topics to gather all the necessary knowledge in order to ensure that the designed artefact is in accordance with all the requirements of the problem environment (strategic alignment). Last but not least, we present the artefacts of this thesis in a manner that is understandable and relatable to both technology- and management-oriented audiences, by using relevant terms accompanied by clear explanations.

2.1.2 Action design research

Action research is a type of research which incorporates theory with researcher intervention to solve immediate organisational problems (Sein et al., 2011). It is an iterative process which uses hypotheses that are refined over repeated cycles of testing (Davison et al., 2004). Sein et al. (2011) propose an Action Design Research (ADR) method which incorporates aspects of both design science research and action research. The authors argue that the ADR is needed because it is necessary to recognise that the artefact design emerges from the interaction with the organisational context even if the original design is guided by the researcher's intent.

The ADR method proposed by Sein et al. (2011) comprises of four stages:

problem formulation; building, intervention, and evaluation; reflection and learning; formalisation of learning. These steps might seem similar to the ones proposed by Wieringa (2009) and Peffers et al. (2007), but the main distinction comes in the second stage where the involvement of practitioners and end-users is emphasised. Figure 2.2 illustrates the iterative process of this stage in which different evolutions of an artefact are developed based on the feedback of practitioners and end-users.

Figure 2.2: The Building, Intervention, and Evaluation stage according to Sein et al. (2011)

Due to the way it is designed, ADR is highly suitable for developing artefacts such as games and software tools. Therefore we have chosen to follow this research design to guide our development of the two serious games and of the software tool implementation. By using this design we can ensure that the artefacts are suitable for the target audience.

2.1.3 Mixed methods

In order to enrich the results of our research, we have chosen to use elements of empirical research in the demonstration and evaluation phases of design science. We are using a mixed methods approach in which we combine both elements of qualitative and quantitative research for the purposes of breadth and depth of understanding and collaboration (R. B. Johnson et al., 2007).

The main reason for using a mixed method is that one data source might be insufficient for a proper validation and evaluation. Furthermore, qualitative and quantitative research provide different pictures or perspectives regarding a topic (Creswell & Clark, 2011). Qualitative data provides a detailed understanding of a problem while quantitative data provides a more general understanding of a problem.

One of the main benefits of using a mixed method approach is that it compensates for the limitations of both research methods. On the one hand, quantitative research is usually considered to be weak in representing the voices of the participants and the context they are talking in. On the other hand, with qualitative research, the main weakness comes from the fact that the personal interpretation and bias of a researcher play a big role in the outcomes of a research. Also, in most cases, the results cannot be generalised due to the small sample that is used (Creswell & Clark, 2011).

2.2 Research methods

During this research, we have used a variety of research methods in order to fully understand the problem and to evaluate and validate our proposed solution. Table 2.2 shows which research method(s) and corresponding measurement instrument(s) have been used to answer each research question. The measurement instruments are further detailed in the following section.

Table 2.2: Overview of the research methods and data collection methods used

Research question	Research method	Data collection
SQ1: What is the current thinking regarding strategic alignment?	Literature review	–
SQ2: What is the problem with strategic alignment?	Literature review Survey	– Questionnaire
SQ3: How can strategic alignment be improved?	Case study Survey Participatory research	Observation/Interview Questionnaire Workshop

2.2.1 Literature review

The literature review is often the starting point of a research. It helps set the context for a research problem, determine what has been already developed to help solve that problem, and helps shape the solution proposed by the research (Tranfield et al., 2003). By using a Systematic Literature Review (SLR) researchers can ensure that a rigorous review of all relevant literature has been covered. Blumberg et al. (2008) state that a literature review is an iterative process of three tasks: searching for information, assessing the information obtained and synthesising the assessment of information. Complementary to the process defined by Blumberg et al. (2008), Rouhani et al. (2015) propose a process with three main phases, each with their specific activities. An overview of this process can be seen in Figure 2.3.

We follow the process described by Rouhani et al. (2015) to guide our SLR. First, we select the most suitable scientific databases for searching for relevant

Figure 2.3: Systematic Literature Review activities according to Rouhani et al. (2015)

literature based on our selected keywords. Second, we establish the inclusion and exclusion criteria, and we select the relevant studies. Third, we report our results by synthesising the data, presenting and discussing our results. The results of the SLR we have conducted to support our research can be seen in Chapter 3.

We use SLR to gather the relevant information needed to answer the following knowledge research questions:

SQ1: What is the current thinking regarding strategic alignment?

SQ1.1: What is the current thinking on Business strategy?

SQ1.2: What is the current thinking on Enterprise Architecture?

SQ1.3: What is the current thinking on Capability-based planning?

SQ2: Why is there a problem with strategic alignment?

According to Rouhani et al. (2015), after identifying the research questions that can be answered with the help of SLR, the next step is selecting the databases which will be used for the literature search. Typically, the SLR is focused on scientific databases, rather than on books, technical reports, white papers, etc., since it is assumed that the majority of the research results are also described and referenced in scientific papers (Rouhani et al., 2015). The following databases have been selected for the SLR process:

JSTOR (<http://www.jstor.org/>)

SD (<http://www.sciencedirect.com/>)

Scopus (<http://www.scopus.com/>)

WoS (<http://www.webofknowledge.com/>)

IEEE Xplore (<http://ieeexplore.ieee.org/>)

ACM Digital Library (<http://dl.acm.org/>)

Google Scholar (<https://scholar.google.nl/>)

Several keywords, linked with the help of *AND* and *OR* logical operators, are used to find relevant studies in the title, abstract, and keywords of the literature, as follows: "business strategy" AND ("strategic planning process" OR "strategy planning" OR "strategy process"), ("strategy formulation" OR "strategy development") AND ("strategy implementation" OR "strategy execution"), "strategy model" OR "strategy technique" OR "strategy framework", "strategy" AND "enterprise architecture", "strategy implementation" AND "enterprise architecture", "strategy planning" AND "enterprise architecture", "enterprise architecture" OR "enterprise architecture frameworks", "capability based planning" OR "capability theory", "strategic alignment" OR "business IT alignment", "strategic alignment" AND "enterprise architecture", ("strategic alignment" OR "business IT alignment") AND "capability".

Not all databases allow for using more than two operators or do not allow for the grouping of keywords with parentheses to add extra logic to the search. In these cases, all the combinations are used one-by-one. Furthermore, all these keywords have been selected because we investigate the state-of-the-art literature from multiple domains (SM, EA, and CBP), the relationships between them, and also their relationship with Strategic alignment.

The next step in the process defined by Rouhani et al. (2015) is conducting the literature review. This step includes defining several criteria for inclusion and exclusion of the literature. We use and the guidelines proposed by Rouhani et al. (2015) and adapt them to our own research.

We choose to include studies which are English, published in journals (and conference proceedings if needed), that represent relatively recent scientific developments (after the year 2000), and studies which are focused on Business strategy, EA, CBP, and Strategic alignment. Provided that the resulting literature after performing a SLR does not provide the necessary knowledge, we will expand the search to grey literature such as technical reports, white papers, magazines, etc. This could be the case for literature concerning the more practical aspects of our research, such as strategy techniques, EA, and CBP. Furthermore, we choose to include literature that is older than 2000 if it is undeniably relevant to our research, such as original works that have influenced our topics of interest or research that is still considered pertinent nowadays. We choose to exclude studies that are not in English, duplicate studies, and studies that are not related to the research questions.

The study selection is performed based on the following processes proposed by Rouhani et al. (2015):

- Search databases to identify relevant studies based on chosen keywords;
- Exclude studies based on the exclusion criteria;
- Exclude studies based on their titles and abstracts;
- Evaluate remaining studies based on their full text;

- Re-evaluate the results at random;
- Determine the primary studies.

Based on these inclusion and exclusion criteria, we have collected all the results from all the databases and created our own database of raw results. These raw results have been imported into EndNote, where they have been submitted to a multiple step selection process. The main advantage of using EndNote for the selection process is that it is fairly easy to manage these references into categories, to have a complete overview of the references, to identify and delete duplicates, to make back-ups, and to read all the basic information of the references (title, abstract, keywords, publisher, etc.).

2.2.2 Survey

Survey research is one of the most commonly used quantitative research methods. It is a primary data collection tool in which abstract information of all types can be gathered. It is especially useful for measuring opinions, attitudes, intentions, expectations, etc. (Blumberg et al., 2008) from a large population in a highly economical way (Saunders et al., 2009). The survey research method can be used to collect data which can be analysed quantitatively to identify possible relationships between variables. It can be a time-consuming method due to several aspects: the sample needs to be representative, a pilot test of the data collecting instrument needs to be done, and a good response rate is necessary (Babbie, 2013). Sample bias is a very important aspect when it comes to the generalisability of results, and can be diminished by having a high response rate (Easterbrook et al., 2008).

Questionnaires are the most commonly used data collection instruments. Nonetheless, other instruments such as structured interviews can also be used. In our research we have conducted several surveys, as follows:

- A survey that investigates the problems with strategic alignment. This survey has been conducted during the problem investigation phase, in order to determine which variables influence strategic alignment. The survey was quantitative in nature and was distributed electronically using the online platform <http://enquete.com/>. Both an English ¹ and Dutch language ² questionnaire were created. The questionnaire used for the English version of this survey can be seen in Appendix E.

- A survey that investigates the usefulness, ease of use, self-efficacy, task-technology fit, and intention to use the method. The supporting questionnaire has been developed based on the validated sets of questions by Venkatesh et al. (2003), F. D. Davis (1989), Delone & McLean (2003), and Goodhue & Thompson (1995). The survey was administered on several occasions, for the purpose of evaluating the strategy process board game, based on the experiences of the

¹<http://alignment-eng.enquete.com/>

²<http://alignment-nl.enquete.com/>

students which have played the strategy process board game. The questionnaire used for these surveys can be seen in Appendix L.

- Three surveys that investigate the usefulness, ease of use, self-efficacy, task-technology fit, and intention to use, which were used to evaluate the results of the MSc and BSc theses of students which have contributed to this dissertation. These surveys are not included in the appendices of this dissertation but can be found in the respective theses of the students.

2.2.3 Case study

The case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003). The main research questions that can be answered with the help of a case study are the *How?* and the *Why?* questions.

The case study is a method that contrasts and complements the survey research method. Whilst survey research aims at studying a large sample of a population for the purpose of generalisation, the case study focuses on a very small instance of a population, which can also be an individual (Woodside, 2010). Furthermore, close-ended responses which are often collected with the help of survey questionnaires fail to uncover the nuances and dynamic interactions that happen thoughts and actions within and between individuals (Woodside, 2010). Case studies, on the other hand, are used to understand real-life phenomena and interactions in depth (Yin, 2003). The data collection instruments most commonly used with case studies are interviews, observations, and workshops. Yin (2003) proposes a linear but iterative process for the case study research method, which can be seen in Figure 2.4.

Another perspective regarding case studies is offered by Burawoy (1998), which defines the new concept of the extended case method. The purpose of this method is to discover flaws in existing theories and to modify them accordingly. The extended case method brings the novelty of starting an analysis with a preconceived idea about what the outcome will be and if it does not match to the expectations, then the theory that it is based upon needs to be rebuilt or improved instead of just being approved or rejected. For the case at hand, the extended case method is the most appropriate, and it aligns with the premises of the ADR by Sein et al. (2011).

In our research, we have conducted three case studies, with three substantially different organisations, namely an insurance organisation, a public university, and a investment fund. These organisations also differ in size, maturity, the sector and industry they operate in, and last but not least the focus of the case study. Further details regarding the case studies are provided in Chapter 7.

Insurance organisation: the case study is focused on the modelling of strategic and capability-related concepts with the help of the ArchiMate standard. Our research on the topic of modelling strategy and capability-related

Figure 2.4: The process of Case Study Research as proposed by Yin (2003)

concepts was presented to the representatives of the organisation. Based on the guidelines of our method, we modelled the strategy and capabilities of the organisation and presented the results to the representatives. In a workshop setting, we discussed our results with several representatives of the organisation which in return provided their feedback. Similarly, we were given documentation reflecting the progress of the organisation in adapting our research to suit their needs. The main data collection methods used in this case study are interviews, workshops, observations, and documentation.

Public university: the case study is focused on the alignment between Strategy, EA, and Projects, with the help of CBP. This case study, unlike the other two, contains aspects of all the disciplines that are included in the ESAM and has an emphasis on improving strategic alignment with the help of CBP. During this case study, in close collaboration with a representative from the University's Information Management department, we developed, linked, and modelled (using ArchiMate) the Strategy, Capabilities, Applications, and Projects of the University. The main data collection methods used in this case study are interviews, workshops, observations, and documentation.

Investment fund start-up: the case study is mostly focused on strategy formulation with the help of strategy techniques. During this case study, the main emphasis is on the first part of the ESAM, namely on applying several combinations of strategy techniques for different purposes, such as elaborating a strategy, defining a new business idea, and performing an impact analysis of a strategic choice. The representatives of the organisation applied these strategy techniques under our guidance and in close collaboration. The main data collection methods used in this case study are interviews, workshops, and observations.

2.2.4 Participatory action research

Participatory Action Research (PAR) is a type of action research focused on understanding the world by trying to change it collaboratively with practitioners (Santini et al., 2016). It is a democratic process which helps bring together action and reflection, theory and practice, and emphasises the participation of practitioners in the pursuit of practical solutions for specific or generic problems (Reason & Bradbury, 2001). Scholars argue that PAR is able to produce results that have a higher validity than other types of social research, due to the strong collaboration between researchers and practitioners in both the interpretation and design of solutions (Brydon-Miller et al., 2003).

Santini et al. (2016) defined PAR as a four step cyclical process, which involves Planning (definition of the problem and research approach), Action (implementing a pilot approach), Observing (data collection on the impact of action), and Critical reflection (developing a revised action on the basis of observations).

In our research, we use PAR in combination with the workshop data collection method in order to design, test, and evaluate several aspects of the method in collaboration with practitioners. Some examples of this include the three case studies in which we apply and evaluate our method, the two serious games in which we co-design, test, and evaluate the supporting games for our method, and the software tool which is designed and evaluated with the help of knowledgeable participants.

2.3 Data collection methods

During this research, we have used multiple data collection methods to gather relevant information for the validation and evaluation of the ESAM. The following sections describe the characteristics of the collection methods used: questionnaire, interview, observation, and workshop.

2.3.1 Questionnaires

The questionnaire is a data collection method which contains a series of questions or other types of items designed to request relevant information which can be analysed (Babbie, 2013). The questionnaire is typically used in conjunction with the survey research method (Kotzab et al., 2005). There are multiple types of questionnaires that can be used in a research, such as self-administered questionnaires and interviewer-administered questionnaires (Saunders et al., 2009). The main difference between these two types of questionnaires is the amount of interaction the researcher has with their respondents. For the self-administered questionnaire, the respondents fill in the questionnaire without any interaction with the researcher, while in the case of the interviewer-administered questionnaire, the researcher asks the questions and records the

responses from the participants (Kotzab et al., 2005). Figure 2.5 illustrates the different types of questionnaires and delivery methods, according to Kotzab et al. (2005).

Questionnaire					
Self-administered			Interviewer-administered		
online		postal (+fax)	delivery and collection questionnaire	telephone questionnaire	structured interview
e-mail	web site				

Figure 2.5: Types of questionnaires and delivery methods according to Kotzab et al. (2005)

Questionnaires are often used for quantitative analysis, but can also be used for gathering qualitative information by using open questions which leave room for the respondents to further elaborate their answers. In the case of quantitative data collection, respondents are asked to give their opinion on several statements relevant to the topic of the study. These opinions are ranked with the help of a Likert scale. a Likert scale is a measure that has been developed to improve the measurement of the responses in a standardised manner (Babbie, 2013). Typically, the Likert scale used to rate opinions about statements consists of response categories such as *strongly disagree*, *disagree*, *neutral*, *agree*, *strongly agree*, and *n/a* (not applicable). In the case of questions, the Likert scale can contain response categories such as *never*, *sometimes*, *most of the times*, *always*, and *n/a*.

During our research, we have used the self-administrated questionnaire to gather quantitative information from our respondents regarding how their organisations are dealing with strategic alignment. The results of the questionnaires have helped us identify the most pressing issues they are experiencing with alignment. We use these results as requirements for the design of the ESAM. The full questionnaire is included in Appendix E. Furthermore, we have used the self-administrated questionnaires for evaluating the strategy board game based on several aspects, such as usability, ease of use, self-efficacy, task-technology fit, and intention to use the ESAM. The full questionnaire is included in Appendix L.

The main advantage of questionnaires is that they can be standardised and the results can be generalised if the sample is big enough. They also do not require a big investment of money and can be used without too much intervention from the researchers.

2.3.2 Interviews

The interview is a data collection method which focuses on the conversational interaction between the interviewer and interviewee, with the purpose of improving knowledge in a specific area or topic (Wengraf, 2001). Data collection with the help of interviews relies heavily on respondents being able and willing to give accurate information (King & Horrocks, 2010). Interviews, as a qualitative data collection method, are flexible and open-ended in style, they tend to focus on the actual experiences of participants instead of general beliefs and opinions, and the relationship between interviewer and interviewee is crucial (King & Horrocks, 2010).

There are three main types of interviews: structured, semi-structured, and unstructured/ in-depth interviews (Lussier, 2015). In a structured interview, a predetermined and standardised list of questions is administered to the participant (Saunders et al., 2009). This method is referred to as an interviewer-administered questionnaire, and it one of the data collection methods we presented in Section 2.3.1. By comparison, semi-structured and unstructured interviews are not standardised. In the case of a semi-structured interview, the researcher uses a list of themes and questions as a guideline, which can vary from interview to interview (Saunders et al., 2009). In the case of an unstructured interview, the researcher has no topics and questions prepared (Lussier, 2015). Figure 2.6 illustrates the different forms of interviews that can be used, according to Saunders et al. (2009).

Figure 2.6: The different forms of interviews according to Saunders et al. (2009)

The semi-structured interview is generally preferred by researchers because it gives the freedom to ask both the pre-prepared questions, but also to go into more depth on topics that are relevant to the interviewee (Lussier, 2015). During our research, we have used semi-structured interviews to gather relevant in-

formation at different phases, such as during the design process of the method, while developing the serious games and software tool, and during the three case studies.

2.3.3 Observations

The observation is a data collection method that is used to study subjects in their natural environment, and can sometimes be the only method for collecting certain types of data (Blumberg et al., 2008). Observation are classified as either behavioural (non-verbal analysis, linguistic analysis, extralinguistic analysis, spatial analysis) or non-behavioural (record analysis, physical condition analysis, process or activity analysis) (D. R. Cooper & Schindler, 2001).

Furthermore, observations can be categorised as either direct or indirect. In the case of direct observations, the event or behaviour of a person is observed in real time. In contrast, for indirect observations, the behaviour itself is not observed, rather its effects are (Beri, 2013).

For our research, we use observations during the case studies, the game testing workshops, and the software tool workshops. We employ both behavioural and non-behavioural observations to analyse the behaviour of the participants in course of the workshops. Furthermore, we have used both direct and indirect observations. Direct observations were used to document the behaviour and reactions of the participants to the method, the serious games and the software tool. Indirect observations were used to document the effects of using the ESAM in the three case studies.

2.3.4 Workshops

The workshop is a data collection method which is mostly used in combination with PAR. The main purpose of a workshop is to serve as a learning instance in which participants are considered experts in the topic being investigated and also have a strong influence on shaping the research aim (Caretta & Vacchelli, 2015). However, workshops are quite understudied, mostly due to their perceived lack of legitimacy outside of PAR (Caretta & Vacchelli, 2015). Therefore, they are only a limited amount of studies which discuss workshops, and also use them in studies. Nonetheless, they are identified as possible means to promote relationship thinking and can provide an increased understanding of a topic (Evers et al., 2016).

In practice, however, workshops are used very frequently, especially within the strategy development processes of organisations. A large-scale study by Hodgkinson et al. (2006), revealed that over 75 percent of organisations surveyed employed workshops that for the purpose of formal strategy-planning. Furthermore, strategy workshops frequently involve the usage of strategy techniques, such as the SWOT analysis, stakeholder analysis, scenario planning,

market segmentation, and in a few cases even the FFF and Value chain analysis (Hodgkinson et al., 2006). Moreover, the study indicates that the usage of workshops has a strong positive impact on business planning and clarification of strategies, they provide a good means for general communication and co-ordination of strategies, can lead to a better understanding of business processes and corporate values, mission, and vision, and can facilitate the development of people and the internal communication of strategy (Hodgkinson et al., 2006).

With this in mind, we use workshops in all the aspects of the ESAM which require the involvement of participants, and which fall within the boundaries of PAR. Therefore, we use workshops in many different instances in our research. One such example is the three case studies in which we work directly with the representatives from the organisations, in order to apply the ESAM to their specific needs. Furthermore, we use workshops to help design and test the two serious games that support our method, according to the guidelines of ADR. Moreover, we use workshops to present and evaluate several components of the software tooling support for the ESAM.

2.4 Method engineering

Method Engineering (ME) is a discipline with a focus on designing, constructing, and adapting methods, tools, and techniques for systems development (Henderson-Sellers & Ralyte, 2010). It can be used to construct new methods from parts of already existing methods, also called method fragments (Brinkkemper et al., 1998). However, since it has been concluded that the idea of a universal method which can be used in all situations is not applicable in practice, a specialisation of ME has emerged, called Situational ME (Harmsen, 1997; Henderson-Sellers & Ralyte, 2010).

Within Situational ME, many approaches have been proposed, ranging from rigid methods to a full use of situational ME concepts (Harmsen, 1997). A few examples of these approaches, according to Harmsen (1997), are as follows:

- Use of rigid methods in which certain standards are used, that are suitable for a very specific situation;
- Selection of one rigid method, from several available ones, which is applied without adaptation;
- Toolkit or Multiview approach which implies that several methods are included, each of which addressing a specific need;
- Paths within a method approach which implies that several alternative paths are available, each of which can be used for a specific situation;
- Selection and tuning of a method outline which implies that there is not only a choice between different approaches but also a possibility to further adjust an approach to better suit a certain situation;

– Modular method construction implies that method fragments are available in a method base, and can be assembled based on certain rules and guidelines.

Out of all the aforementioned approaches, modular method assembly is considered to be the most complex one. Within this view of Situational ME, a new method is assembled in a modular manner and can be modified and augmented to meet the requirements of a given situation (Ralyte & Rolland, 2001).

For the purposes of our research, we have chosen to use the modular method assembly approach to Situational ME, as proposed by Harmsen (1997). However, we also include aspects of other approaches, such as the idea of multiple alternative paths and the possibility to adjust the provided methods. Figure 2.7 illustrates the process of Situational ME, as proposed by Harmsen (1997).

Figure 2.7: The process of Situational Method Engineering, according to Harmsen (1997)

It is worth mentioning that Situational ME research has a strong focus on developing methods that are aimed at supporting projects and not entire organisations. Furthermore, the main purpose of these resulting methods is usually aimed at improving project performance, which does not apply in our case. Therefore, we have followed the guidelines of Harmsen (1997) and have

adapted them for our own purposes, by extending the scope to organisations instead of projects, and by focusing on strategic alignment instead of project performance.

In order to design our method, we research the currently available methods, models, tools and techniques from SM, CBP, and EA, as part of our **method administration**. Furthermore, we include these selected method fragments into a **method base**, which we use as components for our method design.

Regarding the **situation** that our method should be applicable to, we choose to focus on organisational transformations supported by strategic alignment. Within this, we can **characterise several situations** in which the method should be applicable to, reflected in the five challenges mentioned in Chapter 1. Based on these challenges we **selected several method fragments**, in the form of different strategy techniques, CBP techniques, and an EA modelling language.

Furthermore, we **assemble these method fragments** based on the guidelines of the strategy process, that includes aspects of strategy formulation, strategy implementation, and strategy control. Therefore, we design the phases of our method and populate them with several strategy techniques, models, and methods from our selection.

Moreover, we deviate from the guidelines of Harmsen (1997), by including **several paths** in our method. These paths correspond to the two alternative situations that can occur in the course of strategic decision-making, namely continuing to challenge competitors, or explore the possibility of a niche market. Additionally, we allow and encourage for users to **customise** our method in order to fit their particular needs, as long as the original scope and intention are maintained.

Finally, we argue that our proposed combination of method fragments can be used by organisations to **improve their strategic alignment**. We test this assumption with the help of three case studies which serve as means to validate our proposed method and to **accumulate experience** from practice. This can be used at a later stage to improve our selection and the combination of method fragments.

The results of our Situational ME can be seen in Chapter 4, which illustrates how the ESAM has been designed as a cross-domain solution based on method fragments from multiple disciplines. Furthermore, we demonstrate how these method fragments are combined and how they contribute to each other.

2.5 Validity threats to the research results

In this section, we discuss the possible threats to the robustness of the results. Validity refers to the extent by which the measures that are used in a study can adequately reflect the meaning of the concept studied (Babbie, 2013).

2.5.1 Face validity

Face validity refers to the empirical measures selected being in line with the common understanding or image regarding a particular concept (Babbie, 2013). For example, in order to measure political conservatism, each of the measures selected should indicate conservatism or the opposite liberalism.

We accounted for face validity by performing a SLR which has provided a list of the most commonly used and accepted concepts regarding strategic alignment, the strategy process, and the four disciplines. We have used this information to design our proposed method, including several guidelines, phases and strategy techniques.

Furthermore, we have constructed several questionnaires based on the guidelines of the UTAUT. Since the constructs and statements proposed by the UTAUT have been thoroughly validated throughout the years, by designing our questionnaire based on these guidelines, we ensure that we are using appropriate constructs for gathering the needed insights. Additionally, we have also developed the strategic alignment questionnaire based on a SLR of influencers of strategic alignment.

Moreover, we have designed the method evaluation instrument based on a SLR of strategic alignment influencers. We have identified studies which have validated in both qualitative and quantitative manners the relationships between certain constructs and strategic alignment. Subsequently, we have defined the items of the instrument based on this acquired knowledge.

2.5.2 Construct validity

Construct validity refers to choosing correct operational measures for the concepts being studied (Yin, 2003). Construct validity is strongly related to the face validity. The main difference is that with construct validity we investigate if the selected construct actually measures what it is supposed to. We account for construct validity by performing a SLR which has provided the definitions, concepts, and measurements we have used to design our questionnaires. For example, we have used information gathered from a SLR to construct the questionnaire regarding strategic alignment, in order to gather information from practice relating to issues experienced by organisations. Additionally, we have used the same information to construct the evaluation instrument for our method.

2.5.3 Internal validity

Internal validity refers to determining causal relations, between two or more concepts, which implies that one condition leads to another condition (Yin, 2003). Internal validity is mainly a concern for explanatory or causal studies and not for descriptive or exploratory studies. Internal validity can become an issue if a researcher incorrectly concludes that there is a causal relation-

ship between two constructs without knowing that a third factor might have had an influence on the relationship. We address internal validity by using several research methods and data collection methods. For example, when performing the case studies we gather the relevant information through four different methods, namely, interviews, observations, documentation, and workshops, which according to Yin (2003) can increase the internal validity of a case study through data triangulation.

2.5.4 External validity

External validity refers to defining the domain to which the results of a study can be generalised (Yin, 2003). When a high degree of generalisability, thus external validity, is required, it is important that the sample is representative for the population to be generalised (Berg & Latin, 2008). We account for external validity in the case of the strategic alignment survey by disseminating the questionnaire to a large sample of respondents from different types of organisations and different functions, with the support of multiple institutes, such as the Open Group, the Association of Enterprise Architects (AEA), and the Nederlands Architectuur Forum (NAF).

Furthermore, for the case studies, we have used analytical generalisation. Analytic generalisation refers to striving to generalise a particular set of results to some broader theory when using case studies and experiments (Yin, 2003). The generalisation, in this case, is not automatic and needs to be replicated in a second or even third instance. In the case of our research, we have performed three case studies in order to replicate results. We compare the results of these three case studies by using a standardised approach (the five challenges and the evaluation instrument), which brings us insights relating to the aspects which are shared and different between the three cases. Based on this analysis, we can make generalisations of certain aspects of our method, and also identify which aspects could be considered situational.

Moreover, in the case of the board game, we have used statistical generalisation, which is specific to survey research. We have used a survey questionnaire to validate several aspects of this serious game, such as usefulness, ease of use, etc. Based on the results of this survey, we have performed a statistical analysis in order to gather more detailed insights related to the serious game.

2.5.5 Reliability

Reliability refers to the operations of a study (e.g. data collection procedures) being repeatable, and by doing so obtaining the same results as the initial study (Yin, 2003). One prerequisite for reliability is having good documentation of the procedures that have been followed. We account for reliability by documenting the procedures we used, starting with the SLR, the construction and use of the questionnaires, and the protocols we used for the case studies.

2.6 Summary and Conclusion

Within this chapter, we present our chosen research methodology, namely Design Science Research Methodology (DSRM), which not only guides our research but also dictates the structure of this dissertation. DSRM is a research methodology mostly used in IS studies, due to its focus on designing artefacts aimed at solving specific problems. We choose the research methodology, due to its alignment with the main goals for our research, namely designing a solution (in the form of a method supported by serious games and a software tool) focused on helping organisations address their strategic alignment problems.

Furthermore, we complement DSRM with a research methodology aimed at the iterative design of artefacts, namely Action Design Research (ADR). Within the guidelines of ADR, an artefact is developed not only based on the knowledge of the researcher, but also on the experience of practitioners and end-users. This can help researchers design solutions that are tailored more precisely to the needs and requirements of their end-users. We use ADR mostly in the case of developing the two serious games and the software tool. Nonetheless, we use some aspects of ADR also in the development of our method, in an indirect manner (by using the strategic alignment survey to gather insights about current issues from practice), and in a more direct manner during the three case studies (by using feedback provided by the representatives to make small adjustments).

Moreover, within our study, we make use of mixed methods, by combining both qualitative and quantitative methods. The main reason for this is that qualitative (detailed understanding of a problem) and quantitative (more general understanding of a problem) research provide different pictures or perspectives regarding a topic, and also they compensate for each other's weaknesses. As a quantitative method, we use the survey research, which is one of the most commonly used means of measuring opinions, attitudes, intentions, and expectations of large populations. In order to collect the data needed for the survey research method, we choose to use the questionnaire, which contains a series of questions or other types of items designed to gather relevant information which can be analysed.

For the purpose of qualitative research, we use the case study, which is an empirical inquiry that investigates a contemporary phenomenon in-depth and within its real-life context, especially when the boundaries between the phenomenon and the context are not clearly evident. In order to collect the necessary data for the case study research method, we have chosen to use interviews, observations, workshops, and documentation. Interviews imply a direct data collection method based on the conversational interaction between the interviewer and interviewee, with the purpose of improving knowledge in a specific area or topic. Observations can be classified as behavioural (non-verbal analysis, linguistic analysis, extralinguistic analysis, spatial analysis) or non-behavioural (record analysis, physical condition analysis, process or activ-

ity analysis) and study subjects in their natural environment and can sometimes be the only method for collecting certain types of data. Workshops are data collection methods that rely on organising meetings in which participants can actively discuss and/or perform practical work on certain topics. Finally, documentation refers to the physical documents that might contain information about a particular topic or organisation, which can be used as input for research methods such as case studies.

Additionally, we have used a Systematic Literature Review (SLR) in order to gather knowledge about the research problem, to determine what has been already developed to help solve that problem, and helps shape the solution proposed by the research. By using a SLR, we can ensure that a rigorous review of all the relevant literature has been covered. The SLR is an iterative process containing three tasks: searching for information, assessing the information obtained, and synthesising the assessment of information. The knowledge gathered with the help of the SLR is used as a basis for developing our method, and the supporting serious games and software tool.

In order to design our method we have used the guidelines provided by Method Engineering (ME), a discipline with a focus on designing, constructing, and adapting methods, tools, and techniques for systems development. We have adjusted these guidelines to align better with our needs, by extending the scope of ME to organisations instead of projects, and by focusing on strategic alignment instead of project performance. Additionally, we have built on the guidelines of the modular method construction and extended them with aspects such as multiple alternative paths, selection and customisation, in hopes to make the ESAM as flexible as possible.

Finally, in order to account for the validity threats to our research, we investigate several aspects, such as face validity, construct validity, internal and external validity, and reliability. We account for face and construct validity by performing a SLR which provides the most commonly used and accepted concepts regarding strategic alignment and its related aspects. Second, we construct several questionnaires based on the guidelines of the UTAUT, which contains constructs and statements that have been thoroughly validated throughout the years. Third, we account for internal validity by collecting the necessary information in the case studies through four different methods, namely, interviews, observations, documentation, and workshops. This can increase the internal validity of our case studies through data triangulation. Fourth, we account for external validity in the case of the strategic alignment survey by disseminating the questionnaire to a large sample of respondents with a great variety of functions within different organisations. Furthermore, for the case studies we use analytical generalisation in order to generalise a particular set of results to a larger group of organisations. Moreover, in the case of the board game, we use statistical generalisation in order to make generic statements about several aspects of the serious game, such as usefulness, ease of use, etc.

Chapter 3

Literature review

This chapter is based on the contents of the following paper:

Roelfsema, M., Aldea, A., Lankhorst, M. and Franken, H. (2015). How about Strategy? A survey into the Pitfalls of Strategic Alignment, *Journal of Enterprise Architecture (JEA)*, 12(1), pp. 7-18.

In this chapter, we report on the results of the SLR. Appendix D presents the full results of the SLR, including the raw results obtained after searching the selected databases with the chosen keywords, the intermediate results after eliminating duplicates and irrelevant studies, and the final selection of studies.

The raw results are generated after the initial selection of literature, per database and per group of keywords, before the elimination of duplicates and irrelevant literature. Following this, according to Rouhani et al. (2015), we have continued by eliminating duplicates and irrelevant studies, based on an analysis of titles and abstracts. For the final selection, we have evaluated the remaining studies based on their full text.

In addition to these results, we have chosen to include supplementary literature which we consider extremely valuable and relevant to our research. This literature was not found in the process of our SLR due to it being older than 2000, or being published as grey literature. A few examples of these exceptions are the seminal work of Henderson & Venkatraman (1999) on the SAM, the initial work on Dynamic capabilities of Teece & Pisano (1994), the review of the different schools of thought on the strategy process by Mintzberg (1990), etc.

From the final 82 selected studies, a majority are journal articles, followed by conference papers, and lastly by studies included in collections, such as books. The bar chart shown in Figure 3.1 illustrates the amount of studies per type and discipline. It is worth noting that the big discrepancy between the amount of studies selected for SM and the other disciplines can be explained by the fact that we included at least one study per strategy technique in the

final selection of studies. Therefore, if we would subtract the studies regarding strategy techniques from the total of amount attributed to SM, we would have 15 articles, 2 conference papers, and 0 studies in collections that can be attributed to literature regarding the strategy process.

Figure 3.1: Number of selected studies per type and topic

As it can be seen in Figure 3.1, the selected studies for both SM and Strategic Alignment (SA) include mostly journal articles, as opposed to the selected studies for CBP and EA which include a majority of conference papers. This suggests that the literature regarding SM and SA has a higher level of maturity since journal articles usually contain research that is more advanced and better validated. Contrary to this, a higher number of conference papers usually suggests that a discipline or topic is relatively new and in the beginning phases of its development. Therefore, we can conclude that CBP and EA are two disciplines which are still in their infancy in the scientific community. On the contrary, SM and SA can be considered fairly mature areas of research.

A major difference can be observed also when looking at the years in which the selected studies are published. The spread of publication years for the selected studies ranges from 2001 to 2015. This is in line with the criterion of selecting studies that are newer than the year 2000. Figure 3.2 illustrates all the selected studies per year and discipline.

What can be observed from Figure 3.2 is that a majority of the selected studies (62,2 percent) are published between 2010 and 2015. This implies that 40 percent of the publication years account for almost two-thirds of the overall selected studies. Therefore, this suggests that there has been an increase in interest in the areas selected for our research. More specifically, this increase can

Figure 3.2: Number of selected studies per year and topic

be accounted by a rise in publications relating to EA and CBP which are mostly represented in studies selected from 2009 to 2015. The majority of studies relating to EA and CBP are published between 2012 and 2015 (79,2 percent). This suggests that these two disciplines have gained more attention in the recent years in the academic world, which is in line with our previous conclusion that these disciplines are still in their infancy in the scientific community.

The selected studies relating to SM and SA are spread throughout the whole range of publication years. In the period from 2001 to 2009, studies relating to SM and SA form an overwhelming majority (90 percent) of the selected studies. This can be explained by our previous conclusion that EA and CBP have seen a rise in interest in the academic world mostly in the last few years, contrary to practice where they have been under development for decades.

Furthermore, an increase in publications regarding SM and SA can also be observed for the years between 2010 and 2015. These six years account for slightly more than half (51,7 percent) of the total number of selected studies relating to SM and SA. This increase suggests that new developments can also be observed for SM and SA, which might be explained by developments in

complementary fields such as EA, CBP, and SA.

By looking at the kinds of topics covered by the studies we selected with the SLR, we can identify several trends for research. We discuss these in more detail the following paragraphs. Furthermore, we make a distinction between the literature on the strategy process and the studies focused on strategy techniques. The main reason for this separation is that these two topics are related to each other but they each serve a different function. The studies regarding the strategy process discuss fundamental aspects of how the process should look like, whereas the studies regarding strategy techniques are more concerned with what models and methods you can use to support the strategy process.

Recent literature regarding the strategy process has moved away from debates relating to fundamental aspects of SM, such as deliberate or emergent strategy formulation, which have been the focus of researchers a few decades ago (Mintzberg, 1990; Ansoff, 1991). Consequently, current studies propose that a balanced combination of deliberate and emergent strategy formation is recommended (Grant, 2003). Furthermore, the main focus of these studies has shifted more towards identifying what problems organisations are experiencing with the strategy process rather than developing conceptual frameworks which can guide the behaviour of organisations. As a result, less new theories are observed regarding the strategy process, and at the same time, more empirical studies are performed to gather knowledge about the practical issues experienced by organisations (Kaplan & Norton, 2005; Sull, 2007; Franken et al., 2009). This observation is in line with the more generic trends regarding SM where most of the research from the past decades has been focused on strategy formulation (from a theoretical point of view), and not much attention has been given to strategy implementation which is mostly focused on practical application of theories (Cater & Pucko, 2010). Consequently, we can conclude that recent studies are focused on gaining more insights into the implementation of SM theories into practice.

Similarly, in the past few decades, the studies relating to strategy techniques consisted mostly of proposals for new techniques developed to serve different purposes, such as organisational assessment (SWOT), and business modelling (BMC). In more recent literature, the focus has shifted towards more practice-oriented research, such as validating existing strategy techniques (Kaplan, 2012), determining which strategy techniques are still used by organisations (Phillips, 2011), identifying how they are applied in organisations (G. Cheng et al., 2014), suggesting new applications for existing strategy techniques (Fritscher & Pigneur, 2015), and proposing additions or extensions to existing strategy techniques in order to link them to other domains/disciplines (Giannoulis & Zdravkovic, 2012). These practice-oriented developments related to strategy techniques, together with more empirical and evidence-based studies related to the strategy process, suggest that SM research is headed towards adapting existing information to better suit the practical needs of organisations while expanding the knowledge-base with cross-domain insights.

In the case of the literature regarding SA, whilst being more mature than CBP and EA literature, it can still be considered a relatively new topic when compared to SM. Since the publication of the SAM of Henderson & Venkatraman (1999), the literature on this topic has steadily evolved. One of the most notable research trends is represented by literature focusing on the Business-IT side of SA. More specifically, this literature focuses on why the Business-IT alignment is important (El-Mekawy et al., 2015; Fritscher & Pigneur, 2011), what factors can influence it (Bergeron et al., 2004; Luftman, 2004), how it can be improved with the help of existing knowledge (Decoene & Bruggeman, 2006; Asli et al., 2013), by extending/adapting existing knowledge (Fritscher & Pigneur, 2011; Danesh & Yu, 2015; Kurniawan et al., 2013), by proposing new approaches to improve the alignment (H. M. Chen et al., 2005; Wegmann et al., 2005), and last but not least on providing an overview and assessment of existing approaches (Doumi et al., 2011). A less represented research trend consists of literature which has less of an emphasis on the role of IT in SA, and more on the position of the organisation within the competitive environment with support from an appropriate structure (Baker & Jones, 2008), and how can SA improve the performance of organisations (Bergeron et al., 2004).

The literature regarding EA has been kick-started by the work of Zachman (1987) which has laid the foundation for this discipline in the academic world. Since the publication of the Zachman EAF, the discipline has evolved and has produced a multitude of alternatives to the work of Zachman (1987). In recent literature, the emphasis has shifted towards the development of other EAFs, such as the TOGAF standard. This change can be explained by the growing interest that organisations have shown, in the past few years, in using the TOGAF standard. Subsequently, several research trends revolving around the TOGAF standard can be observed, with a focus on the Content Metamodel (Svee & Zdravkovic, 2015; Gerber et al., 2010), the ADM (Buckl et al., 2009; Alm & Wißotzki, 2013), and an integration between the TOGAF standard and SM concepts (Kurniawan et al., 2013). Furthermore, the developments surrounding the ArchiMate modelling language, which accompanies the TOGAF standard, are also focused on the metamodel. More specifically, these developments are aimed at the Motivation extension and the Business layer, and contain proposals for extending the language with strategic, capability, and value-related concepts (Jacob, Quartel, & Jonkers, 2012; Azevedo et al., 2015; Bakhtiyari et al., 2015), have a focus on relating ArchiMate to other domains (de Kinderen et al., 2012; Fritscher & Pigneur, 2011; Caetano et al., 2015), and develop ways to analyse EAs (Gungor & Oguztuzun, 2014; Singh & van Sinderen, 2015; Manzur et al., 2015).

The case of the literature regarding CBP is fairly different than the others. When searching for available literature on the topic of CBP only a few results can be found in scholarly databases. Out of these few studies, a majority are focused on applications in very specific instances of the defence sector (Eisler & Allen, 2012; Yu et al., 2012), while only a limited number consider its ap-

plication to organisations. More specifically, these organisational applications are mostly developed for the manufacturing industry, with a focus on change impact analyses (Jarvenpaa & Torvinen, 2013) and on developing adaptable manufacturing systems (Keddis et al., 2015). Other literature identifies the role of CBP as a top-down approach that links strategic intent to implementation (Weigand et al., 2014). When considering the literature that discusses capabilities separately from the scope of CBP, a trend can be observed regarding studies that propose them as a solution for improving the Business-IT alignment (Danesh & Yu, 2015; Stirna et al., 2012; Miklos, 2012; Lee & Song, 2011; Zdravkovic et al., 2013).

The case of the literature regarding CBP is a good example of a situation when a SLR, performed with the help of only scientific databases, does not provide a good representation of the available knowledge or interest regarding a domain. In this case, a more accurate overview can be generated by using more unconventional sources of information, such as Google Scholar, white papers, technical reports, and even blogs. For CBP, expanding the search boundaries has delivered valuable information regarding CBP methodologies developed and used by the defence departments of many countries all around the world, for many years now (Chairman of the Joint Chiefs of Staff, 2009; TTCF, 2005; P. K. Davis, 2002). Furthermore, it has provided insights into the relevance of CBP for other domains, such as EA, with open standards like TOGAF including chapters featuring an explanation of the relationships to CBP (The Open Group, 2011).

One common aspect shared by all the selected literature is that it is not sufficient for providing a clear picture of a specific domain. It is however sufficient to present the developments within a domain in last few years. However this information is not enough to provide a good knowledge base for developing an adequate solution. One of the main reasons is that many of the recent developments are based on research that has been performed outside of our selected range or years (2000-2016). One such example is the SAM of Henderson & Venkatraman (1999), which has laid the foundation for most of the research regarding SA. In order to have a better understanding of the recent developments, it is crucial to have knowledge regarding the initial research. Therefore, in the following sections, where we present the result of the literature review, we have also included literature that was not selected through the process of the SLR.

Furthermore, in some cases, the selected studies did not include enough information regarding a specific aspect. Therefore, with the help of backwards and forwards reference searching we have filled in this knowledge gap. The backwards reference search refers to reviewing the references of the studies resulted from the keyword search, while the forwards reference search refers to reviewing articles that have cited the studies resulted from the keyword search (Levy & Ellis, 2006). The backwards reference search can also lead to finding articles containing the original research in a specific domain, while the forwards

reference search can be used to find follow-up studies which have improved, confirmed, or disproved certain research.

One case in which backwards reference searching was used to gather more information is the literature regarding strategy techniques. In most cases, studies discuss the individual application of a specific strategy technique. With the help of the SLR, only two studies have been found that discuss the usage of multiple strategy techniques, of which only one was based on empirical data, namely the research conducted by Stenfors et al. (2007). We considered this study to be valuable but not sufficient to provide a clear and unbiased overview of the usage of multiple strategy techniques. Therefore, by investigating the references provided in the article of Stenfors et al. (2007), we were able to identify another major study regarding the usage of multiple strategy techniques, namely the one performed by Rigby & Bilodeau (2015) for Bain & Company.

Moreover, in the following sections, we also include literature that was obtained from the research conducted by University of Twente students in the course of obtaining their MSc and BSc degree, under our supervision and within the boundaries of the research presented in this dissertation.

In the following sections, we report on the selected studies, both resulting from the SLR and the additional ones (as identified above), which are used as a knowledge base for designing our proposed solution, the ESAM. Section 3.1 presents the current thinking on SA. Section 3.2 discusses the literature found on the topic of business strategy, with a focus on the strategy process, and the most used strategy techniques. Section 3.3 presents the state-of-the-art on EA, the most relevant frameworks, with a focus on the TOGAF standard, and its supporting modelling language, the ArchiMate standard. Section 3.4 discusses the most relevant literature on CBP, capability theories in general, and current CBP frameworks and methods. Additionally, we briefly present in Section 3.5 several aspects related to EPM, in order to get a basic understanding of its purpose and available techniques. We conclude by discussing the shortcomings of current literature and position our ESAM as a proposed solution for these problems.

3.1 Strategic alignment

SA is considered crucial for organisations to pursue due to it helping improve business performance. Multiple researchers throughout the years have studied this relationship and have shown that SA leads to better organisational performance (Schwarz et al., 2010; Sabherwal & Chan, 2001; Cragg et al., 2002; Rivard et al., 2006) in the form of increased sales revenues (Kunnathur & Shi, 2001; Kearns, 2005), improved operational efficiency (Oh & Pinsonneault, 2007), cost reductions (Chang et al., 2008; A. M. Johnson & Lederer, 2010), and can enhance customer value (Celuch et al., 2007).

However, SA is a complex concept, with many definitions and interpreta-

tions, that has been the focus of SM literature for decades. The most famous interpretation of SA is the one provided by Henderson & Venkatraman (1999), which considers it to be the strategic fit between the position of an organisation in a competitive market and the design of an appropriate structure to support the execution. Furthermore, SA is considered to be dynamic in nature, thus, organisations go through a continuous process of adaptation and change. Figure 3.3 illustrates the SAM of Henderson & Venkatraman (1999).

One of the cornerstone propositions of the SAM is that in order for SA to be possible, the cross-domain relationships need to be recognised (Henderson & Venkatraman, 1999). Therefore, four perspectives on SA are proposed by the authors: strategy execution (business strategy has been articulated and it drives organisational design choices and the design of the IT infrastructure), technology transformation (implementing the chosen business strategy through an appropriate IT strategy and articulating the required IT infrastructure and processes), competitive potential (exploitation of emerging IT capabilities in order to influence key aspects of the business strategy), and service level (understanding of the external impact of the IT strategy and the design of an appropriate IT infrastructure and processes).

Figure 3.3: The Strategic Alignment Model (SAM), according to Henderson & Venkatraman (1999)

As it can be seen, Henderson & Venkatraman (1999) have recognised that IT plays an important role within SA and can influence the ability of an organisation to realise value. Subsequently, several studies have chosen to solely focus on the Business-IT alignment side of SA. El-Mekawy et al. (2015) describe Business-IT alignment as a preferred condition in which the relationship between Business and IT is optimised in order to maximise the business value of IT. Furthermore, Fritscher & Pigneur (2011) argue that in order for organisations to successfully implement planned change, they need to align their formulated strategy with their supporting processes and IT infrastructure.

However, not all research fully emphasises the role of IT in SA. Baker & Jones (2008) consider SA as the ability to create synergy between the position of the organisation within the competitive environment and the design of the appropriate structure to support the execution. Bergeron et al. (2004) argue that SA is an indicator of the organisational performance being realised by a fit between factors such as strategy, structure, technology, culture, and environment. In the context of the strategy process, SA can be achieved when strategy formulation and strategy implementation are an intertwined and continuous process. Therefore, when SA is achieved, strategy implementation is in line with the Business-IT structures, and the Business-IT strategies are developed to match the organisational environment.

Based on the SAM of Henderson & Venkatraman (1999), Baker & Jones (2008) propose that there are five types of alignment, namely business alignment (structure and resources of an organisation should support the strategic intent), IT alignment (IT resources should be guided by IT strategy), contextual alignment (resources of the organisation should fit their competitive context), structural alignment (organisational resources should match the IT resources), and strategic alignment (fit between the business strategy and the IT strategy).

While some studies hold the SAM of Henderson & Venkatraman (1999) in high regard, others consider it only as a high-level conceptual map with no practical application (Hu & Huang, 2006; Luftman et al., 2008). Furthermore, the SAM is also criticized for not providing guidelines for how organisations can correct misalignment, or how an organisation can connect their strategies to the supporting architecture H. M. Chen et al. (2005).

In the following sections, we present the problems with SA, as identified from the literature. We discuss both the inhibitors and the enablers of SA. Furthermore, we present the results of our survey about SA, in which we identify the most important problems with alignment, as experienced by organisations in an international sample. Moreover, we discuss the current research on cross-domain relationships that support SA. This is highly relevant since Henderson & Venkatraman (1999) argue that SA cannot be achieved by focusing only on one domain, such as SM. Last but not least, we discuss the currently proposed solution for SA. This provides a better understanding of the limitations of current solutions.

3.1.1 The influencers of strategic alignment

There are many factors that can influence SA, such as strategy, structure, technology, culture, environment, resources, capabilities, and others (Bergeron et al., 2004; Baker & Jones, 2008). These factors, also called influencers, can influence SA in a positive (enabler) or negative (inhibitor) manner. In this section, we present aspects of both enablers and inhibitors of SA, which are used as a basis for designing the ESAM. The inhibitors of SA we use as a guideline for designing the method in terms of which methods, models, methodologies, and processes should be included (Chapter 4), while the enablers of SA we use to evaluate if the method can actually help organisations with improving SA (Chapter 7, Chapter 8).

Bridging the gap between the ideal of SA and the organisational realities of strategy formulation and implementation can prove difficult (Beer & Eisenstat, 2000). In a recent study, C. Bradley et al. (2013) have found that 65 percent of executives struggle with SA. A strategy, no matter how good, cannot be implemented successfully if the people responsible don't know what to do differently, they don't understand how and why they should change, and also don't have the necessary resources. Furthermore, in the case of big changes over a long period of time, smaller and more achievable goals, connected to the long-term strategy, should be formulated (C. Bradley et al., 2013).

These results have also been found by previous research. The study of Alexander (1985) investigated which problems occur when implementing strategic decisions. The top three findings of this study include implementation taking longer than originally predicted (76 percent), major issues surfacing during implementation that were not identified beforehand (74 percent), and the coordination of the implementation activities not being effective enough (66 percent).

Hrebiniak (2006), identifies the top five obstacles to strategic alignment as the inability to manage change effectively and overcome resistance to change, a poor or vague strategy, not having guidelines or a model to guide strategy implementation efforts, poor or inadequate information sharing among individuals/units responsible for strategy execution, and trying to execute a strategy that conflicts with the existing power structure.

Similarly to the inhibitors of SA, several studies investigate what factors organisations should focus on in order to successfully align strategy development with implementation. One of the most notable is the Strategic Alignment Maturity Model (SAMM) of Luftman (2004) which mentions several maturity categories which could positively influence SA. Figure 3.4 illustrates the factors identified by Luftman & Kempaiah (2007) as means to measure the maturity of an organisation's Business-IT alignment.

Figure 3.4: The Strategic Alignment Maturity Model by Luftman & Kempaiah (2007)

In order to get a better understanding of the available literature on the influencers of SA, we have conducted two studies with different purposes. The first study, performed as part of a MSc thesis (Roelfsema, 2014), was designed to investigate SA in practice with the help of a survey questionnaire. Within this study, a literature review was conducted in order to determine the items of the questionnaire, which contained both enablers and inhibitors of SA. Furthermore, the main expected outcome of this study has been an identification of the most problematic aspects of SA for organisations. We use this information as a basis for designing the ESAM. The following paragraphs reflect the findings of this study.

A complete overview of the enablers and inhibitors of strategic alignment, as identified by Roelfsema (2014), can be seen in Appendix F. Furthermore, based on these factors identified from the literature, we have conducted a survey to investigate the efforts of organisations regarding SA. The full survey can be seen in Appendix E. One of the main findings of our survey identifies the top ten most significant problems with SA experienced during the strategy process, as stated by the respondents of the survey (Figure 3.5). We use these top 10 factors identified from the survey as guidelines for designing the ESAM.

In this survey, we grouped some of the factors we identified into four cate-

gories SA indicators, Culture and shared beliefs indicators, Organisational capabilities indicators, and Communication indicators. As it can be seen in Figure 3.5, the Culture and shared beliefs, SA, and Organisational capabilities indicators make up the top 3 problems with SA experienced by organisations. However, the Communication indicators, although not in top 3, they represent the majority of items in the top 10 identified problems. We can conclude that good communication about the strategic intent, and the role and responsibilities of employees are vital to improving SA.

Figure 3.5: The top 10 most significant problems with strategic alignment, as stated by the survey respondents

The second study investigating the influencers of SA was conducted as part of a literature research report performed by a MSc student at the University of Twente (Kusumaningrum, 2016). Within this study, a secondary SLR of the influencers of SA has been performed. In order to have a complete picture of the available research on this topic, the SLR was complemented with backwards and forwards reference searches. This led to the selection of 34 articles which contain information relevant to identifying the influencers of SA. The influencers of SA which are mentioned by most studies are Communication, followed by IT/IS project planning, Knowledge sharing, Information strategy, and others. A full overview of the results of this study can also be seen in

Appendix F.

While the first study focuses on the identification, from practice, of the most problematic aspects relating to SA, the second study focuses on performing a SLR in order to determine which factors are mentioned in literature as enablers of SA. The results of these studies allow us to determine which benefits our method should deliver to the organisations that will be using it, in order to help them improve their SA. These benefits, identified as enablers of SA, are used to validate the ESAM as a method for improving SA.

3.1.2 Cross-domain relationships

While Henderson & Venkatraman (1999) propose that cross-domain relationships are needed in order for SA to be possible, the majority of literature on SA comes from SM. For example, scholars have been trying to adapt the existing strategy techniques and methods to accommodate for the needs of the IT domain. The BSC is one such model, which has been adapted to use IT measurements (Schelp & Stutz, 2007). Similarly, Fritscher & Pigneur (2011) propose a model transformation between the BMC and the EA modelling language ArchiMate, as a solution for improving Business-IT alignment. Based on this, we consider the inclusion of strategy techniques within the ESAM, with an emphasis on relating them to ArchiMate, and to each other.

Complementary, Malta & Sousa (2010) suggest the development of EA, a discipline for designing, planning and implementing organisational change, as a solution for managing the alignment between Business and IT. Supporting this statement, recent literature reveals that, in the case of the EA modelling language ArchiMate, several improvements have been proposed such as the addition of the Resource and Capability concept (Iacob, Quartel, & Jonkers, 2012; Azevedo et al., 2015), model transformations between ArchiMate and e3value (Bakhtiyari et al., 2015; de Kinderen et al., 2014), mapping of the BMC with ArchiMate (Iacob et al., 2014), and others.

Other studies have suggested that the development of dynamic capabilities is strongly linked to the improvement of SA in organisations (Harguem et al., 2014; Danesh & Yu, 2015). Furthermore, capabilities are seen as a means to align Business and IT (Stirna et al., 2012; Miklos, 2012). This view is in line with SM literature which has identified Capabilities as a way for organisations to gain and maintain competitive advantage in a turbulent environment (Teece & Pisano, 1994; Eisenhardt & Martin, 2000). Furthermore, it reflects the current developments in EA, which have recently included the concept of Capability in the context of CBP (The Open Group, 2011). Although CBP is gaining more interest in the academic world, the literature available on this topic is very limited.

Another proposed solution to improving SA is the usage of Portfolio Management (PM) (Meskendahl, 2010). Project Portfolio Management (PPM) is a commonly used technique to align a portfolio of projects with strategic goals.

Successful PPM can lead to an effective strategy implementation as long as there is an alignment between the organisational structure and the needs of PPM (Kaiser et al., 2015).

As it can be seen, most of these studies propose extensions of established methods, models, standards with cross-domain knowledge. However, currently, there is no method which builds up on this knowledge on a larger scale, such as the whole strategy process, which is essential for ensuring SA within organisations. Therefore, in designing our method, we focus on the steps of the strategy process, as identified from literature. Furthermore, we build up on the latest developments from the three disciplines, namely SM, EA, and CBP, to combine cross-domain knowledge in manner that can prove useful for improving SA. A more detailed description of these three domains, their benefits and limitations, is available in the following sections.

3.1.3 Approaches for improving strategic alignment

Throughout the years, many models, methods, frameworks, etc. have been developed to help organisations improve SA. Besides the SAM proposed by Henderson & Venkatraman (1999), other notable proposals are the SAMM by Luftman (2004), the IAF by Van't Wout et al. (2010), the SEAM by Wegmann et al. (2005), the INSTAL method by Thevenet & Salinesi (2007), the BITAM by H. M. Chen et al. (2005), the e3value model by Gordijn & Akkermans (2003) and others.

In a recent article, Doumi et al. (2011) have made an analysis and comparison of different SA approaches. All of the approaches analysed by Doumi et al. (2011) construct the alignment top-down. This can prove to be problematic for the organisations which are attempting to move away from the hierarchical model towards more flat one in which initiatives can emerge bottom-up and employees are empowered to solve customer problems (e Cunha et al., 2011).

Furthermore, the majority of these approaches do not focus on the evaluation of the alignment, and neither of them has any elements considering the correction of the alignment. This is a major oversight since the evaluation and re-engineering of organisations is considered a crucial aspect to competing in dynamic environments.

Moreover, while a majority of these approaches support some form or another of modelling, most of them lack the level of formality which is necessary to relate the business aspects to the supporting EA at the model level. Only the approaches of Bleistein (2006) and Gordijn & Akkermans (2003) have, from the modelling point of view, a sufficient formal foundation.

Additionally, in most cases, the alignment is mostly focused on Business-IT strategy, or the Business processes and IT, and only in some cases on Business-IT infrastructure. From the approaches analysed by Doumi et al. (2011), only one focuses on all of the aspects mentioned by Henderson & Venkatraman (1999), namely the Zachman Framework (Zachman, 1987). Additionally, to the Zach-

man Framework, we have identified the IAF, the SEAM, and the BITAM as approaches that fit the criteria proposed by Henderson & Venkatraman (1999) for SA. The main limitation of these approaches is that they mostly emphasise aspects that are the responsibility of an enterprise architect. Furthermore, these approaches mainly focus on Business-IT alignment, while other aspects such as resources, capabilities, change planning and engineering, are under-represented or missing.

As a conclusion, most of these proposed solutions share the same limitations, such as a predominantly top-down approach, a lack of techniques for evaluating and correcting alignment, they provide only informal modelling support, and most importantly, they have a strong emphasis on the Business-IT alignment, and not on SA as a whole. Furthermore, these solutions are not truly cross-domain, which is a strong limitation from the perspective of Henderson & Venkatraman (1999).

3.2 Business strategy

Strategy is a concept that is familiar and influential in the context of organisations (Brock & Barry, 2003). However, just because it is a frequently used term it does not make defining it any easier. The most commonly used definition of strategy is as a plan or action that an organisation takes in order to realise their objectives Harreld et al. (2007). In other words, a strategy represents the understanding of an organisation's assets, position, and their relation to the environment. A strategy must identify, protect, acquire, and sustain critical capabilities, in order to provide mitigation against future uncertainties (Hough, 2011).

This seemingly simplistic conceptual endeavour is actually very complex when applying it to a practical situation, due to uncertainty, complexity of competition and change, especially in fast-moving markets (Harreld et al., 2007). In order for an organisation to be successful, managers need to be able to scan environments, identify opportunities and threats, design appropriate responses, and ensure that these plans are implemented accordingly (Harreld et al., 2007). All these steps can be referred to as the strategy process.

3.2.1 Strategy process

According to Mintzberg (1990), the strategy process is best captured by ten schools of thought. The design school was the first to divide the strategy process into two steps: strategy formation and strategy implementation. This has led to a series of debates focused on how a strategy is most effectively formulated. The opinions of scholars on this topic are divided into two opposing camps. One group of scholars promotes the benefits of a formal and deliberate strategic planning (prescriptive schools) while another supports the idea that

strategy emerges over time as a response to various environmental stimuli (descriptive schools) (Rose & Murphy, 2015). Elfring & Volberda (2001) identify the main characteristics of two opposing ways of looking at strategy formation (prescriptive versus descriptive): top-down versus bottom-up, planning versus spontaneous, analytical versus visionary, and perfect rationality versus bounded rationality.

Scholars on both sides have vividly expressed their criticisms of the opposing theories. Henry Mintzberg is considered one of the most vocal critics of the deliberate strategy. In particular, he argues that the division between strategic thinking (strategic formulation) and strategic action (strategic implementation) is not beneficial nor practical (Mintzberg, 1990). He states that such a clear distinction and ordering implies that a strategy is formulated without taking into account the organisational structure. Mintzberg (1990) argues that the strategy and structure of an organisation are equally important and that there should not be an established precedence between the two, but they should be intertwined. Another big critique he brings to the deliberate planning of strategy is that environmental predictions cannot be made and the strategy process cannot be encompassed into traditional analyses such as the strengths, weaknesses, opportunities, and threats (SWOT) framework (Rose & Murphy, 2015).

Furthermore, the main supporters of the emergent strategy claim that, unlike planned strategy, it is very suitable for organisations operating in very dynamic environments. However, Ansoff (1991) contradicts this by arguing that making rational choices is even more important in dynamic environments because it helps the organisation focus on alternatives that are more likely to succeed, rather than spending time, money, and effort on alternatives with little hope of success. Furthermore, emergent strategy formation can only be successful in environments where change is incremental and slower than organisational response (Ansoff, 1991).

In recent studies, authors have moved on from siding with one or the other perspective on strategy formation, and are instead stating that organisations should use both deliberate and emergent strategies in a complementary manner (Grant (2003); Hill & Jones (2012)). The ideal situation, in this case, would be to use a formal strategic planning model, but also to recognise that strategic initiatives can emerge from within the organisation (Andersen, 2004). Studies have shown that organisations which integrate their formal strategic planning process with flexible responses to their changing environments can achieve the best performance (Grant (2003); Dibrell et al. (2014)). Furthermore, it is important for organisations to have a clear, unambiguous strategy backed up by sufficiently detailed plans (Acur & Englyst, 2006).

Strategy formulation, be it deliberate or emergent, does share some commonalities in literature. Within SM studies, it is specified in several steps, such as defining a clear mission and goals, analysing the internal and external environment, evaluating alternatives based on scenarios, formulating strategies in

line with the mission, vision, and business model, detailing the chosen strategy into objectives, expected results, and plans, evaluating and controlling the implementation (Slater et al., 2006; Hill & Jones, 2012; Phillips, 2011; Hough, 2011; Grunig & Kuhn, 2008).

Formulating a strategy is only the start while implementing it into an organisation is the real challenge (Bradford & Harrison, 2015; Hrebiniak, 2006). This statement is validated by many studies that have found that between 50 percent and 90 percent of organisations have problems with implementing strategies (Kaplan & Norton, 2005; Economist Intelligence Unit, 2004; Sull, 2007; Roelfsema et al., 2016; Franken et al., 2009).

While strategy formulation has received quite some attention over the years, within SM, literature on strategy implementation is lacking by comparison (Cater & Pucko, 2010). Noble (1999) argues that this lack of cohesiveness of the literature on strategy implementation is due to strategists viewing implementation as a fairly mechanistic control function and as an activity following strategy formulation. Hrebiniak (2006) argues that managers can benefit from an implementation model which presents a process, in which steps or decisions are involved, and a more logical approach to implementing a strategy.

The implementation process, although under-researched in the field of SM, has been defined throughout the years. According to Cater & Pucko (2010), it includes the design of an organisational structure, establishing operational level objectives, designing operating structures, and creating adequate incentive and control mechanisms to support the implementation. However, when looking at other disciplines such as EA, we can identify clearly defined steps for strategy implementation, which can be used to supplement the knowledge gap from SM. As an example, we can adapt the TOGAF ADM iteration cycles into strategy implementation steps, as follows: implementation design (based on architecture development cycle), business transformation planning (based on transition planning cycle), and governance of the implementation (based on architecture governance cycle) (The Open Group, 2011).

3.2.2 Value and value-based approaches

Aligning strategy formulation and implementation is only one facet of SA. According to Henderson & Venkatraman (1999), on a service level perspective of SA, an organisation needs to design an appropriate structure and processes in order to meet the rapidly changing demands of the end-users. Thus, the focus in this perspective is on how an organisation can provide the expected value to their customers by designing the appropriate support within the organisation.

Complementary to this, Baker & Jones (2008) consider SA as the ability to create synergy between the position of the organisation within the competitive environment and the design of the appropriate structure to support the execution. Therefore SA spans further than just the borders of the organisation. It also considers the relationships of an organisation with and within the environ-

ment, such as the value delivered to its customers, the value exchanges within their network, etc.

The concept of value has been discussed since the days of Aristotle (Vargo et al., 2008), and to this day, it is still a point of debate for many scholars (O’Cass & Ngo, 2010). The creation and delivery of value are considered to be the core purpose of organisations (Vargo et al., 2008). The survivability and continued profitability of organisations are linked to their ability to fulfil their economic purpose, which is to create and distribute sufficient value to each primary stakeholder from their value network (Clarkson, 1995; Hillman & Keim, 2001).

In practice, the term of value is a common occurrence in discussions of business strategy (Brandenburger & Stuart, 1996). A business strategy typically describes, at a high-level, how an organisation intends to create and deliver value to its stakeholders. The execution of the strategy addresses the mobilisation and alignment of specific resources and capabilities (Kaplan & Norton, 2004a). Therefore, the change associated with a certain strategy needs to realise a specific value for stakeholders.

But what is value? Many different definitions and meanings have been attributed to the concept of value. The two most predominant views on value, which have been originally identified by Aristotle, are value-in-use and value-in-exchange. **Value-in-use** represents the quality of something as perceived by users in relation to their needs (Lepak et al., 2007). This quality refers to how much that something is worth to someone. Value-in-use is created by integrating resources and applying competencies (Vargo et al., 2008).

Value-in-exchange refers to the amount paid by the user to the seller for the value-in-use of something (Lepak et al., 2007) which was created by the seller and distributed in the market (Vargo et al., 2008). This second view on value is related to the idea of bartering in which one party offers something to another party, which in return will offer something of equal value. The value (i.e., price of the exchange) is determined based on the supply and demand. By looking at value-in-exchange in this way it can be said that it represents the price the buyer is willing to pay in order to benefit from something produced by the seller.

Based on the different views presented on value, we suggest a basic and general definition of value. Simply said, a **value** is the quality (worth) of something (tangible or intangible) as perceived by a stakeholder (in relation to their goals/needs).

Over the years, several approaches have been developed to support value, within different disciplines. In SM, Porter has introduced the **value chain** as an approach for analysing the sources of competitive advantage by examining the activities of an organisation and their interactions (Porter, 2008a). Although the value chain has proven very useful in the past decades, it has become an inappropriate tool to analyse many industries today and uncover sources of value, particularly in sectors such as banking, insurance, telecommunication,

news, entertainment, some areas of the public sector, etc. (Peppard & Rylander, 2006).

The modern version of the value chain is the **value network**. The main difference between the two approaches is that the focus is not on the organisation or the industry (value chain), but on the value-creating system itself, in which different actors co-produce value (value network) (Peppard & Rylander, 2006). The value network creates value through complex dynamic exchanges between one or more actors which can take the form of (1) goods, services and revenue (including contracts, invoices, confirmations, payment, etc.), (2) knowledge (strategic information, planning knowledge, technical know-how, etc.), (3) intangible benefits (customer loyalty, image enhancement, etc.) (Allee, 2000).

The e3value ontology (Gordijn & Akkermans, 2003) is an economic value-based modelling approach which incorporates ideas of the value chain, value network with value exchanges. Besides describing value exchanges of the value network, this ontology also captures behavioural aspects of such networks by using value activities, start and end stimuli and dependency paths.

Another approach to value, coming from lean management, is **value stream mapping**. Traditionally, it is used as a visual representation of all the activities needed to bring a product from raw material, through manufacturing, to the customer (Gracanin et al., 2014). An organisation can have multiple of these value streams, each corresponding to one product/service. This type of approach to value is used to link the value-creating activities of an organisation to the customer. Even though this approach was developed with the manufacturing sector in mind, it is now also used in other sectors which are focused on delivering services, such as healthcare (Lummus et al., 2006).

3.2.3 Strategy techniques

Throughout the years, a myriad of tools and techniques have been created for the sole purpose of helping managers master the strategy process (Nohria et al., 2003). These tools and techniques are named in literature in different ways: strategy techniques, strategy techniques, strategy tools, strategy frameworks, management models, management tools, management techniques, etc. For the purpose of simplification and consistency, we have chosen to use the term of strategy techniques.

Strategy techniques are recognised as helpful and even necessary in streamlining strategy development and execution (Nohria et al., 2003). Organisations nowadays have absorbed standard and iconic strategy techniques which they are using for multiple purposes (Hughes et al., 2009). This raises the question of what strategy techniques are out there and which of them are being used by organisations.

In a recent study, conducted as part of a MSc thesis, we investigated which strategy techniques still raised the interest of the academic world in the past five years (2011–2016). In this study, 33 studies were selected, which included

20 different strategy techniques (Febriani, 2016b). The results of this study can be seen in Appendix G. The results indicate that the most mentioned strategy techniques are the FFF, the BMC, and the BSC. Therefore, we can conclude that these strategy techniques are still under development in the last few years and could constitute a good starting point for designing a method for improving SA. Out of the 33 selected studies, 11 were published in 2014, 7 were published in the years 2012 and 2015, 6 were published in 2011, and only 2 in 2010. This suggests that there has been a growing interest in literature, in the past few years, relating to strategy techniques.

When performing the SLR regarding strategy techniques, many results were found, which mainly discuss the individual application of a specific strategy technique in an organisation. Only two studies have been found that investigate the use of multiple strategy techniques in organisations. The study performed by Stenfors et al. (2007), investigates which strategy techniques are most used by a sample of the 500 largest companies in Finland. The results indicate that the SWOT analysis, the BSC, Scenario planning, and Environmental analysis are ranked among the top 10 most used strategy techniques. The full results of this study can also be seen in Appendix G. The study of Phillips (2011) mentions the Mission statement, the PESTEL analysis, the SWOT analysis, and Scenario planning as tools that are very valuable for organisations, based on the author's own experience with practice.

By investigating the references provided in the study of Stenfors et al. (2007) we have identified another major study regarding strategy techniques. For the past 15 years, Bain & Company have been performing a study to understand the usage of strategy techniques. This research is very valuable because it provides an insight into what organisations choose to use as support for their strategy process. Strategic planning, the BSC, and Mission and Vision statements rank among the top ten most used strategy techniques (Rigby & Bilodeau, 2015). The full results of this survey can also be seen in Appendix G. Another interesting finding of this study is that in 2002 the usage of strategy techniques reached its peak, with an average of 16.1 per organisation. In general, the usage of strategy techniques has been on a decline since, but the usage with mid-size organisations has seen a small increase since 2014 (7.6 strategy techniques, up from 6.8). Also in the case of large organisations, in 2014, on average 8.1 strategy techniques have been used (Rigby & Bilodeau, 2015).

In a recent study, we also investigated the usage of strategy techniques with a survey that was distributed internationally with the help of The Open Group, the AEA, and the NAF. The results of this survey can be seen in Figure 3.6, based on 177 responses. Unsurprisingly, the results of our survey also indicate that the SWOT analysis, the BSC, the Strategy map, and the BMC are in the top 5 most used strategy techniques.

Figure 3.6: The most used strategy techniques, as identified in our strategic alignment survey

As it can be seen, many studies still investigate these strategy techniques in hopes to further validate their usefulness, find new ways to use them, or discover new means to combine them. Regardless, what all of these studies have in common is that they only focus on one or two strategy techniques at a time, instead of trying to relate multiple of them. Furthermore, they consider the strategy techniques as useful tools for strategy formulation and implementation in a generic manner but do not investigate specifically how they can be used in the strategy process. Moreover, even if some of these techniques are considered to help solve to the Business-IT alignment problem, only a few studies look into how they can be linked to other disciplines outside of SM, such as EA. Appendix G contains an overview of the strategy techniques which are chosen to be included in the ESAM, together with a short introduction of their purpose and main concepts.

3.3 Enterprise architecture

EA management is a discipline which focuses on the holistic management of the enterprise, based on elements of an organisation's architecture, such as business processes, applications, information in Cows, hardware, as well as the relationships between them (Buckl et al., 2013). It is the complete, consistent and coherent set of methods, rules, models and tools which will guide the (re)design, migration, implementation and governance of business processes, organisational structures, information systems and the technical infrastructure of an organisation according to a vision (Engelsman et al., 2009). As a discipline, EA needs to help organisations deal with emerging Business-IT capabilities and align them to the existing organisational elements (Alwadain et al., 2014).

EA contains four interrelated domains, namely the **Business Architecture** (defines the business processes an organisation uses to meet its goals), **Data Architecture** (describes the structure of an organisation's logical and physical data resources), **Application Architecture** (describes the landscape of an organisation's applications, their interactions, and their relationships to core processes), and **Technology Architecture** (describes the software and hardware capabilities of an organisation that are required to support the deployment of business, data, and application services).

One of the recent trends in EA focuses on the idea of assessing to what degree certain goals of an organisation are fulfilled by the EA. In order to address the research gap relating to the lack of consistency in defining appropriate metrics for this purpose, Matthes et al. (2012) have proposed a structure for defining, documenting, and retrieving EA management metrics. This kind of structured approach to defining metrics could enable enterprise architects to plan, forecast, benchmark, and assess the goal fulfilment by an EA. Furthermore, well-defined metrics can also be used to analyse the evolution of an EA over time. In this regard, Bhat et al. (2015) propose a metamodel which links temporal aspects to metrics in an effort to promote a more dynamic approach to EA which allows for quick assessments at any point in time.

3.3.1 Enterprise architecture frameworks

An Enterprise Architecture Framework (EAF) is a communication tool that presents a set of models, principles, services, approaches, standards, design concepts, components, visualisations and configurations that guide the development of architectures (Schekkerman, 2004). EAFs usually adopt similar definitions of architectures but are varied in focus, scope and intent. Some are developed with specific domains in mind (e.g. defence sector, IT for large organisations, etc.), while others are focused on the kinds of information needed to document an architecture (e.g. types of models or data) (Schekkerman, 2004). Figure 3.7 presents the overview of EAFs, according to Bernaert et al. (2015).

Bernaert et al. (2015)

published in 2011, 7 in 2015, 5 in 2013, and 4 in 2012 and 2014, respectively.

sector, the TOGAF standard has a surprisingly higher adoption rate than its

closest competitor, the Federal Enterprise Architecture Framework (FEAF), 44 percent for the TOGAF standard versus 12 percent for FEAF.

In a more recent study performed by the AEA in 2013, 54 percent of respondents indicated that they use a hybrid EAF, while only 26 percent indicated that they use a popular EAF (Cameron & McMillan, 2013). Of the respondents that indicated they use a popular EAF, 79 percent indicated the TOGAF standard as the popular EAF they use, with DoDAF in second with 8.5 percent usage. The respondents that indicated they use a hybrid EAF were also asked to indicate from which popular EAF they drew elements to build their hybrid approach. The TOGAF standard was indicated by most respondents as the EAF they draw elements from (82.2 percent). Zachman (52.7 percent), Gartner (26 percent), FEAF (21.2 percent), and DoDAF (16.4 percent) were also indicated as EAFs from which elements were used to create hybrid approaches (Cameron & McMillan, 2013).

This trend to use hybrid or home-made EAFs has also been identified in the survey performed by Gartner in 2011. Of the respondents which indicated the use of an EAF (55 percent), 37 percent named home-made or blended frameworks as their main EAFs, whereas none of the popular EAFs scored much more than a 10 percent adoption rate (Gall, 2012). Furthermore, the results of the same survey indicate that organisations are quite often using the services of consulting firms such as IBM, Deloitte, etc. to help them craft a best-of-breed framework (Bernaert et al., 2015).

The white paper by Sessions (2007), sponsored by Microsoft, provides a comprehensive comparison between four of the top EAFs available at that time, namely the Zachman EAF, the TOGAF standard, FEAF, and Gartner. The final scores for the EAFs are relatively close to each other (TOGAF slightly in the lead) and with the exception of the Zachman framework which scores very low compared to the other three EAFs. Although this comparison is almost a decade old, it is still very valuable by providing an insight into the most important criteria to consider when choosing an EAF. Furthermore, it can be used as a reference point for determining what improvements all of these EAFs have made over the past years.

Complementary to the criteria proposed by Sessions (2007), Iacob, Jonkers, et al. (2012) argue that a comprehensive EAF should contain a framework, a process, and also a language to describe the EA. While all of these four EAFs contain a framework, according to Sessions (2007), they each have a different focus: the Zachman EAF is a taxonomy, the TOGAF describes an EA process, the FEAF is a complete methodology, and the Gartner EAF is practice-focused. In the case of the process, the Zachman EAF is the only one that does not provide a step-by-step process for creating an EA, while the TOGAF standard offers a flexible process with the help of the ADM which can be adapted to the need of the user. Regarding language, both the Zachman and Gartner EAFs offer limited support, lacking in reference models or guidance. However, the FEAF is highly focused on providing reference models for multiple purposes and also

the necessary guideline for using these reference models. Similarly, the TOGAF standard does offer reference models and guidance. However, the TOGAF standard is also supported by a formal modelling language, namely the ArchiMate standard, which contains all the relevant concepts for modelling an EA.

3.3.2 The TOGAF standard

The TOGAF is an EAF which provides an approach for designing, planning, implementing and managing EAs (Ferrugento & Rocha, 2015). It is an open standard which provides a practical, industry-managed way of designing EAs (Schekkerman, 2004).

The core of the TOGAF standard is represented by the Architecture Development Method (ADM) which recommends a sequence of various phases and steps to developing an EA. The ADM is intended as an iterative method, over the whole process, between phases, and within phases (The Open Group, 2011). The structure of ADM is cyclical and contains a preliminary phase, eight main phases (Phase A – Architecture Vision; Phase B – Business Architecture; Phase C – Information Systems Architecture; Phase D – Technology Architecture; Phase E – Opportunities and Solutions; Phase F – Migration Planning; Phase G – Implementation Governance; Phase H – Architecture Change Management) and the requirements management process. A complete description of the TOGAF standard is offered by The Open Group (2011) and a summary of it can be found in Appendix H.

Besides the normal development process that the TOGAF standard has undergone throughout the years, several scientific papers have analysed and proposed changes to the standard. Gerber et al. (2010) have investigated the quality of the TOGAF 9 Content Metamodel by using ontology techniques, in hopes to enhance the metamodel construction, specification and design. Their findings conclude that the TOGAF 9 Content Metamodel contains ambiguities and inconsistencies which could prove problematic for those who would like to use it. Furthermore, Gerber et al. (2010) propose that these ambiguities and inconsistencies could be eliminated using ontology technologies.

Similarly, the work of Svee & Zdravkovic (2015) also focuses on the Content Metamodel of the TOGAF standard, namely on enhancing it with consumer values. First, the authors establish the importance and significance of such an addition to the Content Metamodel by means of a survey with practitioners. The results of this survey are used as a basis for enhancing the Content Metamodel with the Consumer Preference Metamodel for Enterprise Architecture (CPMM-EA). In creating the CPMM-EA, Svee & Zdravkovic (2015) try to use as many of existing concepts in the TOGAF Content Metamodel, mainly from the Motivation extension, and only add the concepts that are entirely missing, such as Consumer Value.

While some studies focus on the Content Metamodel of the TOGAF standard, others focus on the ADM. Buckl et al. (2009) complement the generic

development steps of the ADM with the help of a pattern-based approach to EA management. The approach the authors choose is an EA management pattern catalogue which provides best practices for addressing typical EA management concerns with the help of methodologies, viewpoints, and information models.

Another perspective on the TOGAF ADM is provided by Alm & Wißotzki (2013) which investigate the usability of the method for Small and Medium Enterprises (SME). Based on a survey with certified TOGAF users, Alm & Wißotzki (2013) gathered responses regarding which components of TOGAF were useful for SMEs, what phases of the ADM were useful, what steps in those phases are useful, and finally if it made sense to apply TOGAF to SMEs. Based on the results of this research, Alm & Wißotzki (2013) conclude that the ADM was considered useful for SMEs, with an emphasis on the Business Architecture phase (Phase B).

From the perspective of SA, Kurniawan et al. (2013) have proposed a way to integrate the SAMM with the TOGAF 9.1 standard. The authors identify the criteria and attributes of SAMM and map these to the phases of the ADM. This approach can be used to measure the maturity of an EA from the perspective of SA. Therefore, by having this mapping between the SAMM and the ADM organisations should be able to determine which aspects of the ADM should receive more attention in order to improve SA. Similarly to other research presented in this section, the proposal of Kurniawan et al. (2013) also lacks proper validation.

By looking at these recent trends in EA research, we can conclude that the main focus regarding the TOGAF standard revolves around the ADM and the Content Metamodel. Furthermore, within these two areas of interest, related to SA, the focus mainly lies on the Motivation elements and the Business Architecture. Moreover, other aspects that raise interest are the focus on the customers and the value generation and delivery to these customers. All of these developments are in line with our understanding regarding the direction in which the TOGAF standard need to evolve. Therefore, during this dissertation, we also focus on aspects related to Motivation and Business aspects of the TOGAF standard.

3.3.3 The ArchiMate standard

In essence, the TOGAF standard offers viewpoints, techniques, and reference models, but not a complete language. Therefore, the ArchiMate standard was developed. ArchiMate is a modelling language that is used to model and describe EAs over time, as well as their motivation and rationale (The Open Group, 2013).

It can be used to model the structure of an organisation, which is represented in three layers: the Business layer (products and services offered to customers, the business processes that helped create the offering, and the actors that played a part in the business processes), Application layer (applica-

tion services which support the Business layer), and Technology layer (infrastructure services that support the applications). The ArchiMate standard also contains two extensions: the Motivation extension (focus on the motivation behind enterprise change), and the Implementation and Migration extension (focus on the programs, portfolios, project management, and plateaus that can be used in gap analysis). The three layers contain structural, behavioural and informational aspects, and also relationships between and within the layers. A complete description of the ArchiMate language is offered by The Open Group (2013) and a summary of it can be found in Appendix I.

Recently, several studies have analysed and proposed extensions to the language (in the form of new concepts and relationships), improvements to the language (based on ontological analyses), relationships/ transformations to other business modelling techniques (BMC, e3value), and several analysis techniques and tools that can be used to assess the architecture of an organisation.

One notable proposal to extend the ArchiMate language comes from Iacob, Quartel, & Jonkers (2012), which introduce the concepts of Capability, Resource, Value, Risk, and Competence. The authors argue that these concepts are needed to enhance the ArchiMate standard and facilitate the alignment of EA with business strategy and PM. In a related study, Azevedo et al. (2015) ontologically analyse this proposal and conclude that the ArchiMate standard would benefit from adding several of these concepts, including the concepts of Resource and Capability.

Bakhtiyari et al. (2015) propose a method for conceptualising a multi-partner network with the help of EA and more specifically, the TOGAF and ArchiMate standards. The authors argue that EA can be used for business network planning and that even though current EA frameworks support cross-organisational interactions, they do not offer guidance or modelling support for the exchange of organisational artefacts (such as resources, services, processes, business objects) within the network of an organisation.

Complementary, de Kinderen et al. (2014) propose a model integration between e3value and ArchiMate with the help of transaction modelling. In this study, the authors propose formal transformations between e3value and ArchiMate via Design and Engineering Methodology for Organisations (DEMO). de Kinderen et al. (2014) provide a formal mapping of the underlying metamodels and propose a step-by-step approach to applying these metamodels to map a model created in e3value to a model created with ArchiMate.

While the studies of Bakhtiyari et al. (2015) and de Kinderen et al. (2014) focus on improving the modelling support, provided by the ArchiMate standard, for the value exchanges of organisations, Fritscher & Pigneur (2011) focus on the value creation within the organisation. The authors illustrate how visualising the EA of an organisation with a strong focus on the business model can help improve the Business-IT alignment. Similarly, Iacob et al. (2014) investigate how the BMC and ArchiMate can be related to each other in order to facilitate model transformations between the two techniques, a business model-

driven architecture change, a linkage between architecture-based cost analysis, and BMC-based cost/revenue analysis.

While some studies focus on improving the ArchiMate language or to relate it to other domains, others have as a focal point developing ways to analyse EAs. One such study is the one of Gungor & Oguztuzun (2014), in which the authors propose a way to integrate GoalDAG with ArchiMate in order to facilitate the modelling of the contribution of goals and goal-related concepts (such as Requirement and Principle) to the end result desired by an organisation. Such an approach can facilitate for designing cost-benefit analyses which can support the rational decision-making process in an organisation.

Similarly, Singh & van Sinderen (2015) propose a way to assess the criticality and impact of any element in the EA of an organisation. The authors suggest seven metrics which can be determined based on the relationship type, the concept type, and the combination of the relationship and concept type. The study of Singh & van Sinderen (2015), like many others, focuses on assessing the EA of an organisation based on its structural information. However, this type of analysis does not allow for calculating the most dynamic aspects of the EA of an organisation. In order to close this research gap, Manzur et al. (2015) propose xArchiMate as a model-based approach for executing ArchiMate models, which contain both structural and behavioural aspects of the EA, with the help of simulations.

Similarly to the literature regarding the TOGAF standard, the developments surrounding ArchiMate are also focused on the metamodel, and more specifically on the Motivation extension and Business layer. Furthermore, the proposed improvements related to SA are focused on the strategic, capability, and value-related concepts. Another aspect of these studies is the assessment of the EA with the help of metrics and scenarios. These research trends regarding ArchiMate are in line with our understanding of how the ArchiMate standard should evolve in order to facilitate SA. However, all of this research is very focused on specific aspects of SA and there is no integrated view of how all of this knowledge be used to support SA. Therefore, in this dissertation, we focus on integrating and extending this previous knowledge into the ESAM in order to improve the support ArchiMate can provide to the SA efforts of an organisation.

3.4 Capability-based planning

SM research has investigated for the past few decades how organisations can gain and maintain the competitive advantage in such dynamic situations. This has led to the formulation of multiple theories, with a focus on Resources (Barney, 1991) and Capabilities (Teece & Pisano, 1994; Eisenhardt & Martin, 2000) as a source of competitive advantage.

Since the introduction of the resource-based theories, several major limitations have been identified. Of these, the most relevant are the fact that valuable,

rare, inimitable, and non-substitutable (VRIN) resources, as stated by Barney (1991), are neither necessary nor sufficient for sustained competitive advantage in a dynamic environment (Kraaijenbrink et al., 2010).

As a response to this criticism, the capability-based theories have taken shape. Whereas resource-based theories focus on accumulating VRIN resources, the capability-based theories focus on adapting, integrating, and re-configuring internal and external organisational skills, resources, and functional competencies toward a changing environment (Teece & Pisano, 1994).

In practice, there are many views on capabilities, mainly because they are being used in many different domains. In the defence industry, a capability is described as the ability to achieve the desired effect under specified standards and conditions through combinations of means and ways to perform a set of tasks (Chairman of the Joint Chiefs of Staff, 2009). However, this view on capabilities cannot be directly translated to the context of businesses, as it refers more to what you would like to be able to do in a specific situation (e.g. war), rather than the ability, capacity or potential that an organisation, person or system possesses (The Open Group, 2011) in any type of situation, opportune or not.

Iacob, Quartel, & Jonkers (2012) define a capability as the *ability of an organisation to employ resources to achieve some goal*. For example, a "Customer data management" capability is the ability of an organisation to manage the personal information of customers in databases. Thus, capabilities are the ways in which enterprises combine resources, competencies, information, processes and their environments to deliver value to stakeholders. They describe, in high-level terms, what the business is able to do (The Open Group, 2011). They can be synthesised by or connected to other capabilities, business or otherwise.

One of the applications of capabilities is in the context of CBP. According to The Open Group (2011), CBP focuses on the planning, engineering, and delivery of strategic business capabilities to the enterprise. One of the most recent large-scale applications of capability-based theories can be seen in the defence sector. In the past decade, CBP has become a standard in defence planning throughout the NATO alliance (De Spiegeleire, 2011) and has been widely adopted by the Defence community led by Australia, Canada, the United States, and the United Kingdom (Hales & Chouinard, 2011). CBP involves identifying the required capabilities, their desired effects, and the ways (operational activities) and means (e.g. skills, systems, etc.), as well as the conditions and standards under which the capability is required (Ang et al., 2006).

3.4.1 Capability-related concepts and techniques

According to Porter (2008b), strategy helps organisations understand the underlying forces of their industry and can help determine their competitive advantage. Furthermore, the competitive advantage of organisations can emerge from their resources (Barney, 1991) and capabilities (Teece & Pisano, 1994;

Eisenhardt & Martin, 2000). Moreover, according to Grant (2016), capabilities are fundamental to the strategy of an organisation and are needed to enable the strategy.

Therefore, we can state that **strategy and capabilities** are two inter-related concepts which can contribute to achieving the competitive advantage within an organisation. Furthermore, Rashidirad et al. (2013) propose a SA conceptual framework in which they hypothesise, based on available literature, that competitive strategies and dynamic capabilities co-vary, that their fit contributes to achieving SA, and that this fit can lead to improved business value. In the context of the TTF model proposed by Goodhue & Thompson (1995), we can make an analogy between capabilities and technology and the strategy as a task. This can be interpreted further as organisations needing to find the right fit between their capabilities and strategy in order to be successful.

Another very important relationship is the one between **resources and capabilities**. Capabilities can be considered valuable for organisations if they help with adapting, integrating, and reconfiguring internal and external organisational skills, resources, and functional competencies (Teece & Pisano, 1994). Consequently, we can also state that an organisation cannot have a specific capability if it does not possess the supporting resources. According to Grant (2016) resources can be tangible (financial, physical), intangible (technology, reputation, culture), and human (skills/know-how, capacity for communication and collaboration, and motivation). These different types of resources can be used as guidelines for assessing the performance of a capability.

One of the capability techniques most mentioned in the literature is the **Capability map**. According to Scott (2009), a capability map can be used foundation for strategic discussions in terms of business outcomes (increased output, better quality, lower costs, revenue growth or improved market share) and it provides the connection between strategy, processes and resources. It is a blueprint of the capabilities of an organisation and can be decomposed in multiple levels (Ulrich & Rosen, 2011).

Besides decomposition, a capability map can also be used to stratify the capabilities according to the specific purpose they serve within an organisation. Capabilities can be considered, for example, strategic (direction setting, executive-level decision making), value-adding (the core of who the organisation is, how customers view the organisation), support (expenses incurred as result of being in business), etc. (Ulrich & Rosen, 2011). Figure 3.8 illustrates an example of capability map with stratification and decomposition, according to Ulrich & Rosen (2011).

One other important facet of capabilities revolves around the ability to assess them. In order to plan organisational changes based on capabilities, knowledge of the current state and desired future state of the capability base is needed. Therefore, some form of performance assessment for capabilities needs to be used. Paulk et al. (1993) propose a Capability Maturity Model (CMM) which can help organisations assess the maturity of their capability based on

Figure 3.8: Capability map with stratification and decomposition, according to Ulrich & Rosen (2011)

five levels of maturity: Initial, Repeatable, Defined, Managed, and Optimising. For each of these maturity levels, Paulk et al. (1993) propose several guidelines which can be used to determine which one is the most appropriate for a specific capability. However, the CMM is developed with Software Engineering in mind, which make it not directly applicable to more generic capabilities.

Nevertheless, Papazoglou (2014) proposes a possible adaptation of the CMM to more generic purposes. Complementary to the adapted CMM, Papazoglou (2014) also proposes the usage of a capability heat-map as a visual representation of the performance of each capability in the capability map. Each maturity level is represented with a different colour, according to standard colour coding, ranging from red (maturity level 1) to dark green (maturity level 5).

Another aspect presented in the work of Papazoglou (2014) is the gap analysis. Essentially, it is similar to the heat map in representing the maturity of a set of capabilities. The main difference between the two is that a gap analysis combines two heat maps in one, namely the ones describing the current situation and the desired situation. This kind of representation can be very useful to illustrate in a simplistic manner the amount of improvement required for each capability.

One final important aspect related to capabilities within CBP is the capability development plan. While the capability assessment helps determine the performance or maturity of a capability, in order to support the implementation of a strategy, the development of several capabilities might need to be planned over time. Therefore, a capability development plan which contains

the gradual, incremental improvement of capabilities can help organisations have a better overview of these changes. The Australian Government Department of Defence (2012) propose the Capability Systems Life Cycle (CSLC) as a basis for a strategy-led capability development process. Figure 3.9 illustrates the steps of the CSLC, as proposed by the Australian Government Department of Defence (2012).

Figure 3.9: The Capability Systems Life Cycle, as proposed by Australian Government Department of Defence (2012)

The CSLC starts with the needs identification phase in which the missing and under-performing capabilities are identified. Next, the goals for development should be determined, followed by the allocation of the appropriate resources, the development of relevant projects, and finally executing these projects.

3.4.2 CBP for the defence sector

The Technical Cooperation Program (TTCP) published a guideline to help the defence department use a CBP system for long-term force structure planning (TTCP, 2005). This guide points out that CBP is developed as an alternative to threat-based planning, which is a systematic approach to force development for the defence department. It aims to advise the most appropriate force options that should meet the strategic objectives and minimise the cost and risk and comply with the constraint. The generic process of CBP starts from the government guidance and the defence priorities and comes up with the plan of the capability improvement. In this guideline, TTCP defined the input, the assessment tool and the desired outcomes of CBP (TTCP, 2005). However, the method cannot be directly translated to the context of organisations due to its strong emphasis on planning responses to threats, such as wars.

Similarly, P. K. Davis (2002) proposes an approach for assessing capabilities in a Mission-System Framework. It a depiction of when the capability does well, marginally, or poorly in different scenarios (P. K. Davis, 2002). Likewise to the TTCP approach, the Capabilities-Based Process that was proposed by the P. K. Davis (2002) also follows the top-down logic. The goal of the process is to help the defence department transition from where it is now (as is situation) to the desired end state (to be situation) through acquiring the capabilities that are needed to achieve the defence strategy.

Since this CBP method is also intended for military usage, the approach proposed by P. K. Davis (2002) is more focused on risk management and sce-

nario analysis. Thus, in order to be able to apply this CBP in an organisation, an alternate method for capability analysis is needed.

3.4.3 CBP for organisations

The need for CBP in the context of organisations has become more apparent in the recent years. More and more studies identify capabilities as the way to link Business-IT (Danesh & Yu, 2015; Stirna et al., 2012), to link business outcomes to IT (Miklos, 2012), and all-in-all as a solution for improving the Business-IT alignment (Lee & Song, 2011; Zdravkovic et al., 2013). Even with this increased interest, there is little research into how to design, assess, implement and monitor capabilities, and also how to use this in a real case (Miklos, 2012).

One research that applies CBP in the context of organisations is the Collaborative foresight by Weigand et al. (2014). The authors investigate the effectiveness of collaboration between bottom-up strategic planning and top-down strategizing. In this context, Weigand et al. (2014) consider CBP as a top-down approach to strategy intended to promote strategic intent from top level objectives to the lowest task level in implementation.

Another application of CBP is presented by Jarvenpaa & Torvinen (2013), who follow a capability-based approach to assessing the impact of changes in adaptable manufacturing systems by evaluating the effort needed to adapt to changes. A similar view on the applicability of CBP to adaptable manufacturing systems is presented by Keddis et al. (2015). The authors argue that CBP can help future manufacturing systems to be more adaptable and react quicker to changes in markets and demands.

Other studies, such as the ones by Eisler & Allen (2012) and Yu et al. (2012) focus on the most common application of CBP, namely to the military and defence domain. While these studies are valuable, they cannot be applied directly to organisations since the main focus is on preventive planning for scenarios that require immediate responses, such as wars and other threats.

Preliminary research presented by Papazoglou (2014) describes a capability-based methodology that can be used in collaboration with the TOGAF standard and modelled with the ArchiMate language. Although this research presents well-rounded ideas it still has several limitations. First, it presents a waterfall approach in which iteration is possible only at certain points. Second, a large number of assumptions have been made in designing the approach. Last but not least, the methodology was demonstrated using a realistic but fictitious case study (Jonkers et al., 2012) which is not sufficient for a proper validation of the methodology.

Given this increased interest in capabilities, both in theory and practice, it comes as no surprise that it has recently surfaced in EA. EA frameworks such as the TOGAF standard (The Open Group, 2011), have already introduced basic

notions of CBP and its role in designing, planning and implementing organisational change.

One of the main issues addressed by CBP, in the context of EA, is providing enterprise architects with a common ground to initiate discussions with business leaders in terms of business outcomes (increased output, better quality, lower costs, revenue growth or improved market share) instead of projects, processes and applications Scott (2009). The problem is that processes are too detailed, applications are too technical and projects focus on short-term results, usually without immediately recognisable strategic value (Papazoglou, 2014).

From an EA perspective, CBP involves planning in terms of business outcomes before considering projects, processes, applications, etc. Therefore it can be said it considers business value first before cost, risk and resources. The methodology is focused on planning the improvement (over time) of a series of capabilities that will help achieve specific business outcomes. This improvement is typically planned in terms of capability increments. A capability increment is a version of a capability that represents an increase in the performance of the capability. Each capability increment can be realised by an architecture in a specific plateau, which in turn is realised by one or more work packages.

The current specification of the TOGAF standard introduces the concept of CBP as a business planning technique that focuses on business outcomes. The Open Group (2011) defines CBP as focused on the planning, engineering, and delivery of strategic business capabilities to the enterprise. It is considered a business-driven and business-led approach that combines the efforts of all lines of business to achieve the desired capability (The Open Group, 2011). Two notions are introduced, namely capability dimensions and capability increments. Capability dimensions represent the subsets of a capability, which can be used to manage a capability. The Open Group (2011) suggest that these dimensions could help an organisations explain and understand their capabilities.

Different studies propose different categories for these capability dimensions. Typically, a capability could include Process, People and Assets (Greski, 2009). Some studies divide the capability dimensions in more details. For example, Grant (2016) divides assets into tangible assets (financial, physical) and intangible assets (technology, culture and reputation). However, no matter which dimensions are used for a capability, these dimensions will contribute to the value of the capability.

A capability increment is a version of a capability at a certain point in time. This notion is necessary due to the time needed to deliver a certain level of a capability, which might also involve the completion of several projects. Therefore, at any certain point of time, a capability can be considered a capability increment. Combined with the concept of capability dimensions, the capability increments can be used to create a radar/spider chart (Figure 3.10).

Figure 3.10: Capability increments and capability dimensions represented in a radar chart, according to The Open Group (2011)

3.5 Enterprise portfolio management

Even though PM is not the main focus of our research, we include some relevant literature in this review in order to establish some of its basic premises. We consider it a vital aspect of SA, therefore we do mention briefly some applications of our method relating to it.

The name of Portfolio Management has been associated with the management of financial assets over the years (Bayney & Chakravarti, 2012). In order to avoid confusion, we use the name Enterprise Portfolio Management (EPM). Jenner & Kilford (2011) define EPM as a coordinated collection of strategic processes and decisions that enable the most effective balance of organisational change. It is an all-encompassing topic, which covers multiple aspects, such as selection and prioritisation, budgeting and resource allocation, and strategizing to arrive at the best balance between risk and return of an investment, between maintenance and growth, and between the long-term and short-term (R. G. Cooper et al., 2001).

As the definition of EPM already suggests, it is a process which includes a number of steps. Jenner & Kilford (2011) propose a process with two steps: portfolio definition and portfolio delivery. Each of these steps has several activities which should be performed. For portfolio definition five activities are defined: understand, categorise, prioritise, balance, and plan. For the portfolio delivery step seven activities are defined: management control, benefits

management, financial management, risk management, stakeholder management, stakeholder engagement, organisational governance, and resource management.

Maginn et al. (2007) suggest a three-step process, which includes planning, execution, and the feedback step, which is additional to the ones proposed by Jenner & Kilford (2011). This third step contains two activities. The first one, monitoring and rebalancing, refers to using feedback to ensure that the current objectives and constraints of the stakeholders are met. The second activity, performance evaluation, refers to the constant assessment of the investment performance, and also to the portfolio management skill.

Bodenstaff et al. (2014) present yet another view on the EPM process, which is divided into two steps: design and execution. The design step has three activities: identify stakeholders, concerns, and goals; make a balanced portfolio (of projects or assets); value portfolios. These three activities are in line with the main goal for portfolio management proposed by R. G. Cooper et al. (2001). The execution step is similarly divided into three activities: list and score; analyse portfolios; make recommendations on business transformation.

Two specialisations of EPM, relevant for the ESAM, have been discussed in the literature. Both of these follow the main guidelines of the EPM process. The first one, Project Portfolio Management (PPM), refers to the management of groups of projects or investments with the purpose of achieving the strategic and financial goals of an organisation, with limited resources (Bayney & Chakravarti, 2012). The second one, Application Portfolio Management (APM), is a relatively new development and can be directly tied to the increased importance of IT within organisations, more specifically to the development of EA (Riempp & Gieffers-Ankel, 2007).

3.6 Summary and Conclusion

By performing the SLR, we are able to identify several aspects relating the to the state-of-the-art literature available for SM, CBP, EA, and SA. Both SM and SA are two domains that can be considered mature, and which contain well developed and validated research. Contrary to this, EA and especially CBP are two relatively new domains that contain promising research that is less developed and validated.

Furthermore, while literature regarding SM and SA is relatively abundant and equally spread throughout the years, studies relating to EA and especially CBP are more prominent in last few years. This suggests that there has been increasing interest in developing these two disciplines in the scientific community in the past few years. Similarly, literature on SM and SA has seen a slight increase which might be related to the increasing interest in EA and CBP.

Moreover, several trends can be observed in the literature. In the case of SM and SA, recent literature is mostly focused on further developing, validating,

and implementing in practice existing theories, rather than proposing new ones (which was the trend a few decades ago). In the case of EA, the focus also lies on improving existing theories, but with an emphasis on only a handful of theories, such as TOGAF and ArchiMate. In the case of CBP, not much information is available in the literature regarding this discipline, and a majority of the existing studies are either focused on the defence sector or on specific aspects of the manufacturing industry.

Additionally, the selected literature with the help of the SLR is not sufficient for providing a clear picture of a specific domain. It is, however, sufficient to present the developments within a domain in last few years. However, this information is not enough to provide a good knowledge base for developing an adequate solution. One of the main reasons is that many of the recent developments are based on research that has been performed outside our selected range or years (e.g.: the SAM of Henderson & Venkatraman (1999)). In order to have a better understanding of the recent developments, it is crucial to have knowledge regarding the initial research. Therefore, in reporting literature findings we have also included studies that were not selected through the process of the SLR, such as ones found through backward and forward reference searching, from the literature studies performed by the master students supervised during this dissertation, and studies that are considered extremely relevant for providing the necessary knowledge on a topic.

Last but not least, one aspect that is common to all the selected literature is that most of these studies are still very specialised and focused on one or two domains while not paying too much attention to further connections. This provides a fragmented picture of possible solutions that leaves room for many unanswered questions. Furthermore, there are multiple clusters of research which all claim to have the answer to the SA problem, in the form of strategy techniques, capabilities, EA, or EPM. In our view, none of these proposed solutions is the answer independently, but they can help solve the SA problem together.

Therefore, we can conclude that there are several research gaps that can be identified from the literature. First, there are very few solutions that consider combining knowledge from multiple domains to propose a way to improve SA, of which most of them consider the relationships between two domains at a time. Since Henderson & Venkatraman (1999) argue that SA can only be achieved with a cross-domain solution, we consider this to be one of the main challenges that should be solved by the ESAM. This challenge can be considered to be a more theoretical one, which sets generic rules for what knowledge can be used and how the ESAM should be designed. The next three challenges can be considered more practical ones, which focus on the application of the method and on the tools that can be provided to support this.

Second, in the context of the strategy process, SA can be achieved when strategy formulation and strategy implementation are an intertwined and continuous process. Therefore, SA can be achieved only when these two phases

of the strategy process are aligned with each other and also executed without problems. However, in practice, organisations experience quite some difficulties with both formulating and implementing strategies. Thus, we consider formulating and implementing strategies as two challenges that the ESAM should help organisations with, by providing the right guidance and tools to do so.

Third, one of the most well-known types of SA is the Business-IT alignment, which focuses on the relationship between the strategic intent of an organisation and their supporting structure and systems. While the work of Henderson & Venkatraman (1999) introduces the idea of architecture and its importance for SA, the authors do not identify how strategies can be related to the supporting architecture. However, several studies have investigated in the past few years how EA can be further developed in order to help to improve SA. Nevertheless, EA in its current state of development is not sufficiently mature to support SA. Therefore, we consider the further development of EA as the fourth challenge that the ESAM should help solve. Last but not least, the ESAM should help organisations with improving their SA. This means that the method should provide support for the factors mentioned in literature as enablers of SA. Table 3.1 includes a summary of these challenges, main concerns, and several requirements for the ESAM.

Last but not least, a majority of studies regarding SA focus only on aspects relating to the Business-IT alignment and do not investigate other aspects of SA, such as the alignment of the organisation with their environment, as suggested by Baker & Jones (2008). We consider this to be a great limitation of studies relating to SA and has created a significant research gap throughout the years. Therefore, the ESAM should consider aspects of SA as a whole, including environmental alignment, next to the heavily emphasised Business-IT alignment.

In order to evaluate how well the ESAM supports the case study organisations with improving their SA, we design the evaluation instrument based on the enablers we identified from the literature review. Table F.1, included in Appendix F presents the enablers of SA, as identified from the literature. It is worth mentioning, that only studies that include evidence of the positive relationship between a factor and SA have been considered. Furthermore, both factors with a direct and indirect relationship with SA have been included.

Table 3.1: Challenges which the ESAM should help address, with the concerns that motivate them

Challenge	Requirement	Concern from literature
Challenge 1: Cross-domain solution	Cross-domain relationships	Cross-domain relationships are needed for strategic alignment
Chapter 4	Cross-domain knowledge	Majority of studies come from SM
	Two or more domains	Only a few studies focus on the relationship between two or more domains

Continued on the next page

Challenge	Requirement	Concern from literature
	Combined solution	Solutions from different domains are not the answer independently, but together
Challenge 2: Strategy formulation Chapter 4	Flexible strategy planning process	Many problems experienced during formulation
	More objective strategy process	Conflicting priorities regarding strategic goals
	Linked strategy techniques	How strategy techniques can be combined within the strategy process
	Alignment through strategy techniques	Link between strategy techniques and other disciplines (e.g. EA, CBP)
Challenge 3: Strategy implementation Chapter 4	Support for implementing strategies	Many problems experienced during implementation
	Capability-based communication	Communication within the organisation of strategic intent
	Techniques for capabilities	Design, assess, implement and monitor capabilities is not well documented
	Capabilities as intermediaries	Impact of strategic intent on the EA
Challenge 4: Strategic intent to EA Chapter 4	Impact of strategy on existing EA	Strategy unsupported by existing information systems
	Linking strategy techniques and ArchiMate	Formulation and implementation seen as separate processes
	Planning and monitoring change with ArchiMate	How to correct misalignment
	Additional concepts, relationships, views	ArchiMate not mature enough to support alignment
Challenge 5: Strategic alignment Chapter 8	Communication	Improved communication between different roles
	Partnership	Better collaboration between different roles
	Governance	Higher planning sophistication on multiple levels
	Scope & Architecture	Better integration strategic intent and EA
	Measurements	Alignment between different level metrics

Since there are many seemingly distinct factors mentioned in literature, we use the SAMM of Luftman & Kempaiah (2007) to get a better understanding of the kinds of categories these factors fit in. More specifically, the SAMM includes categories of factors such as Communication, Measurements, Governance, Partnership, Architecture, and Skills. It is worth mentioning that these factors are specifically designed for measuring the Business-IT alignment of an organisation. Therefore, they might not cover all aspects relating to SA, or might have too great of a focus on IT and not enough on other aspects.

As it can be seen from Table F.1, the majority of the factors mentioned by literature as enablers of SA fall, more or less, in the categories mentioned by Luftman & Kempaiah (2007). The main differences can be observed relating to aspects such as the environment and organisational size. Furthermore, some of the factors mentioned in the SAMM are now well reflected in the literature that we analysed, such as Change readiness, Hiring and retaining, Organisation

reporting structure etc. The majority of the factors that are not well represented by literature are related to the Skills category proposed by Luftman & Kempaiah (2007). Therefore, in order to design our evaluation instrument we adapt the SAMM with aspects of other literature regarding the enablers of SA. The result of the adaptation of the SAMM can be seen in Figure 3.11.

Figure 3.11: Evaluation instrument for the ESAM, adapted from the SAMM of Luftman & Kempaiah (2007)

One important aspect to be mentioned is that not all of the enablers illustrated in Figure 3.11 are relevant or reflected within the case studies. The evaluation instrument is designed as an objective lens that reflects the literature on the enablers of SA. Therefore, not all the enablers from the instrument will be mentioned in the following sections.

Part II

Solution to the research problem

Chapter 4

Design of the ESAM

This chapter is based on the contents of the following papers:

Aldea, A., Iacob, M.E., Quartel, D., & Franken, H. (2015). Strategic planning and Enterprise Architecture. In *Proceedings of the 1st IEEE Enterprise Systems Conference (ES 2013)* (pp. 1-8).

Aldea, A., Iacob, M.E., van Hillegersberg, J., Quartel, D., Franken, H. & Bodenstag, L. (2015). Modelling strategy with ArchiMate. In *Proceedings of the 30th ACM Symposium on Applied Computing (SAC 2015)* (pp. 1211-1218).

Aldea, A., Iacob, M.E., van Hillegersberg, J., Quartel, D. & Franken, H. (2015). Capability-based planning with ArchiMate, In *Proceedings of the 17th International Conference on Enterprise Systems (ICEIS 2015)* (pp. 352-359).

Aldea, A., Iacob, M.E., van Hillegersberg, J., Quartel, D. & Franken, H. (2015). Modelling Value with ArchiMate. In: A. Persson & J. Stirna (Eds.), *Advanced Information Systems Engineering Workshops: CAiSE 2015 International Workshops, Stockholm, Sweden, June 8-9, 2015, Proceedings* (pp. 375-388). Springer International Publishing.

Aldea, A., Iacob, M.E., van Hillegersberg, J., Quartel, D. & Franken, H. Aligning Strategic Management, Enterprise Architecture and Capability-based Planning: An Enterprise Strategic Alignment Method (ESAM). Submitted to the *Business & Information Systems Engineering (BISE) Journal*.

In this chapter, we present an overview of the ESAM phases, from the perspective of SM, EA, CBP, and some aspects of EPM. This overview is meant to fulfil the requirements of Challenge 1: Cross-domain solution. Namely, within this chapter, we propose several relationships between the four disciplines based on cross-domain knowledge.

Furthermore, with the help of an example case (ArchiPharma), we illustrate how the ESAM can be applied in practice. In order to do this, we focus on the requirements we identified in Chapter 3, namely the ones for Challenge 2, 3, and 4 (Figure 4.1). Since in the context of the ESAM we integrate all these challenges in a seamless manner, the sections of this chapter do not explicitly mention them. Rather these challenges are addressed within each phase of the method, in which we combine aspects of strategy techniques, modelling with ArchiMate, and CBP techniques.

Figure 4.1: The challenges that will be illustrated within Chapter 4

Based on the literature review presented in Chapter 3, we include the following eleven phases in the ESAM: Visioning process, Environmental analysis, Strategic options, Strategic choice, Strategy elaboration, Strategic measurements, Implementation design, Business transformation planning, Implementation governance, Strategy evaluation, and Business model (Figure 4.2). Each of these phases can be supported by several strategy techniques, frameworks and techniques (Appendix G).

Furthermore, we propose, based on the literature review, a CBP method designed for organisations (Appendix J), which we position within the strategy process. Additionally, we complement the current research on the ArchiMate 2.1 standard, by showing how this specification of the language and several proposed enhancements (Appendix K), can be used to model strategy, capabil-

ity, and value-related techniques. A more in-depth explanation of the ESAM is provided in the following sections (by means of the ArchiPharma running example), where we detail the possible cross-domain relationships, the techniques that can be used, related, and modelled with ArchiMate, in each phase.

Figure 4.2: The phases of the Enterprise Strategic Alignment Method (ESAM)

An important remark to be made is that we do not propose a waterfall method. This is by no means a top-down only approach. The sequence of phases we present describes only one way this method can be used. Iterations can be made at any point in the method and it is possible to use only specific phases of the method if deemed necessary. In essence, the ESAM should be seen as a toolbox with guidelines and models.

To ensure that the ESAM could support collaborative work and communication between practitioners, we have followed the guidelines of Moody (2009). In his work, the author investigates the cognitive effectiveness of using modelling languages, such as Unified Modeling Language (UML), to facilitate communication in a uniform and unambiguous manner. In our case, we have chosen the ArchiMate modelling language as a way to visualise and support the application of the ESAM. Thus, the modelling standard can help improve the cognitive efficiency of our method and can facilitate the collaboration and communication between practitioners.

4.1 The ArchiPharma example case

In order to illustrate the different aspects of the ESAM, we use the ArchiPharma case. ArchiPharma is a large international pharmaceutical organisation (anonymised here due to confidentiality reasons) that has many geographically spread locations, such as New York, London, and Amsterdam, which are the result of many mergers and take-overs. ArchiPharma is aware of the necessity to continuously change and improve in order to reach their vision of becoming the leading provider of pharmaceutical services in the world. To realise this ambitious vision they move their strategy from a complete focus on product leadership to a focus on operational excellence with product leadership still present in the background.

The main issue the organisation is facing is that it needs to comply with many governmental regulations which change regularly. Thus the organisation has to be agile, which is not easy, partly because of the legacy application landscape. The legacy is a result of the many mergers and takeovers where landscapes are simply patched together. These inefficiencies are directly influencing interactions with customers when running daily business. In order to deal with these issues, they plan an enormous transformation. Their main concern is how to manage this. In the following sections, we show how this transformation can be supported by relating disciplines like strategy management, CBP and EA, creating a holistic overview of the transformation.

4.2 Visioning process

This process entails defining clear organisational values (the core philosophy of an organisation), a mission (what an organisation does), and a vision (what an organisation wants to achieve in the future) that would help the organisation stay on track. This phase is usually performed by top management and is essential for establishing the core of why an organisation exists and what it should accomplish in the future. The visioning process phase is specific to SM but can provide valuable insights and guidelines to designing and transforming an organisation, both of which are core aspects of EA, CBP, and EPM. Table 4.1 shows which information is provided by one discipline and used by another (SM provides "Organisational mission, vision, and values to CBP, EA and PM"), which disciplines do not deliver any information to others (x), and where there is a relationship within the discipline (-). These notations are used throughout tables in each phase.

In the case of ArchiPharma, the organisation has defined a vision statement to "Become the leading provider of pharmaceutical products and services in the world" by "Offering the most innovative pharmaceutical products and services, in an agile and reliable manner with a clear focus on their customer's needs" (mission statement). ArchiPharma has also formulated several organisational

Table 4.1: Visioning process phase cross-domain relationships

↓ From → To	SM	CBP	EA	EPM
SM	–	Organisational mission, vision & values	Organisational mission, vision & value	Organisational mission, vision & value
CBP	x	–	x	x
EA	x	x	–	x
EPM	x	x	x	–

values which describe their core philosophy while pursuing their vision and mission statements: innovation, reliability, and customer-focus. Currently, the mission and vision statements of ArchiPharma are realised by their Customer intimacy strategy.

4.3 Business model

The business model is a high-level expression of how an organisation is structured. It describes how an organisation creates, delivers, and captures value (Osterwalder & Pigneur, 2010). The business model of an organisation should be in line with their mission and vision statements, and organisational values. Table 4.2 illustrates the cross-domain relationships within the Business model phase.

Table 4.2: Business model phase cross-domain relationships

↓ From → To	SM	CBP	EA	EPM
SM	–	High-level resources & activities/capabilities	Business value of an architectural change	High-level resources & activities/capabilities
CBP	Capabilities	–	Capabilities	Capabilities
EA	Cost & impact of a (new) business model	x	–	x
EPM	x	x	x	–

There are a number of viable strategy techniques that can be used to support business modelling. One of the most popular ones is the BMC. The BMC can be used as a shared language for describing, visualising, assessing, and changing business models (Osterwalder & Pigneur, 2010). Due to its appropriate abstraction level, the BMC can be used collaboratively with other strategy techniques, such as the SWOT, RBV, Dynamic capabilities, Marketing Mix, etc.

The concepts of the BMC can be related to the EA of an organisation, according to guidelines provided by Iacob et al. (2014), as can be seen in Figure 4.3. Furthermore, these concepts can be incorporated and related to the EA of ArchiPharma.

A similar approach to the BMC is the Marketing Mix which can be used to enhance the business model of an organisation by focusing aspects which are relevant to delivering their products/services to their customers (Perreault et al., 2014). The 8P version of this strategy technique includes aspects such as Product, Price, Place, Promotion, Processes, People, Physical evidence, Profit, Packaging, and Target Market. There is consistent overlap between these eight aspects of the Marketing Mix and the building blocks of the BMC. The Marketing Mix can offer organisations a slightly different view of their business, from the perspective of offerings to customers.

Figure 4.3: Example BMC of ArchiPharma, modelled with ArchiMate

For example, in the case of ArchiPharma, the Product in the Marketing Mix overlaps with the "Innovative products" defined in the Value Proposition of their BMC; the Promotion from the Marketing Mix overlaps with the "Website & Social media" from the Channels of their BMC; The People from the Marketing Mix overlaps with the "Scientists and Researchers" from the Key resources of their BMC. These are just a few examples of possible relationships between the Marketing Mix and the BMC.

The value stream can be used to focus on the key activities of an organisation which create value for their customers and partners. An organisation can have multiple value streams, each corresponding to one product/service (Gracanin et al., 2014). In the context of value networks and e3value, a value stream can be used to further detail the activities/processes that create value for the customer. In the case of a BMC, the value stream can be used to identify the Key activities of an organisation, namely the ones that generate the most value. Figure 4.4 illustrates the possible relationships between these strategy techniques.

Figure 4.4: The relationships between the BMC, Marketing Mix and Value stream

In the case of ArchiPharma, for their "Production" Key activity, they have several processes that support it, such as Grinding, Mixing, Quality control, and Packaging. Each of these processes generates some value for the customer. For example, the Quality control process generates the Quality assurance value for the customer. Together, all the processes deliver a combined value to the customer, such as quality controlled ingredients in a well-labelled packaging that can treat their illness.

The value network is another relevant approach for determining the business model of an organisation, from the perspective of their relationships with partners and customers. The main focus of the value network is on the value exchanges (goods, services, revenue, knowledge, and intangible benefits) between these entities and the organisation (Allee, 2000). Furthermore, the value exchanges can also be identified within the building blocks of the BMC, more specifically in the Value proposition, Revenue Streams, and Cost structure building blocks. The different entities with which an organisation has these value exchanges can also be seen in the BMC, namely in the Key partners and Customer segments building blocks. Figure 4.5 illustrates the possible relationships between these strategy techniques. One well-known strategy technique for representing value networks is the e3value ontology by Gordijn & Akkermans (2003). The e3value is an economic value-based modelling approach which incorporates ideas of the value chain, value network, and value exchanges.

Figure 4.5: The relationships between the BMC, Marketing Mix, and Value network

For example, in the case of ArhiPharma, they have several value exchanges with both their customers and partners. To their customers, they offer "Innovative products", "Premium brands", "Customer focus", and "Regional pricing" (which can be seen in their Value proposition), while their customers offer in return a payment for their products and services (which can be seen in the Revenue streams). In the case of their partners, ArchiPharma offers financial compensation for the products and services of their partners, such as "Marketing" and "Purchasing (of raw materials)", which can be seen in the Cost structure.

The business model of an organisation can also contribute to designing portfolios for EPM. In portfolio management, important assets and projects of the organisation are managed as a whole. The goal is to improve the portfolio performance by balancing relevant criteria like costs and risk (Jeffery & Leliveld,

2004). Key resources and Key activities identified with the BMC can be used as input when designing portfolios later on in the process. For example, applications or projects related to one Key activity or Key resource might be grouped into a single portfolio. Such a portfolio might have an annual investment budget and have required quality levels attached.

Similar remarks can be made for the link between the business model and CBP. Identified Key activities could potentially be used to determine the essential capabilities of an organisation, while Key resources could pinpoint the necessary resources for CBP.

This is the first phase in which the interaction between the different disciplines can be observed. In order for this interaction to be possible, collaboration is needed between several stakeholders, such as business leaders, enterprise architects, and project and portfolio managers. Collaboration between these stakeholders is recommended throughout the whole strategy process.

4.4 Environmental analysis

The main goal of this phase is to determine the internal and external factors that might influence the performance of an organisation. Table 4.3 illustrates the cross-domain relationships within the Environmental analysis phase.

Table 4.3: Environmental analysis phase cross-domain relationships

↓ From → To	SM	CBP	EA	EPM
SM	–	High-level assessment of resources & capabilities	x	x
CBP	Capability map with supporting resources	–	Capability map with supporting resources	x
EA	More accurate estimation of strengths and weaknesses	Architectural realisation of resources & capabilities	–	x
EPM	x	x	x	–

Andrews (2005) suggests, when looking at the external environment, to take into consideration economic, technical, physical, and political trends. This type of analysis can also be done with the help of the PEST analysis, or any of its variations (STEEPLE, DEPEST, etc.). On the same topic, he suggests assessing the community, nation, and world. The FFF of Porter (2008b) can be used in this situation to assess the position of the organisation within its market and industry.

For the internal environment, Andrews (2005) proposes to evaluate the distinctive competencies (capabilities, reputation, and history) and resources of the organisation in terms of strengths and weaknesses. RBV (Barney, 1991) and the Dynamic capabilities (Teece & Pisano, 1994) are two techniques which can be used to determine which resources and capabilities are strengths and which are weaknesses. According to Barney (1991), organisations should strive to have VRIN resources. Resources which fulfil these criteria can be seen as strengths. Eisenhardt & Martin (2000) argue that dynamic capabilities can be seen as a set of identifiable processes, such as product development, strategic decision making, and alliance management. Capabilities can be considered strengths if they help organisations with "adapting, integrating, and reconfiguring internal and external organisational skills, resources, and functional competencies" (Teece & Pisano, 1994).

Capabilities can also be modelled within a capability map, according to CBP. In order to keep the model more simplistic and to provide an appropriate overview, nesting of Capabilities is advised. In this situation, in terms of ArchiMate, the relationship between the parent capability and its child capabilities is Composition. More guidelines regarding the modelling of capability maps can be found in Appendix J. Figure 4.6 illustrates an excerpt from the total capability map of ArchiPharma, modelled with ArchiMate. These capabilities can also be related to the BMC, by including them in the Key activities building block.

Figure 4.6: (Excerpt) capability map of ArchiPharma, modelled with ArchiMate

The capability map can be used as input for discussions about the strengths and weaknesses of an organisation since it contains all the capabilities of an organisation, at a certain point in time. The Dynamic Capabilities technique can be used to determine whether a capability is a strength or a weakness.

The SWOT analysis is one of the most well-known and popular strategy techniques that organisations can use for analysing both their internal (strengths and weaknesses) and external (opportunities and threats) environments. The analyses produced with the help of the PEST analysis, FFF, RBV, and Dynamic capabilities can be included in the four quadrants of the SWOT analysis based on which category they fall under: the PEST analysis and FFF can include opportunities and threats, while the RBV and Dynamic capabilities can include strengths and weaknesses. Figure 4.7 illustrates the SWOT analysis of ArchiPharma, based on the factors identified in the aforementioned analyses.

In this figure, we see how the resource "High-tech facilities" identified with

the help of the RBV and the capability "Research & Development" identified with the help of the Dynamic capabilities analysis can be related to the assessments included in the Strengths and Weaknesses quadrants of the SWOT analysis.

With the help of the ArchiMate language we can also relate the resources and capabilities of an organisation to their EA, as also proposed by Iacob, Quartel, & Jonkers (2012). This can help organisations to make more in-depth analyses of their resources and capabilities based on the services, processes, applications, technology, etc. that help realise them. Furthermore, it could facilitate for more accurate estimations of the strengths and weaknesses of an organisation, but also of the costs and benefits of making investments into specific resources and capabilities. Moreover, linking capabilities to the organisational structure, which in this case is represented by the EA, is also considered as one of the first steps of CBP. In Figure 4.8 we illustrate how the resources and capabilities of ArchiPharma can be related to the elements of their EA that help realise them.

Figure 4.7: The example SWOT analysis of ArchiPharma

One of the critiques of Mintzberg (1990) regarding the assessment of strengths and weaknesses of an organisation is that in order for the assessment to be relevant it needs to be done in the context of a problem and not as a pure thinking exercise. Therefore these strengths and weaknesses should be relevant to specific scenarios. One model that supports this kind of thinking is Scenario planning. Schoemaker (1995) defines scenario planning as a tool that helps organisations capture the richness and range of possibilities in an easy and graspable manner. Scenario planning has a broader scope than just giving context to an

assessment of strengths and weaknesses. It can also be used for defining strategic options and making strategic choices. In the case of ArchiPharma, scenario planning can be used complementary or as an alternative to the SWOT analysis.

One other aspect promoted by the design school which received criticism from Mintzberg is the claim that deliberate strategy can also be a creative process. He states that such a bureaucratic approach which relies on standardised techniques is not compatible with a creative form of SM and it promotes the continued pursuit of given strategies rather than strategic change (Mintzberg, 1990). Ansoff (1991) challenges this critique by stating that a deliberate and explicit strategy does not impede creativity, but it in fact solely controls erratic deviations from the strategy.

Figure 4.8: Example relationship between capabilities, resources, and EA, modelled with ArchiMate

A good example of a deliberate approach that promotes a creative strategy process is the BoS. The main goal of the BoS is to challenge companies to break away from competition and create a niche market where competition is irrelevant (Kim & Mauborgne, 2005). Well-known examples of the BoS are Cirque du Soleil and Ryanair. Similar to Scenario planning, the scope of the BoS is broader than just environmental analysis and can also be used for subsequent

phases. In the case of ArchiPharma, the organisation could choose to apply the BoS in order to explore the possibility of expanding or repositioning to a niche market.

As a conclusion, there are multiple models, frameworks, and theories which can be applied to analyse the environment. Furthermore, this is another phase in which information regarding the structure of an organisation becomes very valuable. Thus, good communication and collaboration between business leaders and other roles, such as enterprise architects, is crucial. Capabilities can be used as a means to facilitate this interaction and discussion since they provide a common language (Gils & van Dijk, 2014).

4.5 Strategic options

The purpose of this phase is to formulate alternative strategies, which are based on the results of the environmental analysis. Table 4.4 illustrates the cross-domain relationships within the Strategic options phase.

Table 4.4: Strategic options phase cross-domain relationships

↓ From → To	SM	CBP	EA	EPM
SM	–	Strategic alternatives	Strategic alternatives	Criteria for definition of portfolios (per alternative)
CBP	Strategic capabilities (per alternative)	–	Strategic capabilities (per alternative)	x
EA	Alternative strategies based on architectural improvements	x	–	x
EPM	Overview of possible investment portfolios	x	x	–

According to the popular theory by Treacy & Wiersema (1993) all organisational strategies fall into three categories: Operational Excellence, Customer intimacy, or Product leadership. An organisation can have more than one category of strategies, as long as there is one dominating strategy, and the others are supporting it. Another well-known approach for formulating strategies comes from the work of Porter (2008b), which proposed a classification of strategies based on either taking an offensive or defensive position in the market (Cost leadership, Differentiation, and Focus). However, as Porter (2008b) admits, if an organisation fails to develop its strategy in at least one direction, it will become stuck in the middle.

Andrews (2005) argues that alternative strategies can be made by combining the strengths (S), weaknesses (W), opportunities (O), and threats (T) of an organisation which resulted from a SWOT analysis. This suggested approach overlaps with the ideas of the Confrontation Matrix, also known as TOWS matrix (Weihrich, 1982), which is a complementary strategy technique to the SWOT analysis. The TOWS matrix facilitates the formulation of several types of alternative strategies (SO, ST, WO, and WT) based on SWOT combinations. Even though most consider the TOWS matrix to be part of the SWOT analysis, it is actually a distinct technique which has been designed to complement it. Figure 4.9 illustrates some examples of alternative strategies for ArchiPharma.

Figure 4.9: Example TOWS matrix, modelled with ArchiMate

In the case of ArchiPharma, the organisation has three alternative strategies, formulated based on factors from their internal and external environment. These strategies can also be included in the generic categories proposed by Treacy & Wiersema (1993). As an example, the "Standardisation and centralisation of customer-facing systems" can be considered an Operational excellence type of strategy. the "Investment in further developing the R&D capability" can be considered an addition to the current Product leadership type of strategy.

Furthermore, with the help of CBP, we can determine which capabilities and resources are needed in order to realise each strategic alternative. This implies that for each alternative strategy a specific set of strategic capabilities can be identified. Based on how well they fulfil the requirements of the specific strategy, we can distinguish between the capabilities of an organisation that are weaknesses and need improvement, and the ones which are considered

Figure 4.10: Example relationship between capabilities, resources, and an alternative strategy, modelled with ArchiMate

strengths because they can currently support the implementation of the chosen strategy. Furthermore, the assessment of capabilities can also lead organisations to formulating alternative strategies to help improve or take advantage of them. Figure 4.10 illustrates how the capabilities and resources of an organisation can be related to the "Standardisation and centralisation of customer-facing systems" alternative strategy defined with the help of a TOWS matrix.

EA provides an opportunity to propose alternative strategies based on improvements that can be made to the architecture of an organisation. Therefore, an organisation can formulate strategies that take advantage of its underlying strengths or that improve on certain weaknesses. Essentially, the EA can be used to propose inside-out types of strategies which can be linked the internal perspective of the SWOT and TOWS.

Choosing which assets and projects to manage in which portfolios depends on what strategy the organisation is pursuing. To pursue "Standardisation and centralisation of customer-facing systems", for example, ArchiPharma can come with a budget for projects that lead to realising this strategy. Therefore, projects that contribute to this strategy can be grouped into one project portfolio so that investment decisions are made based on a holistic view of the relevant projects. The various strategies an organisation might consider can lead to various choices in portfolio divisions. Therefore, when pursuing several strategies at once, projects and assets, such as applications, can be added to more than one portfolio. Making smart choices in shaping the portfolio landscape ensures providing meaningful overviews for managers to make investment decisions on projects and enterprise assets (Maizlish & Handler, 2010).

4.6 Strategic choices

The main goal of this phase is to determine the best course of action for an organisation, based on its available strategic alternatives. Table 4.5 illustrates the cross-domain relationships within the Strategic choices phase.

Table 4.5: Strategic choices phase cross-domain relationships

↓ From → To	SM	CBP	EA	EPM
SM	–	Chosen strategy	Chosen strategy	High-level cost, benefit, risk assessment of strategic choice
CBP	Impact of strategy on capabilities	–	Impact of strategy on capabilities	x
EA	Impact of strategy on the EA	Impact of strategy on the EA	–	x
EPM	x	x	x	–

Andrews (2005) suggests that alternative strategies should be evaluated based on the best match of opportunities and resources. One model which follows his reasoning is the QSPM. David (1986) defines the purpose of the QSPM as an approach to determine the attractiveness of alternative strategies based on key internal and external factors. Although the QSPM is less known its merits come from its alignment with the SWOT analysis and the TOWS matrix.

In the case of ArchiPharma, with the help of the QSPM, the strategy to "Standardise and centralise the customer-facing systems" is identified to be the most promising one. It represents the strategy which is most in line with the most important internal and external factors of the organisation. Table 4.6 illustrates an excerpt of the QSPM used to assess the attractiveness (At.) of the alternative strategies of ArchiPharma.

As a financial approach to making strategic choices, we propose the work of Roelfsema (2014), one of the MSc theses which contributed to this dissertation. The main premise of Roelfsema’s research is that a strategic alternative which does not have value for an organisation should not be chosen. In this situation, the value is determined by the expected return and the associated risk of strategic alternatives. The expected return can be calculated with the use of the Net Present Value (NPV), Internal Rate of Return (IRR), Profitability Index (PI), discounted payback period, etc. Roelfsema (2014) identifies the NPV to be the best method for calculating the expected return. The associated risk can be determined by using a sensitivity analysis and Monte Carlo simulation, both combined with scenario analysis.

From the point of view of CBP, a high-level assessment of the strategic capabilities in terms of impact (high, medium, low) can help organisations estimate

Table 4.6: Example (excerpt) Quantitative Strategic Planning Matrix (QSPM) of ArchiPharma

Key factors	I	At. S1	At. S2	At. S3
Strengths				
High-tech local facilities	4	1	5	3
Many licenses and patents	5	1	2	1
Many investors	3	5	3	2
Multichannel customer management	4	2	1	5
Weaknesses				
Many unstandardised systems	5	2	3	5
Inefficient R&D	4	1	5	1
Decentralised customer databases	4	3	1	5
Slow regulatory compliance	3	4	2	3
Opportunities				
Global epidemics increase demand	3	2	2	3
Mergers & acquisitions	4	5	3	2
Many small suppliers	2	1	1	1
Low requirements emerging countries	4	5	1	1
Threats				
Ten global competitors	3	2	2	4
Highly regulated industry	5	3	3	5
Increased R&D costs	4	1	5	1
Multichannel customer management	4	2	1	3
Total score		137	157	177

I = Importance of the factor for the organisation

At. = Attractiveness of the factor for the strategy

S1 = Expansion strategic alternative

S2 = R&D investments strategic alternative

S3 = Standardisation strategic alternative

the effect of implementing each alternative. This kind of information combined with a financial or risk analysis can give a complete picture regarding the impact of each strategy on the organisation. Figure 4.11 illustrates how the capabilities of ArchiPharma are impacted, based on the selected strategy.

Figure 4.11: Example impact of strategy on capabilities, modelled with ArchiMate

Complementary to the analysis that can be made with the help of CBP, an organisation can make a more in-depth impact analysis with the help of EA. Especially analysing the impact strategy choices have on, for example, the business process landscape, can provide the necessary input for making informed strategic decisions later in the strategy process. Essentially, each alternative strategy will affect the architecture of an organisation in a different way. These differences can, in the end, be used as reasons for choosing one strategy above another. For example, for an organisation that does not want to undergo a big transformation, a strategy that is related to minor changes in the EA might be chosen above an alternative which implies big changes. Furthermore, it might turn out that the underlying infrastructure is not sufficiently robust for supporting the changes necessary to implement the chosen strategy. The costs involved to upgrade the infrastructure might be overlooked when neglecting to involve EA as a discipline in choosing which strategies to pursue.

PPM is closely related to this specific part of the ESAM. Project prioritisation is traditionally done based on costs, benefits, and risk. The analysis described above is a solid starting point for evaluating the projects that are under consideration. The analysis takes several factors and criteria into account so that strategic options can be looked at from different perspectives. At this stage, the importance of one criterion might outweigh another when making final decisions. For example, the strategic advantage might outweigh financial criteria. Prioritisation of criteria in decision-making at this point can be reused later on in PPM where projects are ranked according to. The ranking of a project depends on the importance and score for similar criteria.

4.7 Strategy elaboration

In this phase, the strategy(s) that has been chosen is specified into achievable objectives. Table 4.7 illustrates the cross-domain relationships within the Strategy elaboration phase.

Table 4.7: Strategic elaboration phase cross-domain relationships

↓ From → To	SM	CBP	EA	EPM
SM	–	Strategic objectives	Strategic objectives & Stakeholders	Strategic objectives & Stakeholders
CBP	x	–	x	x
EA	x	x	–	x
EPM	x	x	x	–

Kaplan & Norton (2004b) propose that strategy should be specified into objectives linked by cause-and-effect relationships in order to improve clarity and focus, and possibly also strategic alignment. One of the strategy techniques that can support the specification of strategy into objectives is the Strategy map. This technique helps to visualise the cause-and-effect relationships between different layers of objectives, which are grouped into four perspectives: financial, customer, internal, and learning and growth (Kaplan & Norton, 2004b). These perspectives are the same ones which are used in the BSC. Figure 4.12 illustrates how the chosen strategy of ArchiPharma can be decomposed into several objectives, based on the four perspectives of the Strategy map.

These objectives can be used as a starting point to determine the architectural vision of the organisation, which corresponds to phase A of the TOGAF ADM standard. Based on this information, the EA practitioner can start preparing their vision for the enterprise transformation that will enable the realisation of the business objectives. At this point, the relevant stakeholders should also be identified.

The strategic capabilities that have been identified in a previous phase (strategic options phase) can be linked to the various strategic objectives. In order to link the four perspectives of the Strategy map to the different levels of decomposition/ aggregation of capabilities, we propose the work of S. Cheng (2015), another one of the MSc theses which contributed to this dissertation. According to this, a financial objective (the highest level objective in a Strategy map) can be linked to the highest level capability, named a level one capability. This means that the specific capability, provided it has an adequate performance level, can help realise the financial objective. Similarly, a level two capability can help realise a customer objective (level 2 objective).

From the point of view of EPM, an important prerequisite is that portfolios are formulated taking objectives and their stakeholders in mind. This is a necessary step in the design phase of portfolio management approaches. Objectives and stakeholders provide the relevant input needed for deciding on portfolio divisions (Bodenstaff et al., 2014).

Figure 4.12: (Excerpt) Strategy map of ArchiPharma, modelled with ArchiMate

4.8 Strategic measurements

The purpose of this phase is to determine the key performance indicators which can be used to monitor the strategy implementation, and also evaluate the end result of the implementation (Grunig & Kuhn, 2008). Table 4.8 illustrates the cross-domain relationships within the Strategic measurements phase.

Table 4.8: Strategic measurements phase cross-domain relationships

↓ From → To	SM	CBP	EA	EPM
SM	–	Strategic metrics	Strategic metrics, initiatives & stakeholder concerns	Strategic metrics, initiatives & stakeholder concerns
CBP	Capability metrics	–	Capability metrics	Capability metrics
EA	Architectural requirements & constraints	x	–	x
EPM	Portfolio metrics	Portfolio metrics	x	–

The BSC proposed by Kaplan & Norton (1992) can be used as a support for this phase. The role of the BSC is to provide organisations with a framework in which they can, for each objective, define key performance indicators, specify targets, and determine the initiatives that need to be implemented in order to realise the chosen strategy. If a Strategy map has been used by the organisation to determine the strategic objectives, the same objectives can also be used with the BSC, as is the case for ArchiPharma (Table 4.9).

Table 4.9: The example excerpt Balanced Scorecard of ArchiPharma, as part of the Strategic measurements phase

Perspective	Objective	Measure	Target	Initiative
Internal	Optimise IT processes	Process performance	<90 %	Consolidate applications
		Process variance	>10 %	Harmonise processes
		Information consistency	100 %	Centralise information

Measurements are also important for CBP. Besides having an objective look at the outcomes of improving a capability, defining metrics can help with assessing the current and desired performance levels, with monitoring progress, and with evaluating the realised outcomes of the improvement (TTCP, 2005). The strategic key performance indicators can be used as a guideline for determining relevant capability metrics. For example, the "Reliability" metric could be used to measure the level of the "Customer management" capability. In this example, the "Reliability" metric is a decomposition of the higher-level strategic metric "Process performance" (Figure 4.13).

Figure 4.13: Example capability metrics, modelled with ArchiMate

This phase should also provide enough information to complete phase A of TOGAF ADM standard. The initiatives determined in this phase can be used as a valuable input for determining the requirements of the enterprise transformation. Furthermore, the Key performance indicators can be used to determine

several constraints, and also concerns that stakeholders might have. Enterprise architects can discuss with business leaders their vision about the changes in terms of capabilities and resources, and request formal approval to proceed (Figure 4.13).

Also for EPM the identified key performance indicators are very important. EPM aims at providing relevant analysis on a large enterprise landscape of assets and projects so that well-informed business transformation decisions can be made. Making choices on which analysis to use for which portfolios is based on performance measurements for monitoring the strategy implementation. "Business value" might be such a key performance indicator. In an application portfolio, this indicator might be evaluated by a combination of the number of business critical processes an application supports and by the number of relations the application has with surrounding applications. This analysis provides input for making transformation decisions on the application portfolio that help to bring the strategy implementation forward.

4.9 Implementation design

This is the first phase that deals with strategy implementation. The main goal of this phase is to determine the current (as-is situation) and desired performance levels (needed to realise the strategic goals and objectives of the organisation in terms of capabilities and supporting architecture). This is a phase in which multiple iterations are suggested in order to determine the best implementation solution. Table 4.10 illustrates the cross-domain relationships within the Implementation design phase.

Table 4.10: Implementation design phase cross-domain relationships

↓ From → To	SM	CBP	EA	EPM
SM	–	x	x	x
CBP	Current & desired performance levels of capabilities	–	Current & desired performance levels of capabilities	x
EA	Baseline & target architecture	Baseline & target architecture	–	x
EPM	x	x	x	–

At this stage, capabilities are re-assessed, in more depth, based on the architecture of the organisation, in the context of the strategic intent, and measured with metrics based on the strategic key performance indicators from the Strategic measurements phase. This assessment is an extension of the one performed in the Environmental analysis phase, and its results can be used as new input for another iteration of the strategy process if so desired.

The results of this assessment will reflect the current performance levels of each capability, based on a quantitative or qualitative assessment. Subsequently, this information can be used to determine the gap between the current and desired levels. The capability heat map can be used as a high-level method for representing capability gaps (TTCP, 2005). After assessing the relevant capabilities in the capability map and determining their desired future levels, a specific colour can be assigned to their performance levels (Papazoglou, 2014), as seen in Figure 4.14.

Figure 4.14: Example capability heat map linked to EA elements, modelled with ArchiMate

Figure 4.14 also shows how the elements of an EA can be related to a capability map. The performance of a capability can be derived from measuring at the operational level. The current performance level can be derived from the baseline architecture and the desired performance level can be derived from the target architecture. This covers phases B, C and D of the TOGAF ADM standard. The gap between the current and target states of an architecture can also be represented, in a more abstract manner, at capability level, by using a gap analysis or spider chart. Figure 4.15 illustrates the spider chart created for the "Customer management" capability of ArchiPharma, based on the capability metrics presented in Figure 4.13. This kind of analysis can also be included in management dashboards, and it is typically found in EPM dashboards.

Figure 4.15: Example spider/radar chart based on capability metrics

4.10 Business transformation planning

The main goal of this phase is to develop the implementation roadmap at several different levels (goal, capability, architecture, and project). This is a highly complex phase in which very important decisions need to be made regarding which aspects of the implementation are going to be pursued and in which order. Table 4.11 illustrates the cross-domain relationships within the Business transformation planning phase.

Table 4.11: Business transformation planning phase cross-domain relationships

↓ From → To	SM	CBP	EA	EPM
SM	–	Business cases	Business cases	Business cases
CBP	Capability development plan (roadmap)	–	Capability development plan (roadmap)	Capability development plan (roadmap)
EA	Architecture roadmap	architecture roadmap	–	Project definition
EPM	Project portfolio selection	Project portfolio selection	Project portfolio selection	–

From the point of view of SM, Business cases can be used to create the goal roadmap and to influence the project roadmap. With the help of a Business case, an organisation can ensure that every project or portfolio that is approved

is in line with the organisational goals and objectives. Additionally, it can help with selecting which projects or portfolios are implemented, based on the benefits provided to the organisation and their costs and risks. In some cases, it can also be used to elaborate goals into implementable actions.

In the case of ArchiPharma, multiple business cases have been developed for each of the projects corresponding to the strategic initiatives identified with the BSC. In these business cases several elements are defined, such as a description of the project, the objective it contributes to realising, the benefits of implementing this project, the costs and risks of implementing this project, the organisational change that will result from its implementation, the responsible(s), and the start and end dates of the project.

Furthermore, these business cases should support the capability development plan, in which the timeline of the capability improvements is determined. Typically, these types of improvements are not all made at once, but they are planned in capability increments, over time (The Open Group, 2011). This implies that the improvement of a capability is usually done in multiple increments, each providing a part of the expected added value of improving the capability. A capability roadmap can be used to sequence and plan these capability increments over time (Papazoglou, 2014). By using this method, it can become easier to have an overview of when each increment is supposed to be implemented. A capability roadmap can also be used to communicate the implementation plans with management.

In our example, ArchiPharma has four capabilities need to be improved "Customer data management (CDM)", "Customer order management (COM)", "Customer billing and collection management (CB&CM)", and "Accounting (Acc)". Figure 4.16 illustrates the capability development plan for the four capabilities that need improvement, as they can be modelled with ArchiMate.

Figure 4.16: Example capability development plan, modelled with ArchiMate

An approach for prioritizing capabilities for the development plan can be derived from the work of Danesh & Yu (2015). The authors use i^* to illustrate the dependency relationship between capabilities. Furthermore, Danesh & Yu (2015) state that capabilities can complement each other by fulfilling goals,

satisfying soft goals, providing resources, or performing tasks. By applying their idea of dependency between the capabilities of an organisation it might become possible to determine a logical order in which capabilities need to develop in order to use the least amount of resources to fulfil a goal.

Phase F of the TOGAF ADM deals with detailing the migration plan from the baseline architecture to the target architecture, in order to realise the organisational goals, objectives and strategies. In this phase, an implementation roadmap is established together with the portfolio and project managers, in order to have an alignment between the planned architectural changes and the actual projects that will be realised within the organisation. Similarly, the implementation roadmap is checked against the higher-level roadmaps, such as the capability development plan and the goal roadmap.

4.11 Implementation governance

The main focus of this phase is to monitor and ensure the alignment between the implementation roadmap and the actual execution. This can be done with the help of guidelines, principles, and accountability of the parties responsible for the implementation. Table 4.12 illustrates the cross-domain relationships within the Implementation governance phase.

Table 4.12: Implementation governance phase cross-domain relationships

↓ From → To	SM	CBP	EA	EPM
SM	–	x	x	x
CBP	x	–	x	x
EA	Governance of architectural implementation	Governance of architectural implementation	–	Governance of architectural implementation
EPM	Monitoring of project portfolios	Monitoring of project portfolios	Monitoring of project portfolios	–

Phase G of the TOGAF ADM standard refers to the governance of the implementation and creates a link between the architecture and implementation organisation. The outcome of this phase should be the actual implementation of the organisational change. Therefore, this phase is mostly characteristic for disciplines such as, PPM, which can provide a good overview of the status of the implementation, by abstracting from specific details and focusing on the most relevant aspects. These overviews facilitate decision-making based on aspects such as, which projects to start first, which IT systems to phase out and which capability increments to focus on in the next quarter.

The various portfolios that are created during the previous steps provide a solid basis for governing the implementation (Ross et al., 1996). They are

created with strategic objectives and stakeholders in mind. They analyse and evaluate the portfolios for exactly those performance indicators that are important for the chosen business transformation. Results are visualised in dashboards that address exactly those three dimensions (objective, stakeholder, performance indicator). The dashboards provide the necessary overview of the often complex landscapes by abstracting from irrelevant details and focusing on important aspects. These overviews allow well-informed decision making on the continuation of the transformation process. Decisions can be made, for example, on which projects to start first, which IT systems to phase out and which capability increments to focus on in the next quarter.

4.12 Strategy evaluation

This is the final phase of the method in which the concerned and results of the strategy implementation. After the implementation is complete, an evaluation can be performed. The key performance indicators established with the help of the BSC can be used to compare the target outcome to the realised outcome of the implementation. If the implementation is successful, the realised outcomes should be at least equal, if not better, to the target outcomes. Table 4.13 illustrates the cross-domain relationships within the Strategy evaluation phase.

Table 4.13: Strategy evaluation phase cross-domain relationships

↓ From → To	SM	CBP	EA	EPM
SM	–	Target vs. realised outcomes	Target vs. realised outcomes	Target vs. realised outcomes
CBP	Strategic capability performance evaluation	–	Strategic capability performance evaluation	Strategic capability performance evaluation
EA	Architectural evaluation of the implementation	Architectural evaluation of the implementation	–	Architectural evaluation of the implementation
EPM	Evaluation and suggested improvements to asset portfolios	Evaluation and suggested improvements to asset portfolios	Evaluation and suggested improvements to asset portfolios	–

In the example of ArchiPharma, one of the targets was achieved, and two were not (Table 4.14). It is recommended that this assessment is made continuously during the implementation process, in order to fore-come that the targets are not met. If deviations are detected during the implementation process, several recommendations for improvements can be made.

From an EA perspective, this phase of the ESAM overlaps with the last phase of the TOGAF ADM standard, which is called the architecture and change man-

Table 4.14: The example excerpt Balanced Scorecard of ArchiPharma as part of the Strategy evaluation phase

Perspective	Objective	Measure	Target	Outcome
Internal	Optimise IT processes	Process performance	<90 %	95 %
		Process variance	>10 %	15 %
		Information consistency	100 %	80 %

agement phase (H). The main goal of this phase is to ensure that the architectural changes are managed accordingly and to provide continual monitoring of changes within the environment of the organisation. The scope of this TO-GAF ADM phase overlaps with the environmental analysis phase described in the beginning of the ESAM. At this point, a new cycle of the strategy planning process can start.

Within this phase, the results of the implementation can also be analysed from the perspective of capabilities. By comparing the performance level of capabilities to their desired level an analysis can be made, with the help of the capability metrics, to determine if the strategic objectives have been realised.

The asset portfolios (the portfolios that contain important assets of an organisation like applications and infrastructure) continue to being managed in this phase. The effects of the various projects during the business transformation are reflected as improvements in the asset portfolios. The dashboards provide necessary input for continuing with the next cycle.

4.13 Summary and Conclusion

This chapter can be considered the first design part of the ESAM, where we go into more detail regarding the cross-domain relationships, as part of our solution for Challenge 1: Cross-domain solution. In order to do this, we have presented an overview of the 11 phases of the ESAM: Visioning process, Business model, Environmental analysis, Strategic options, Strategic choices, Strategy elaboration, Strategic measurements, Implementation design, Business transformation planning, Implementation governance, and Strategy evaluation. Eight of the 11 phases can be easily identified from SM literature, whereas the remaining three (relating to strategy implementation) are specific to EA.

For each phase presented in Figure 4.2, several cross-domain relationships between SM, CBP, EA, and partially EPM are possible. In the sections of this chapter, we present an in-depth explanation of the possible relationships between the four disciplines, from the lens of each phase of the ESAM. A simplified overview of the proposed relationships between the four disciplines within the ESAM can be seen in Table 4.15.

What can be observed from Table 4.15 is that a majority of the ESAM phases can contain bi-directional relationships between the four disciplines. This implies that within these phases with bi-directional relationships (✓) disciplines both provide and receive information from each other. Therefore, we can conclude that these disciplines can be considered equally relevant for the strategy process and that a close collaboration between them is required.

Table 4.15: The ESAM cross-domain relationships

Phases	Disciplines			
	SM	CBP	EA	EPM
Visioning Process	+	–	–	–
Business Model	✓	✓	✓	–
Environmental analysis	✓	✓	✓	x
Strategic options	✓	✓	✓	✓
Strategic choices	✓	✓	✓	–
Strategy elaboration	+	–	–	–
Strategic measurements	✓	✓	✓	✓
Implementation design	–	✓	✓	x
Transformation planning	✓	✓	✓	✓
Implementation governance	–	–	✓	✓
Strategy evaluation	✓	✓	✓	✓

+ = provides input to another/multiple discipline(s)

– = receives input from another/multiple discipline(s)

✓ = provides and receives input to/from another/multiple discipline(s)

x = no interaction

In some phases of the ESAM, we can see that some disciplines are only providing information and the rest are only receiving this information. For example, in the case of the Visioning process, the mission, vision, and values of an organisation are usually defined by top management. Furthermore, the visioning process phase is specific to SM but can provide valuable insights and guidelines to designing and transforming an organisation, both of which are core aspects of EA, CBP, and EPM.

A reversed example can be seen in the case of the Implementation design phase, where the main disciplines responsible for providing relevant information are EA and CBP, whereas SM is one of the disciplines receiving this information. In this phase, we can also see that from the point of view of EPM there is no interaction with the other disciplines. This situation occurs because of the

lack of information from literature and practice regarding the involvement of EPM in this phase, due to this discipline not being the focus of our research.

Additionally, within this chapter we illustrate how the ESAM can be used to address Challenge 2 (Strategy formulation), Challenge 3 (Strategy implementation), and Challenge 4 (Strategic intent to EA), with the help of the ArchiPharma case (Section 4.1), an anonymised pharmaceutical organisation.

Throughout each section of this chapter we focus on three aspects, corresponding to the three challenges. First, based on Challenge 2, we illustrate which strategy techniques can be used within the phases of the ESAM. We argue that these strategy techniques can be replaced or modified as long as they still fit with the purpose of the phase, in order to promote the flexibility of our method. Furthermore, we illustrate how these strategy techniques can be linked to each other, in order to provide a stream of information from one to another, and also to facilitate traceability of decisions. Moreover, we argue that our proposed combination of strategy techniques can enable organisations to have a more objective process due to included support for documenting decisions, for brainstorming, and even for more objective decision-making with the help of some strategy techniques.

Second, we focus on several aspects included in Challenge 3, such as incorporating a method for CBP within the strategy process in order to support strategy implementation. The complete overview of the CBP method are included in Appendix J. Furthermore, we provide several best practices for defining and using capabilities since they represent the core of CBP. Moreover, with the help of the ArchiPharma case, we illustrate how the strategic intent identified in the previous section (Section 5.2) can be used and related to CBP. Additionally, we illustrate how capabilities can be related to EA concepts (such as service, process, and application) without using the ArchiMate language notations. Last but not least, we illustrate how several CBP assessment and planning techniques can be applied and visualised.

Third, we focus on several aspects included in Challenge 4, such as proposing and using additional concepts and relationships for the ArchiMate 2.1 specification. Based on an analysis of the possible mappings between strategic, capability, and value-related concepts, and ArchiMate concepts, we conclude that the ArchiMate language is not mature enough to fully support the modelling of such concepts (Appendix K). Therefore, we propose several additional concepts and some changes to existing concepts in order to enable endeavours such as linking strategy techniques to ArchiMate, and impact analyses of strategies on existing EA. Furthermore, we present how several planning and monitoring techniques can be supported with the help of the ArchiMate modelling language.

Table 4.16 illustrates the requirements we formulated for first four challenges, together with a summary of how we address them within the ESAM.

Table 4.16: Overview of the challenges addressed in Chapter 4, including the requirements and how it is addressed within the ESAM

Challenge	Requirement	How it is addressed in the ESAM
Challenge 1: Cross-domain solution	Cross-domain relationships	Emphasis on how and what collaboration is possible within the phases of the method
	Cross-domain knowledge	The phases, techniques and collaborations are based on knowledge from multiple domains
	Two or more domains	Four domains (SM, CBP, EA, EPM)
	Combined solution	Phases and techniques combined from multiple disciplines
Challenge 2: Strategy formulation	Flexible strategy planning process	Formal process designed in a modular manner (toolbox)
	More objective strategy process	Support for documenting decisions, brainstorming, objective decision-making
	Linked strategy techniques	Extensive combinations of multiple strategy techniques
	Alignment through strategy techniques	Inclusion of strategy techniques which promote alignment
Challenge 3: Strategy implementation	Support for implementing strategies	Complete CBP method
	Capability-based communication	Capability map and guidelines for defining and using capabilities
	Techniques for capabilities	Support for designing, assessing, planning, implementing, and monitoring capabilities
	Capabilities as intermediaries	Relationship between strategy and EA via capabilities
Challenge 4: Strategic intent to EA	Impact of strategy on existing EA	Traceable relationship between strategy and EA modelled with ArchiMate
	Linking strategy techniques and ArchiMate	Mapping between strategy technique concepts and ArchiMate concepts
	Planning and monitoring change with ArchiMate	Support for BSC, roadmapping, etc. with ArchiMate
	Additional concepts, relationships, views	Several suggestions for new concepts and improvements to existing concepts/relationships

Chapter 5

Software tool support for the ESAM

This chapter is based on the contents of the following papers:

Aldea, A., Iacob, M.E., van Hillegersberg, J., Quartel, D. & Franken, H. Strategy on a Page: Management dashboards with ArchiMate. Submitted to the *Business & Information Systems Engineering (BISE) Journal*.

Febriani, T.R., Aldea, A., Iacob, M.E. & Daneva, M. Strategic planning process using reasoning tree-based approach. Submitted to the *7th International Symposium on Business Modeling and Software Design (BMSD 2017)*.

Scrieciu, M.V., Aldea, A. & Iacob, M.E. The Infinity method – Improving strategic alignment through mutual understanding. Submitted to the *7th International Symposium on Business Modeling and Software Design (BMSD 2017)*.

Seeing the importance of organisations being able to formulate, align, and implement their strategies in order to remain competitive, it stands to reason that many techniques and software tools to support this process have already been introduced. At an operational level, many standards have been developed, which have been implemented in a multitude of software solutions, such as, Business Process Management (Dunie et al., 2015), Enterprise Resource Planning (Guay et al., 2015), etc. Similarly, at a tactical level, Business Intelligence (Parenteau et al., 2016), EA (Mcgregor, 2016), and other domains have been supported by software tools, some based on academic research, and others just on experience from practice.

However, when looking at a strategic level, only a few software tool solutions are currently available (Iervolino & Van Decker, 2016), of which, most of them are not including support for well-known strategy techniques, such as the BMC, the SWOT analysis, the BSC, and others. Furthermore, many of these Computer-Aided Design (CAD) solutions are not based on scientific research, but rather on experience from practice. While practical experience is highly valuable, it might also be incomplete or biased to particular situations. Moreover, most of these software tools do not offer a connection to EA, which is considered to be a discipline that helps improve the alignment between strategy and operations, and Business and IT (Malta & Sousa, 2010).

Therefore, we consider that while the current software offerings for the operational and tactical levels are abundant and well-developed, the strategic level is lacking by comparison. Similarly, Teece (2010) argues, when looking at business modelling, that there is little support for designing and analysing business models, which can lead to poor understanding of an organisation and ultimately, to commercial failure.

The lack of support for designing and analysing aspects pertaining to SM is also recognised by Osterwalder & Pigneur (2013), which argue that IS research could provide beneficial guidance on this topic in three areas. First, it can help provide a common language, conceptual frameworks, and visual schemas that can help with understanding and designing strategy techniques. Current SM research is mostly focused on observing, classifying, and describing strategy techniques (Osterwalder & Pigneur, 2013).

Second, it can help transform the strategy process into a design activity, in which prototyping, exploring alternative solutions and validating ideas plays a central role. Currently, the strategy process is mostly focused on decision-making and does not consider a trial-and-error-based learning process for using strategy techniques Osterwalder & Pigneur (2013).

Third, CAD, which has played an important role in transforming the EA discipline, can also be used at the strategic level to assist managers and executives with designing and selecting strategic options. Currently, SM research does not provide enough knowledge on how CAD can be used to support strategy techniques. According to Osterwalder & Pigneur (2013), SM could benefit greatly from cross-domain research in this area.

Therefore, our goal for this chapter is to introduce our CAD proposition, which can assist organisations with designing, analysing, and visualising strategies with the help of well-known strategy techniques and ArchiMate-based dashboards. We argue that our proposed software tool has multiple theoretical and practical contributions. First, as a theoretical contribution is the integration of knowledge, theories, and ideas from multiple fields of research, such as SM, CBP, and EA. Second, we propose a unique way to use ArchiMate concepts to support the creation of management dashboards by providing building blocks, templates, and a mapping between strategic concepts and ArchiMate concepts. Third, we introduce a way to combine and use strategy techniques in

a spreadsheet-based tool in order to gather strategic information in a structured manner, that can be reused in an ArchiMate model or dashboard.

From a practical standpoint, our CAD solution provides clear guidelines and templates for practitioners to follow and use when designing their strategy. Second, by providing a way to visualise strategic information with the help of ArchiMate, we can enable EA practitioners to create interactive management dashboards, which can better emphasise the value of EA. Third, by facilitating the collection of strategic information in a structured manner, with clear mappings to ArchiMate concepts, we can simplify the process of incorporating strategic information into EA models. Finally, our CAD solution can also help organisations with bottom-up decision making, by improving communication between top management and EA practitioners with the help of the interactive dashboards.

One of the most notable CAD solution, based on a strategy technique, is the web-based version of the BMC. This implementation of the BMC supports users in a multitude of ways that could not be provided by a paper-based version, such as unlimited space for prototyping, built-in help function, and the possibility to export the canvas to other applications such as Microsoft PowerPoint and Excel, just to name a few.

This software implementation of the BMC is based on extensive research on how CAD can be used to enhance the usage of the technique. In their research, Fritscher & Pigneur (2010) have proposed a prototype, created through multiple iterations, which introduces several software-supported features for the BMC, such as the dragging-and-dropping of elements, the ability to link elements, colour-coding and attributes for elements, the layering of multiple BMCs, and others. Based on this prototype, the authors investigate whether it can have any added benefits when compared to the traditional paper-based version. Their results illustrate that the computer-aided version of the BMC is perceived by participants as useful, and performs similarly to the paper-based version, which is considered as very encouraging by Fritscher & Pigneur (2014a) since CAD can support advanced features. To investigate how users might utilise features, such as colours, attributes, and the positioning of elements, Fritscher & Pigneur (2014b) perform a large-scale experiment. Their results indicate that in most cases, users would utilise such features only when provided with enough incentives to do so.

This reasoning is also reflected by the Task-Technology Fit (TTF) model by Goodhue & Thompson (1995), which argue that a technology needs to fit with the task at hand, to have a positive impact on the performance of an individual. In the case of the web-based tool proposed by Fritscher & Pigneur (2014b), it could be argued that the users did not utilise all the features available because they seemed to not be a good fit with the task they had to perform.

This perceived lack of fit could also be explained by the TTF model of Zigurs & Buckland (1998), which focuses on describing the fit between generic types of tasks and technology characteristics, in the context of group performance.

The model identifies five types of tasks that can occur from a group process perspective, namely simple tasks, problem tasks, decision tasks, judgement tasks, and fuzzy tasks. Furthermore, this TTF model also identifies three categories of technology characteristics that complement these tasks, such as communication support, process structuring, and information processing. Table 5.1 illustrates the fit profiles of the TTF model proposed by Zigurs & Buckland (1998).

Table 5.1: The fit profiles of the TTF model proposed by Zigurs and Buckland (1998)

	Communication support	Process structuring	Information processing
Simple task	High	Low	Low
Problem task	Low	Low	High
Decision task	Low	High	High
Judgement task	High	Low	High
Fuzzy task	High	Medium	High

To design our CAD solution, we use the two TTF models of Goodhue & Thompson (1995) and Zigurs & Buckland (1998) and adapt them to better suit our needs. The two models are fairly similar in their explanation of the TTF, by both focusing on the Task and Technology characteristics, which need to be aligned. The main difference is related to the perspective they focus on, which in the case of Goodhue & Thompson (1995) is the individual, and in the case of Goodhue & Thompson (1995) is a group of individuals. We argue that in the case of organisations, both types of users can be found, and therefore, we choose to focus on both while making a distinction between the types of tasks and technology that are most common in each situation.

For our CAD tool, in the case of individual tasks, the emphasis lies on gathering, aggregating, evaluating, structuring, and modelling of information, which implies the need for Information processing technology characteristics. The main goal is to provide a good overview of the current or desired state of the organisation, in an area of interest. However, in the case of group tasks, the focus lies on facilitating brainstorming, collaboration, and feedback, which are supported by Communication technology characteristics. The main goal here is to facilitate discussions between group members, based on the information presented with the tool. Additionally, in the case of strategy design, process structuring is necessary to ensure the completion of all aspects related to the task, besides a sufficient level of communication support and information processing. Table 5.2 illustrates our adaptation of fit profiles proposed by Zigurs & Buckland (1998).

In order to design this tooling support, we have focused on four distinct, but inter-related aspects. First, we develop support for visualising strategic information in a manner that includes only the most relevant details. Furthermore, our proposed way of visualising this information supports also additional fea-

Table 5.2: Adapted fit profiles based on Zigurs and Buckland (1998)

	Communication support	Process structuring	Information processing
Overview	Low	Low	High
Discussion	High	Low	Low
Design	Medium	High	Medium

tures, such as highlighting of the relationships between the different concepts presented. This way of visualising information, named Strategy on a Page, is further detailed in Section 5.1.

Second, we design several templates, for the Strategy on a Page, that can be used for specific purposes, such as Strategy elaboration, New business idea, Impact analysis, and CBP. The full overview of these templates and additional research can be seen in the BSc thesis of Scrieciu (2016). Within this dissertation, we demonstrate how these templates are applied in the case of the Investment fund, which can be seen in Section 5.2.

Third, we design software support for several popular canvases which are also often used in practice, such as the BMC, SWOT analysis, BSC, etc. These canvases are included in order to facilitate the usage of advanced features to support the modelling, design, and analysis of strategy techniques. We demonstrate the results of applying these canvases, in the case of both the Public university and the Investment fund, in Section 5.2.

Fourth, we investigate how organisations can be guided through the strategy process in a manner that is easy and approachable for them, in order to ensure that strategic information is generated and gathered in an appropriate manner. The full overview of this study can be seen in the thesis of Febriani (2016a). Within this dissertation, we demonstrate how this strategy design tool is applied in the case of the Public university, which can be seen in Section 5.2.

Last but not least, we demonstrate the implementation of the ESAM within the software tool. Since at the time of writing the dissertation, the implementation of the software tool was not complete, we only illustrate a few examples of how it can be used. Nevertheless, these examples are representative of how the tooling support for the ESAM is realised and can be generalised to all aspects of the method. The main reason for this is that the tooling support is created in a modular manner, with reusable components that are applied similarly throughout the implementation. Further details about the implementation of the ESAM within the software tool is presented in Section 5.2.

5.1 Management dashboard tool – Strategy on a Page

The management dashboard tool named the Strategy on a Page, can assist organisations with designing, analysing, and visualising strategies with the help of well-known strategy techniques and ArchiMate-based dashboards. Therefore, the Strategy on a Page is focused on the phases of the ESAM that relate to analysing the environment of an organisation, formulating and choosing an alternative strategy, and elaborating it into objectives and measurements (illustrated in Chapter 4).

The main application of the Strategy on a Page is to visualise the most important aspects of this information in a compact manner, similarly to a dashboard. Furthermore, the Strategy on a Page relies on concepts and relationships modelled in ArchiMate models. The main reason for this is that the Strategy on a Page is envisioned as a tool that can be used by ArchiMate users (such as Enterprise Architects) to present the information from EA models in a manner that is more familiar and relatable to managers and other decision-makers.

To design the Strategy on a Page, we use the knowledge detailed in Table 5.3, of the mappings between strategy techniques and ArchiMate concepts.

By defining a mapping between these techniques and ArchiMate concepts, we can determine which kinds of strategic concepts and information can be included in the Strategy on a Page. Furthermore, by relating these strategy techniques to EA concepts, we can provide EA practitioners with a good starting point for translating strategic documents into EA models. Moreover, by identifying what kind of information managers are used to receiving from the specific strategy techniques, we can facilitate the creation of management dashboards based on information in the EA of an organisation. Additionally, we can determine how these techniques can be related to each other, which could prove valuable when trying to relate the information gathered from different techniques in ArchiMate models.

It is worth mentioning that the "+" symbol in Table 5.3 indicates the existence of concepts included in the techniques, that generate an output usable by another technique. Similarly, the "-" symbol indicates concepts included in the techniques, that need input from another technique.

Besides the Strategy on a Page, we have also implemented support for several canvases based on some of the techniques detailed in Table 5.3. More specifically, we have created canvases in which ArchiMate concepts can be used in a way that mimics the normal usage of these techniques.

Table 5.3: The mapping between strategy techniques and existing/proposed ArchiMate concepts

→ ArchiMate ↓ Strategy model	Goal	Course of Action	Capability	Resource	Actor	Value	Interface	Collaboration	Assessment	Driver	Metric	Product	Service	Work package	Requirement	Outcome
Vision	+															
Mission		+														
BMC			+	+	+	+	+	+				+	+			
SWOT			-	-		-			+	-						
PESTEL										x						
BSC	+	+									+				+	
TOWS		+							-	-						
Brainstorming		+								+						
FFF					-					+						
Risk Analysis									+	-						
ERRC		+				-										
Strategy Canvas						-			+							
Six Paths					-	-			+	-		-	-			
Value Proposition			-	-		+							+			
Capability map			+													
Resource map				+												
MoSCoW	-														+	
Value Disciplines		+														
Gap analysis			-	-		-			+							
MCDA	+					-					+	-				
Kanban Board	-				+				+		+			-		

+ = Output that is provided by a strategy technique

- = Input that is needed by a strategy technique

5.1.1 Prototype

The initial design of the Strategy on a Page was done as a PowerPoint mock-up in which different elements of the tool were simulated. The result is a 40-slide presentation which behaves like an interactive dashboard that allows the user to highlight relationships between concepts. The objective of this mock-up was twofold. First, it was aimed at getting a better idea of how the Strategy on a Page should look like, how it should behave, and also what kind of information it should contain. Second, it was intended to be used as a demonstration of the Strategy on a Page concept, to receive feedback and initial reactions from possible users.

Based on the positive reactions received on the mock-up, we have developed our prototype for the Strategy on a Page in the BiZZdesign Enterprise Studio¹ software tool. Features and changes to the Strategy on a Page concept were implemented based on discussions with several Research Consultants, Business Consultants, and Enterprise Architects. An example of the Strategy on a Page concept, as implemented in the software tool, can be seen in Figure 5.1.

Figure 5.1: The Strategy on a page prototype

To design the look of the Strategy on a Page, we adapted the concept of the building block introduced by the BMC of Osterwalder & Pigneur (2010). The very popular strategy technique has been appreciated by both scholars and practitioners for its simple design, which can help focus the user on several important topics. We keep the purpose of the building blocks as a container for concepts of the same type, such as Key Resources, Key Activities, etc., but generalise it to be applicable to any type of strategic concept.

¹<http://www.bizzdesign.com/enterprise-studio>

Second, we create two types of building blocks, namely one that displays information in a textual format, and one that displays the information in a graphical format. We allow for this distinction to be made to facilitate users to create whatever types of custom views they consider appropriate. Similarly, we allow for the size and position of each building block to be changed. Additionally, to display several of the analyses supported, such as heat mapping and gap analysis, colour coding is necessary. In this case, the graphical building block can be used for displaying both the information and the corresponding colour.

Third, since one of the main features of the Strategy on a Page is to emphasise the underlying relationships between concepts, some form of highlighting needs to be supported. Furthermore, users should be able to toggle this highlighting feature on and off in an easy and intuitive manner. Therefore, the feature is assigned to the concept that the user is highlighting, and is toggled by clicking on the concept. Moreover, the prototype can support more advanced features such as customising how many related elements will be highlighted, if only direct relationships or also indirect ones will be highlighted, and the colours that will be used for highlighting. Additionally, concepts can be added to building blocks from existing EA models, with a drag-and-drop function. In this case, the highlighting is based on the underlying relationships from the EA models that contain the concepts used in the Strategy on a Page.

Fourth, to design the Strategy on a Page, we considered what kind of information should be included in each building block. Essentially, any type of concept can be included in the building blocks, with no restrictions on a specific layout or type of concepts that can be displayed. However, users are recommended to include only the most relevant information in these building blocks to fit on just one page, either landscape and portrait.

Finally, the prototype supports relationships with the native EPM module of the software tool with the help of cross-model relations. Once a relationship is established between two elements, one from each type of model (EA and EPM), the highlighting function can also be used to make explicit which program, project, application, etc. from a portfolio is related to a goal, initiative, outcome, etc. Since portfolios of projects usually contain several analyses (e.g. cost/benefit analysis), these can be included in the Strategy on a Page in order to emphasise the financial implications of strategies.

In terms of the TTF by Zigurs & Buckland (1998), the generic Strategy on a Page can support fuzzy tasks in which there is no predetermined goal or focus, and the user spends effort on understanding what information should be included and how it should be structured. The main reason for this is that the generic Strategy on a Page dashboard is very versatile and can support any type of task goal due to its customisable building blocks, which can be used to structure information in many different ways. Furthermore, the technology characteristics for fuzzy tasks require a high communication support and information processing, combined with a medium structuring of the process. The Strategy on a Page supports the gathering, aggregation, evaluation, and

structuring of information (information processing), which can be done by any person that has access to the tool, in an individual or collaborative manner via the team platform (communication support), and can be used to structure the process of discussion and decision-making with the help of the building blocks and highlighting (process structuring). Therefore, in terms of the fit profiles defined in Table 5.2, the Strategy on a Page can be used for both overview (information processing) and discussion goals (communication support), and also for strategy design goals (process structuring). We have used the Strategy on a Page in two case studies, integrating information from multiple strategy techniques (Section 5.2).

5.1.2 Templates

Besides the generic Strategy on a Page, which can be seen in Figure 5.2, we propose several additional templates focused on specific goals, such as New business idea, Strategy elaboration, Impact analysis, and Capability-based planning. Figure 5.2 illustrates the templates for the four use cases, which are quite different from each other. Nonetheless, they are all based on concepts, models, and techniques from SM, EA, and CBP as can be seen in Table 5.4.

Table 5.4: Concepts, models, and techniques used in the four templates

Capability-based planning	Strategy formulation	New business idea	Impact analysis
Capability map	Mission & Vision	Resource assess. (Relevance)	Resource assess. (Impact)
Capability assessment	Value disciplines	Capability assess. (Relevance)	Capability assess. (Impact)
Capability roadmap	Generic strategies	MoSCoW analysis	BCG matrix
Strategy map	Balanced Scorecard	Mission & Vision	Pareto analysis
Gap analysis	Blue ocean strategy	Strategy map	Problem & Objectives
Kanban boards		Morphological schemas	Gap and Solutions analysis

In order to determine the usefulness of these four templates, we have applied them in two case studies, one relating to the first template (Public university), and one relating to the last three templates (Investment fund).

In terms of the TTF model by Zigurs & Buckland (1998), these templates are intended for problem tasks, in which the emphasis is on finding a solution to help achieve a specific goal. In the case of the Strategy on a Page templates, a user can design a dashboard which includes the most relevant information relating to a specific goal of an organisation (e.g.: Strategy elaboration). The information included in this dashboard should offer enough insights to be able to get a better grasp of what is needed to achieve a goal, or to give an overview of how a specific goal has already been achieved. Furthermore, these dashboards are intended to be used in a group setting to generate discussion and facilitate decision-making. Therefore, the dashboard can be adjusted within group sessions, or afterwards based on feedback, which qualifies as a simple task.

Strategy elaboration

Figure 5.2: Strategy on a Page templates for four different purposes

5.1.3 Canvases

To support the modelling of strategic information directly in the software tool, we have created several canvases, based on well-known strategy techniques. These canvases include the BMC, SWOT analysis, TOWS matrix, PESTEL analysis, Strategy map, and the BSC. We have selected these six canvases based on what literature indicates as the most used in practice, as detailed in Section 3.2.3. More canvases are intended to be added soon, based on feedback gathered from practitioners.

Similarly to the Strategy on a Page, for these canvases, we have also used the mapping to ArchiMate concepts as a basis for designing them. In this way, we can ensure that any information that is filled in these canvases can also be used for creating dashboards with the Strategy on a Page, and for enriching existing ArchiMate models with strategic information. Figure 5.3 illustrates the Strategy map and BSC canvas we have created and the ArchiMate concepts they are mapped to.

Figure 5.3: Example Strategy map and BSC canvas included in the software tool

With these canvases, we can also facilitate the creation of underlying links in between the different strategy techniques, and the strategic concepts modelled in them. From an EA point of view, this aspect is very important and is often missing from strategic documents. The main reason for this is that strategic documents are usually intended to give an overview of the direction an organisation is heading in, which is done, in many cases, without explicit links between different aspects such as objectives, requirements, initiatives, metrics. Since in the case of EA, and especially ArchiMate, such relationships are crucial

for creating coherent models and analyses, this implies that, usually, EA practitioners might need to make assumptions to translate strategic information into ArchiMate models.

Moreover, with the help of CAD for these strategy techniques, we can add advanced features which can give a new depth to these techniques. One example of such features is the ability to reuse elements that have already been defined on a previous occasion. Therefore, a user does not need to define an element twice, but rather can just drag-and-drop the element in the new canvas from a list of already defined elements. This type of features is very common in software tools that support the ArchiMate language. Furthermore, elements can be imported from different files created with the software tool, just by selecting them from a list, and by copying and pasting them onto the canvas of the new model. Additionally, elements included in ArchiMate models can also be reused in these canvases, by using the same features. Figure 5.4 illustrates an example of how elements can be created (1) in one canvas (2) and reused by dragging them from a list (3) to a different canvas (4).

Figure 5.4: Example element creation and reuse in a different canvas

Another example of advanced features is the ability to make changes to the naming of an element in one canvas or ArchiMate model, that are immediately and automatically applied to every occurrence of that element. This can help keep coherence between the different canvases which share the same elements. When looking at the example presented in Figure 5.4, this means that if we change the naming of the element "Assessment" to "High political pressures" in the PESTEL analysis canvas (2), this change will be automatically updated in both the list of elements (3), and in the SWOT analysis canvas (4).

Additionally, to facilitate the documentation of all the relevant strategic in-

formation, the elements which are modelled in these canvases, have the option to add extra information. In Figure 5.5, we can see the "Assessment" element modelled in the PESTEL canvas, which includes an extra description to the element that can be accessed by clicking the symbol above the element, in the top left corner.

Figure 5.5: Example extra information that can be included for elements modelled in canvases

Due to the flexibility of the software tool, it is possible, in the future, to extend the Strategy on a Page with further analytical features. A few examples of such analyses which are considered to be implemented are the performance analysis with heat/tree mapping, gap analysis, cost/benefit analysis, stakeholder analysis, etc.

In terms of the TTF model by Zigurs & Buckland (1998), within a group setting, these canvases are intended for simple tasks, in which communication plays an important role (e.g.: for brainstorming sessions), and which have just one desired outcome, reflected in the individual purposes of the strategy techniques. However, in an individual setting, these canvases can be used for gathering, aggregating, evaluating, and structuring information, which makes them more suitable for problem tasks. Therefore, in terms of the fit profiles defined in Table 5.2, the canvases can be used for both overview (information processing) and discussion goals (communication support). We have also applied the canvases in the two case studies, in which they were used for multiple purposes, as detailed in Section 5.2.

5.1.4 Strategy design

Besides the canvases included in the software tool, we have also developed a strategy design tool. This tool, named the Strategy Blueprint, uses most of the same strategy techniques as presented in the previous section but is designed in a spreadsheet. The main reason for this is that we wanted to create a tool, that can be used by strategy and decision-oriented practitioners, in an envi-

ronment that is familiar to them, with visualisations that are recognisable, and functionality that is fairly simplistic.

The Strategy Blueprint has been designed based on the guidelines of the ESAM and on the mapping between ArchiMate concepts and strategy techniques presented in Table 5.3. We adjust the ESAM and focus on six phases, each supported by at least one strategy technique. For two of these phases, we create alternative versions, which represent the two options that organisations might face, namely to continue competing in their current market/industry, or to consider transitioning to a niche market. Figure 5.6 contains an overview of the phases included in the Strategy Blueprint.

In the Strategy Blueprint, we provide a ready-to-use structure for organising and synthesising information (e.g. line chart; tornado diagram; matrix, and pie chart). Furthermore, we include pre-defined generic factors that can be used by organisations as guidelines for what should be filled in or can be used as-is. Moreover, we define underlying relationships between the cells in which the information is filled in and the cells where it will be displayed as the result of the specific phase. Additionally, to generate the results of each phase, there are different types of input methods that are used: self-typing, check-boxes, steppers, and drop-down lists. Last but not least, we create connections between the results of the different phases in order to ensure that information only needs to be filled in once, but is available in all the relevant places.

Figure 5.7 illustrates an excerpt from the Business Modelling phase, filled in with information from the second case study, which demonstrates the check-box functionality and the underlying relationships between cells.

Figure 5.7: Example of the automatic features of the Strategy Blueprint

The information gathered with the help of the Strategy Blueprint can be used by EA practitioners in two ways. Either it can be manually added to existing ArchiMate models by using the guidelines presented in Table 5.3 or can be automatically imported with the help of an ArchiMate compliant software tool

Figure 5.6: The phases of the Strategy Blueprint

that contains a data import function. At the moment, the Strategy Blueprint can support both options, due to the usage of basic spreadsheet functionality.

The actual implementation of the Strategy Blueprint is done with the help of Numbers for Apple OS. The other application that has been considered for this purpose is Microsoft Excel, which is fairly similar to Numbers for Apple OS but differs in a few very essential aspects. Numbers was chosen for multiple reasons, motivated by several requirements we had for the tool.

First, the main motivation behind designing the Strategy Blueprint has been to provide users with a way to formulate their strategy in a simplistic manner. Therefore, the chosen application needed to support features, such as check-boxes. Numbers provides this feature built-in the standard application, while for Excel it is still under development and unreliable.

Second, the chosen application needed to provide enough features to create the process of strategy formulation seem semi-automated. For this purpose, we required an application that could be used, amongst others, to detect when a check-box has been ticked. This is used to automatically fill in other cells in the spreadsheets with the information that is visualised next to the check-box. Numbers provides extensive support for this by allowing to detect if a check-box is ticked or not (true/false check) and based on this, perform an action, such as copy the information in the cell next to the check-box in another cell. By comparison, this functionality in Excel is very unreliable and difficult to manage, since these features are still under development.

Third, the overall look and feel of the Strategy Blueprint implementation in the chosen application needed to imply more of a stand-alone tool, rather than just a standard spreadsheet. While Excel provides a good visual representation, Numbers offers much more customisation options, which are closer to our vision for the Strategy Blueprint.

Last but not least, the possibility to be used by any type of user, at any time, with little to no extra effort. This requirement is one of the few where Excel scores much better than Numbers. The main advantage of Excel is, that it is quite often installed on Windows-based machines (laptops, PCs, etc.) and can also be installed on non-Windows machines. Furthermore, files created with Excel are easily compatible with other open source applications, such as the OpenOffice Calc. On the other hand, Numbers is only installed on iOS-based machines, which are less wide-spread than Windows-based machines. However, Numbers offers the possibility to use online, without a local installation, by using an iCloud account. While this solution is free and it works similarly to a locally installed version of Numbers, it does require the user to create an iCloud account (which implies more effort).

Based on this comparison of the two alternative applications, we decided to use Numbers for the first version of the Strategy Blueprint. Our intention still remains to create a future version of the Strategy Blueprint based on Microsoft Excel, in order to make it easier accessible to every type of user. In the following sections, we provide more details regarding the phases of the Strategy Blueprint

and the workshop we organised to evaluate it.

In terms of the TTF model by Zigurs & Buckland (1998), the Strategy Blueprint is suitable for decision tasks, in which process structuring and information processing play an important role. We facilitate the structuring of the strategy design process by providing guidelines for a step-by-step approach, and by including pre-defined templates. Furthermore, the information that is filled in this tool is processed within each step, to generate a summary visualisation, and also between the steps, in order to automatically fill in aspects that have already been defined at a previous step. The Strategy Blueprint is also suitable for judgement tasks in which the emphasis lies on proving communication support and information processing. We support communication by facilitating the propagation of changes automatically throughout the whole tool, in all the places where an element occurs, in order to enable brainstorming and discussion. Therefore, in terms of the fit profiles defined in Table 5.2, the Strategy Blueprint can be used for strategy design goals, which emphasises a structured process, together with sufficient information processing (overview goals) and communication support (discussion goals).

5.2 Software tool implementation

Based on the aspects presented in the previous sections, we have implemented the Strategy on a Page and the canvases in a software tool designed to support the ESAM. Within this section, we demonstrate the usage of our software tool implementation with the help of two case studies, namely the case of the Public university and the case of the Investment fund. For each of these cases, we detail how we used both the Strategy on a Page and also the computer-aided canvases. Furthermore, we also present how the strategy design tool (Strategy Blueprint) was applied to the case of the Public university.

5.2.1 Canvases

In both case studies, we were able to use the canvases included in the software tool to get an overview of the current or desired situation of the two organisations.

Public university case study. To get a better understanding of the context of the Public university, we were provided with several documents containing information about their strategic intent, which we used to fill in several canvases, such as the BMC, SWOT analysis, BSC, etc. As an example, we were able to identify several Strengths (e.g.: strong entrepreneurial identity; modern research facilities), Weaknesses (e.g.: weak international appeal; diminishing brand), Opportunities (e.g.: emphasis on societal and environmental contributions through research; new regulations that urge universities to have a more distinct profile), and Threats (e.g.: new regulations that reduce government

tal funding; strong competition from other universities in the country) of the Public university, which could be plotted in a SWOT analysis (Figure 5.8).

Figure 5.8: Example SWOT canvas in the software tool (Public university)

The SWOT canvas represents one of the most simplistic canvases available in the software tool, in which all elements are essentially modelled with the Assessment concept of ArchiMate. The main distinction is that the elements modelled in each quadrant have a different profile, representing the four types of assessment possible with the SWOT analysis.

Even though we did not participate in the design of the Public university's strategy, with the help of these canvases, we were able to get a clear overview of what the University was planning to achieve. When creating these canvases, we could take advantage of reusing elements defined in previous canvases, which helped highlight the underlying relationships between canvases.

Investment fund case study. In the case of the Investment fund, we have used several strategy techniques, as detailed in the last three columns of Table 5.4. One example is the BSC and the Strategy map, which were used to elaborate the strategy of the Investment fund into more actionable initiatives, as part of the Investment fund's Strategy elaboration goal. Figure 5.9 illustrates these two techniques, as defined in the canvas available in the software tool.

Figure 5.9: Example Strategy map and BSC canvas created in the software tool (Investment fund)

As it can be seen in Figure 5.9, in the software tool, we have chosen to combine the Strategy map and the BSC into one canvas with two levels of complexity. The Strategy map is the basic canvas in which users can define the objectives of their organisation with the help of the four perspectives. For more advanced details, users can click the icon in the top left corner of each perspective, which reveals a BSC table. This table is automatically filled in with the objectives filled in the Strategy map. Furthermore, extra details can be added based on information from ArchiMate models or can be created by defining new Metric elements (for Measures), attributes of Metrics (for Target and Outcome), and Course of action elements (for Initiatives). The BSC table can always be hidden, to facilitate discussions only on the Strategy map.

The Strategy map and BSC of the Investment fund were initially defined by using Microsoft Excel and were later translated in the canvases of the software tool. The canvas in the software tool helped identify that not all objectives, measures, and initiatives were defined in the same manner, and therefore, needed some adjustment, to ensure that decisions could be made based on a clear overview. Furthermore, we could use this information, at a later time, to create a management dashboard that gives an overview of the Strategy elaboration pursuit of the Investment fund.

5.2.2 Dashboards

In both case studies, we were able to use the Strategy on a Page concept, but for fairly different purposes. In the case of the Public university we created one dashboard, while for the Investment fund we created three different dash-

boards, each addressing a distinct goal of the organisation.

Public university case study. In the case of the Public university, we used the Strategy on a Page to link information from three different domains in a logical manner, namely information about their i-Strategy, capabilities, and projects. The i-Strategy is created by the management board, while the capabilities were developed with the Information manager, and the projects were managed by a Program manager. This dashboard was used to provide an overview that can be used for discussions and further strategy design. Figure 5.10 illustrates the Public university's management dashboard.

Figure 5.10: Example management dashboard for the Public university

This dashboard illustrates the most simplistic feature provided by the Strategy on a Page, namely the highlighting based on the direct underlying relationships between elements. Furthermore, we also can see the two different types of building blocks used. In the case of the i-Strategy and Projects and initiatives building blocks, we have used the textual format, while in the case of the Capabilities building block we have used the graphical format. The main reason for this is that we have performed multiple types of analyses based on capabilities, for which we used colour-coding to illustrate performance levels, impact levels, relevance, etc. This type of colour-coding is more suitable for the graphical format building block, rather than textual one.

Investment fund case study. In the case of the Investment fund, we have used the Strategy on a Page to determine, at first, what kind of information needs to be generated based on the goals of the organisation for the case study. Therefore, we have used several strategy techniques to be used during the workshops, as detailed in the last three columns of Table 5.4.

Each of these management dashboards differed not only in purpose and techniques used but also in which features of the Strategy on a Page they used. While the Strategy elaboration dashboard only made use of the textual format blocks, the New business idea dashboard also included graphical format blocks which were used to support colour-coding for resource and capability assessments. The most complex of the three dashboards is the Impact analysis one, which includes besides textual and graphical format blocks, also a chart created

with the help of the EPM module. Figure 5.11 illustrates the Impact analysis dashboard, which demonstrates the usage of highlighting, different types of blocks, and of the EPM charts.

Figure 5.11: Example management dashboard for the Investment fund

5.2.3 Strategy design

In order to demonstrate how the Strategy Blueprint can be used, we apply it to the case of the Public university. A complete overview of the case and how it is applied to the Strategy Blueprint can be found in the thesis of Febriani (2016a). Within this section, we focus on demonstrating the unique features of the Strategy Blueprint, and not on detailing the case study.

Visioning. The first phase of the Strategy Blueprint is, similarly to the ESAM, the Visioning process. Figure 5.12 illustrates the whole phase and features explanations of the different elements available to the user. Each of the phases contain several common elements that are recurring within each phase, such as the name of the phase (Visioning), an overview of where the phase is positioned within the Strategy Blueprint, an explanation of the purpose of the phase and the main question it should help answer, a button to navigate to the next recommended phase, and last but not least, some instructions for how the phase should be used. These common elements are almost always included in the top part of the phase and cannot be edited by users, with the exception of the instructions which are positioned above where the user is required to perform an action.

Figure 5.12: Example of the Visioning phase of the Strategy Blueprint

Furthermore, each phase contains several specific elements, which are always found in the second half of the phase and are partially editable by users. These specific elements are designed based on the purpose of each phase and on the strategy techniques that are included in it. In the case of the Visioning phase, the specific element is a table where users are asked to fill in the Vision and Mission of their organisation. In the case of the University, these reflect their plans until 2020, as can be seen in Figure 5.12.

The other two specific elements refer to two possible strategy types, one for the existing market and one for the niche market. In the case of the University, there are four items defined for both existing market and niche market strategy types. In the top part of the phase, users are instructed to leave these fields blank because they will be automatically filled in when the corresponding phases are completed. Therefore, the Visioning phase can also be seen as a brief overview of the decisions that users have made throughout the Strategy Blueprint.

Business Modelling. This phase is one of the ones recommended to users to consider as a second step towards formulating their strategy. Figure 5.13 illustrates this phase and contains explanations of the different elements available to the user.

Similarly, to the previous phase, the Business Modelling phase also contains a few common elements, such as the name of the phase (Business Modelling), the overview of where the phase is positioned with the Strategy Blueprint, an explanation of the purpose of the phase and the main question it should help

answer, the recommended next phase, and instructions for the user. However, there are a few differences in how these common elements are used. For example, the recommended next phase, in this case, contains two buttons, which each link to another phase. One of these phases is considered optional (Market Analysis), and one is strongly recommended (Environmental analysis).

Business Modelling

How does your business create and capture value?
The objective of this part is to model your business, and understand the internal factors of your company that create and capture value.
Do you get the overview of your business model?

Optional and recommended next phase

Please select max 5 items from each building blocks which are critical in order to be successful in your industry. The summary of your choices will be presented in the Business Model Canvas.

Business Model Canvas

Key Partners	Key Activities	Value Propositions	Customer Relationships	Customer Segments
Local Government	Personal assistance	High Quality Education	Communities	Mass market
Academic Partners	High Quality Research	High Quality Research	Communities	Diversified
Business Communities	Innovative Invention	Innovative Invention	Open Day	Company
Knowledge Institutes	Student Life	Student Life	Representative Office	Researcher
Customer	University Visitation	University Visitation	Alumni	Alumni

Key Partners

- Local Government
- Academic Partners
- Business Communities
- Knowledge Institutes
- Customer

Key Activities

- Personal assistance
- High Quality Research
- Innovative Invention
- Student Life
- University Visitation

Value Propositions

- High Quality Education
- High Quality Research
- Innovative Invention
- Student Life
- University Visitation

Customer Relationships

- Communities
- Communities
- Open Day
- Representative Office
- Alumni

Customer Segments

- Mass market
- Diversified
- Company
- Researcher
- Alumni

Key Resources

- Local Government
- Academic Partners
- Business Communities
- Knowledge Institutes
- Customer

Key Revenue

- Local Government
- Academic Partners
- Business Communities
- Knowledge Institutes
- Customer

Channels

- Local Government
- Academic Partners
- Business Communities
- Knowledge Institutes
- Customer

Cost Structure

- Local Government
- Academic Partners
- Business Communities
- Knowledge Institutes
- Customer

Summary of choices automatically filled in based on checkmarks in the checkboxes (top 5 per category)

Pre-defined factors for each category corresponding to the BMC (factors can be edited/changed)

Figure 5.13: Example of the Business Modelling phase of the Strategy Blueprint

Regarding the specific elements of the Business Modelling phase, two distinct ones are included, each of them serving a different purpose. First, there is the BMC which is used simply as a tool for visualising the results of this phase, and which cannot be edited by the user. Second, there is the area under the BMC (in Figure 5.13 illustrated next to the BMC), which includes several categories with predefined factors. These factors are linked to a check-box (represented to the right of them), which can be check-marked by the users, and thus included in the BMC. According to the instructions provided above this area, users can select a maximum of 5 factors from each category.

If a user considers that these factors are not suitable for their situation, they can edit the text of a factor, and effectively replace it with a new, more appropriate, one. Therefore, the factors included in these categories should be considered as generic guidelines for what can be encompassed in each of them. In the case of the University, several of the pre-defined factors have been adjusted in order to have a better fit with its circumstances. One such example is the two elements in the Value proposition building block named "High-quality education" and "High-quality research", which were not included in the pre-defined elements, due to them being specific to the business model of universities.

Market analysis. This phase is considered as an optional one due to it helping users with making an assessment and comparison of their current market

and a prospective niche market. If a user decides to skip this step, they can come back to it at any time, simply by selecting it from the selection menu at the top of the screen.

Within the Market analysis phase, similarly to the Business Modelling phase, the specific elements are divided into two areas. The first area contains the summary visualisation of the choices that have been made by the user. For this visualisation, we have used a Tornado diagram divided into two halves, each representing either the Blue Ocean (blue colour) or the Red Ocean (red colour). Furthermore, the Tornado diagram includes the results of the three types of analyses performed in this phase, namely the Competitor analysis, the Niche market analysis, and the Resource assessment (Figure 5.14).

Figure 5.14: Example Market analysis Tornado diagram of the Strategy Blueprint

The second area contains the three aforementioned analyses, which need to be filled in by the user. Unlike the Business Modelling phase, the interaction of the user with these analyses is limited to assigning ratings and does not support the editing of factors. The analyses included in this area are also automatically contributing to the end visualisation, represented by the Tornado diagram. As an example, if a user changes the rating of the Supplier bargaining power (Competitor analysis) from Low to Very high, the Tornado diagram reflects these changes by moving the Competitor analysis bar further into the blue half. This represents that the Red Ocean (current market of the organisation) is less attractive due to increasing pressures from the suppliers, which

increases the attractiveness of the Blue Ocean.

In the case of the University, as can be seen in the Tornado diagram presented in Figure 5.14, both the niche market analysis and competitor analysis indicate that the best course of action would be for the University to explore the blue ocean (niche market). However, in terms of the resource analysis, it can be seen that the red ocean (existing market) is clearly the favourite. In order to determine the best course of action, both existing and niche markets can be further explored.

Environmental analysis. This phase is one of the three which contain two alternative versions. The main difference between these two versions is related to the two choices an organisation normally has, to either compete in the existing market or transition to a niche market. Another difference comes from the techniques which are used for each version. For example, the Environmental Analysis version for the existing market uses the PESTEL analysis and the FFF to facilitate the analysis of the external market of the organisation. On the contrary, the Environmental analysis for the niche market replaces these two techniques with the BoS Six Paths Framework.

Another distinction between the two versions of the Environmental Analysis relates to the visualisation chosen for the overview of the choices made by the user. Even though both versions are based on the SWOT analysis, the two chosen visualisations are arguably very different, as can be seen in Figure 5.15.

Figure 5.15: Example of the two versions of visualisations that can be generated within the Environmental analysis phase (existing market and niche market)

This distinction is based on the amount and type of information that is filled in the analyses that help generate the overviews. While in the case of the existing market the users are asked to make a simple assessment of whether a factor can be considered a Strength, Weaknesses, Opportunity, or a Threat, in the case

of the niche market, users are also asked to make more advanced assessments, in the form of a rating of how important each factor is for the organisation.

Nonetheless, there are also similarities between the two versions. Namely, both versions make use of the Capability, Resource, and Value assessments to determine which of these factors are Strengths and which are Weaknesses. However, as mentioned before, in the case of the niche market version, an additional importance analysis is added for the Capability and Value assessments. This information is also needed for the niche market version of the Strategy formulation phase.

Strategy formulation Similarly to the previous phase, Strategy Formulation also contains different versions, one for the existing market and one for the niche market. However, for the Strategy formulation phase, the similarities between the two versions are limited to one technique, based on the BSC, represented as a table. In this table, users should fill in, by hand, the information that corresponds to each strategy formulated within this phase. The information that can be filled in the table is divided into several categories (represented as names for columns), namely a description of the strategy, the objective(s) related to this strategy, the measures assigned to each objective, the targets for the measures, and finally, the initiatives which should help achieve the objectives (Figure 5.16). These categories are based on the items of the BSC.

Strategy Formulation Table

Formulate your strategy based on the result shows in the ERRC Graph and Competitive Positioning Graph.

Strategy ID	Description	Objective	Measure	Target	Initiative
51	Clearly position the University as a world-class entrepreneurial university.	<ul style="list-style-type: none"> • Improve the brand/reputation • Strengthen the spin off and entrepreneurial skill 	<ul style="list-style-type: none"> • university world rank • %new spin off 	<ul style="list-style-type: none"> • World top 100 university rank for overall assessment • Rank top 150 based on Faculty • 10% increment of new spinoff per year 	<ul style="list-style-type: none"> • Increase the number of spinoff • Create a network with global business community • Create an effective university gateway for the business community. • Facilitate active and protective contact with the business community. • Help startups and SMEs (including spin-offs) grow over the long term.

Figure 5.16: Example of the Strategy Formulation table (both versions)

As previously mentioned, the two versions of the Strategy Formulation are very different. In the case of the existing market, the emphasis lies on techniques related to the SWOT analysis, such as the TOWS and the QSPM. Therefore, the analyses and visualisations included in this version of the Strategy Formulation phase reflect this. For example, the analysis area includes four assessments of factors (identified in the previous phase as Strengths, Weaknesses, Opportunities, and Threats) based on their importance for the organisation. This rating is similar to the one that is included in the niche market version of the Environmental Analysis phase. Based on the assessments made by the user, the results are presented in a custom visualisation based on the idea of the TOWS, which creates different combinations of Strengths, Weaknesses, Opportunities, and Threats.

In the case of the niche market version, the focus lies on comparing how

well the user's organisation is performing compared to its closest competitors (on a scale from 1 to 10). This is done with the help of an analysis in which the user is required to assess their organisation and their closest competition based several factors (Capabilities and Values identified in the niche market version of the Environmental Analysis phase). This information is used to create a line chart which summarises how well each organisation is performing with respect to each factor. Based on this, the user is required to decide what factors their organisation should consider changing and also give an indication (on the same scale, from 1 to 10) of what magnitude this change should have. Similarly, this information is used to create a second line chart, which focuses on illustrating the current situation of the organisation and the desired one. Figure 5.17 illustrates the two aforementioned line charts.

Figure 5.17: Example of overview visualisation of the Strategy Formulation phase (niche market)

5.2.4 Evaluation

In the case of the Public university, the Strategy on a Page dashboard was presented to the Public university representative with which we collaborated during the case study. The main scope of this dashboard was to demonstrate how it is possible to use EA and operations at a strategic level. The highlighting feature has been used to emphasise the contribution of projects to the capabilities and ambitions of the University. The general opinion of the Public University representative was positive, which was reflected in his interest to further experiment with the Strategy on a Page. Additionally, the representative mentioned that he intends to show our results to other colleagues.

In the case of the Investment fund, the management dashboards have been presented to the President of the fund which found the highlighting feature as very helpful for emphasising the most important relationships between elements. Furthermore, another aspect that was appreciated was the flexibility of the building blocks, which allows for the definition of custom containers of information based on specific needs. Moreover, having only the most relevant information presented in one page was seen as very useful, even in the case of

a start-up organisation that does not have much information. It is worth noting, that we have worked closely with the President of the Investment fund on defining what should be included in these management dashboards. Therefore, they were tailored to the type of information he considered as suitable to get a good overview of the Investment fund plans.

One other aspect that is worth noting is that in the case of the Strategy on a Page, users might need to have at least basic knowledge of the ArchiMate language, to create the elements that are included in the building blocks. However, this is not required, if another user pre-defines the required elements and relationships. In this case, the user that creates the Strategy on a Page dashboard only needs to drag-and-drop the relevant information from a list, into the building blocks. Nonetheless, the knowledge of the ArchiMate language should not be considered as a limitation, since the Strategy on a Page is intended to be used by EA practitioners, to help present strategic, tactical, and operational information in a simple manner with advanced features.

The canvases, as well as the Strategy Blueprint, on the other hand, can be utilised by any type of user since the connection to ArchiMate is hidden under a very simplistic facade. The users do not need to know what kind of concept they need to model in each part of a canvas, since this selection is already made for them, based on the purpose of the canvas and what ArchiMate elements it should allow. The only thing that a user needs to do is to select the generic element, such as Assessment in the case of the SWOT analysis, place it on the canvas where it should be positioned, and name it with the desired terminology.

5.3 Summary and Conclusion

In this chapter, we have presented our proposed CAD support for creating management dashboards based on ArchiMate elements. The main purpose of the Strategy on a Page management dashboard is to create overviews of strategic information, in a structured yet simplistic manner. Furthermore, the Strategy on a Page is designed to support an explicit link to EA, with the help of a mapping to ArchiMate elements. The tool is intended to be used mostly by EA practitioners to visualise EA models in management friendly way, by including a limited amount of information and displaying it in a dashboard-like manner. Moreover, the Strategy on a Page supports the highlighting of relationships between the different elements included in the dashboard, to provide more information about the motivation of certain choices. This highlighting is supported by relationships defined in the ArchiMate models which contain the information that is eventually displayed in the dashboard. Additionally, the Strategy on a Page is very flexible, which makes it very suitable for creating custom dashboards for any type of purpose or stakeholder.

We have also proposed several computer-aided canvases for some of the most popular strategy techniques available, such as the SWOT analysis, BMC,

BSC, etc. The main purpose of these canvases is to help practitioners that are not familiar with the ArchiMate language to provide strategic information in a way that can be directly reused within the Strategy on a Page and ArchiMate models. Furthermore, the canvases included in the software tool are very similar in visualisation to their paper-based counterparts, which makes them very recognisable. Moreover, the canvases use very simplistic features to support the creation of information that can be used for decision-making or just for getting a better overview of a situation. Additionally, the information that is filled in one canvas can be reused in another canvas, provided that the two canvases are compatible with each other. One such example is the PEST analysis, which provides information regarding the external environment of an organisation, which can be reused in the context of the SWOT analysis, where this information is categorised into Opportunities and Threats.

We have also presented our proposal for a strategy design tool, implemented in a spreadsheet-based environment, which uses and combines strategy techniques in a logical manner. In order to design this tool, named the Strategy Blueprint, we use a mapping between strategy techniques and the ArchiMate modelling language, which helps create the logic and the underlying relationships between the phases of the tool. Furthermore, we have designed several new visualizations for the combinations of existing strategy techniques, which are supported by advanced software functionality. Moreover, we provide managers and other strategy-oriented practitioners support and guidance for using multiple strategy techniques for the purpose of strategy formulation. Additionally, we provide EA practitioners with the necessary structure to be able to use and model strategic information which originates from these strategy techniques.

The two case studies in which we were able to apply the Strategy on a Page, the canvases and the Strategy Blueprint helped provide us with valuable insights into how our CAD proposition can be used. Based on this, we could conclude that our proposed CAD solutions are very promising and that further investigation is needed in order to explore their full potential. Additionally, we consider that the addition of advanced analytical features to all our software tools would greatly benefit the design of advanced management dashboards. Such analytical features should not only be localised in one model or technique but should be used to generate insights based on the underlying cross-model relationships, as also proposed by Iacob et al. (2014), between strategy techniques, EA models, and EPM charts.

Chapter 6

Serious gaming

This chapter is based on the contents of the following paper:

Aldea, A., Iacob, M.E., van Hillegersberg, J., Quartel, D. & Franken, H. (2014). Serious gaming for the strategic planning process. In *Proceedings of the 16th IEEE Conference on Business Informatics (CBI 2014)* (pp. 183-190). IEEE.

Serious games have received more and more attention over the years and have become increasingly important for education and training. They are used as tools for educating, motivating and changing behaviours in a broad spectrum of domains, such as military, education, government, corporate, healthcare, etc.

One of the main reasons that serious games have become so popular is the fact that they allow participants to experience situations that would otherwise be impossible in the real world due to reasons of safety, cost, time etc. (Susi et al., 2007). It is also argued that, with the help of serious games, participants can be guided to develop a specific set of skills. According to Corti (2006) game-based learning can help improve performance, increase awareness of the importance of employee roles, can be used for competency testing, assessment, recruitment process, customer and partner education, as a promotional tool, for induction, as a motivational tool, as an aspirational tool, and for best practices.

Serious games are considered to be formal methods for specifying and planning both education and entertainment content (Gunter et al., 2006) which are supported by a specific game design and mechanics. Deterding et al. (2011) propose a conceptual framework for designing serious games which includes the following guidelines: identifying the skills which need to be developed by the participants, determining what they should learn, which goals should be achieved, defining which aspects of the game should support learning and engagement (incremental learning, linearity of the game activities, short-term

memory loads that are placed upon the learner, support given during the game, transfer of learned skills, interaction, learner control, practice, intermittent feedback, rewards, situated and authentic gaming environment, and accommodating the learner's style), identifying ways to keep the participants engaged and immersed, offering possibilities for reflection, determining the game genre and game mechanics, and defining a way to score the achievements of the participants. The game mechanics are a vital part of the success of a serious game. They define the structure of the game, the way the participants interact with the game environment and can impose restrictions (time constraint, limited resources, turns) and offer rewards (recognition, score, achievements) (Yusoff et al., 2009).

A mistake that is often made with designing serious games is to consider that incorporating an educational element into a game is enough to make it successful as a serious game, both in terms of fun and educational goals. Similarly, educators and game developers assume that learning always occurs in successful games. The true challenge here is finding a trade-off between the two that will not compromise the integrity of one or another. Harteveld (2011) proposes that a successful game should master a balance of three worlds: Reality (no matter how abstract, a game should still have a relation to the real world), Meaning (players should learn something in each game), and Play (a game should be an interactive and engaging tool that immerses people into a fictitious situation). The final ingredient needed for designing a powerful game is having a clear focus for the game (Rouse, 2005).

In the following sections, we present details regarding the two serious games that were developed during this dissertation, namely the Strategy process board game and the HubWays online multiplayer game. Each of these serious games has a different focus. The strategy process board game, as the name implies, is focused on the strategy process and its integration with strategy techniques. The main scope of the board game is to allow players to experience the benefits of using parts of the ESAM, such as some strategy process techniques (e.g.: SWOT analysis, PEST analysis, BMC, etc.). Therefore, we argue that the board game is designed to demonstrate how some of the strategy techniques and phases of the ESAM could be used in a realistic situation. It is also one of the more practical contributions of our research, in which participants can experience the phases of the ESAM which are focused on strategy formulation.

The HubWays game, on the other hand, is focused on emphasising the benefits of pursuing a digital transformation and how it would positively impact the members of the Dutch horticultural industry. To be able to understand the context of this transformation, we have used several strategy techniques, such as the Value disciplines, the BMC, the SWOT analysis, and others. This has helped us to model the shift in strategy, business model, resources and capabilities that are needed in order to support the introduction of the HubWays platform. Consequently, the HubWays online multiplayer game was designed to simulate the impact of implementing a digital transformation, created with

the help of several strategy techniques included in the ESAM.

Therefore, we can conclude that the two serious games serve a complementary function, both demonstrating a different aspect of using the ESAM. On the one hand, the board game demonstrates how strategy can be formulated with the help of the ESAM, while on the other hand, the HubWays game focuses on demonstrating the impact of implementing a formulated strategy and business model.

In order to develop these serious games we have followed the guidelines of ADR, as proposed by Sein et al. (2011). The ADR is very suitable for designing artefacts which are designed in multiple iteration cycles based on the feedback received from practitioners and end-users. Therefore, in the following sections, we present details regarding the different iterations of our serious games.

6.1 The strategy process board game

The game is designed to be a short demonstration of the underlying method and can be used as a means for validation. The participants can use the game to easily familiarise themselves with the method and to experience some of its benefits. Based on the guidelines for designing serious games, we can determine that our strategy process board game has a strong relation with Reality (it is based on information from real organisations), has a powerful Meaning (players face the difficulties of the strategic planning process and learn how to deal with them), and has a well-defined universe of Play (successfully finishing the game relies heavily on the cooperation between participants and on their will to save their organisation).

As mentioned before, the main focus of the Strategy process board game is on the strategy process. In Chapter 4 we presented an overview of the 11 phases of the ESAM, which represent a detailed strategy process. For the purpose of our serious game, we have selected a few of the strategy techniques included in the ESAM as support, such as: BMC, Business Case, FFF, PEST, QSPM, Strategy Map, and SWOT. The underlying method contains a few additional strategy techniques which can be taken into consideration in later iterations of the game.

The target audience for this serious game is practitioners which are willing to improve their skills and knowledge about the strategy process. This game can also be used for educational purposes, to help students familiarise themselves with strategic thinking.

This game serves two main purposes. On the one hand, it helps familiarise the participants with a new way of thinking and working with the strategy process, while on the other hand it serves as a demonstration and validation of the underlying method, the ESAM.

The alpha version of this game is designed to be a collaborative experience in which participants have at their disposal a set of cards, the tasks they need to complete, a cheat sheet with information about the strategy techniques and

some additional materials. The game is intended to be played with three teams, each with 2–5 players. The three teams collaborate with each other in a unique manner that simulates the way information is transferred and used in an organisation. Each of the three teams represents a travel agency that is part of the same market. The three agencies are experiencing similar problems with their external environment that determines them to adjust their strategy. The internal environment of the three agencies is similar but is governed by one major difference, namely the way they have built their competitive position. Based on the strategy technique of Treacy & Wiersema (1993), the three agencies can be identified as pursuing Product leadership, Customer intimacy, and Operational excellence.

As mentioned before, the three teams represent three travel agencies that are competing in the same market. The main game mechanic revolves around it being played in a cooperative manner. This choice was made in order to facilitate the participants to experience how communication can be improved with the help of strategy techniques and some aspects of the underlying ESAM.

The competitive aspect of the game comes into play after the completion of each phase. For example, there are three teams (team A, B and C) and three agencies (agency X, Y and Z). Team A represents at the start of the game agency X, team B represents agency Y, and team C represents agency Z. After the first phase ends, the teams will change the agencies that they represent with each other. That would mean that team A now represents agency Y, team B represents agency Z, and team C represents agency X. Now each team is faced with a situation in which they need to elaborate on a strategy that they did not choose for and don't have any extra information about the reasoning that went behind that decision other than what is written down by the other team. This simulates what happens in most organisations. The top management makes decisions about the strategy that the organisation should pursue and gives guidelines about that to the middle management. The middle management needs to follow up on that strategy even if they didn't participate in the decision making process.

Another aspect that is introduced in this version of the game is an unexpected event. This event occurs after the completion of phase 2. By introducing this aspect in the game, the teams will be forced to adjust their strategy and chosen objectives in order to adapt quickly to the new situation. This will mean going through phase 1 and 2 at a quicker pace, which is possible to the fact that since they are already familiar with them. After the challenge of the event is completed, the participants can proceed to phase 3 and choose the relevant projects for the adjusted strategy.

One important game mechanic is the need for a game master. The game master is the person that supervises the workshop, gives initial instructions, and answers the questions of the participants. This is an essential role with this Version of the game. The main reason for designing the game with a game master is that this role is envisioned for a consultant that would play this game

with practitioners that want to enhance their knowledge of the strategy process.

A final aspect of the game mechanics concerns the duration of the game. In order to keep the length of the game relatively small, the amount of information the participants will work with is limited. For example, they will be given the option of having a new office in one of three predefined locations, each with their benefits and risks. Also, there will be three new destinations that the teams can choose to offer to their customers. These will also have their own benefits and risks, which will make all the choices balanced. Another way to limit the length of the game was to provide the first three steps of the first phase completely filled in. The participants will not have to fill in anything for these steps but they will need to use the information that is provided there, in the following steps.

The alpha versions of the game have been tested on several occasions with a small group of students. Based on the feedback received in these workshops, we have developed the first beta version. Improvements have been made in simplifying the game, reducing the steps, balancing the cards, and in the overall gaming workshop.

The beta version of the serious game is similar to the alpha version in many aspects, such as the game implementation and some of the game mechanics. There are also differences between the two versions, such as no collaborative aspect, no unexpected event, and some strategy techniques which are not present, such as the QSPM and business case. These changes have been made to simplify the game, reduce the duration of the workshop, minimise confusion, and to give a clearer and more motivating goal to the game in the form of a competition for market share. Furthermore, the beta version contains a few additional elements compared to the alpha version, such as a playing board for each team and the main playing board which represents the market in which the three teams operate. In the following sections, we present the game mechanics, the implementation, and the testing of the beta version, while emphasizing the main differences to the latest alpha version.

Game mechanics

Similarly to the alpha version, the game is played with three teams representing the three travel agencies presented before. The game mechanics of the beta version are designed to support competitive game-play, and there is no collaborative aspect outside of the teams. Therefore there will be no switching of agencies between the teams, as was designed in the alpha version. This mechanic was eliminated due to time limitations and some level of confusion created by switching agencies between teams. Although this mechanic was intended to emphasise that there is no need for prior knowledge to understand the strategic intent of an organisation as long as all relevant information is documented in a structured and clear manner, it has also created unnecessary confusion.

The unexpected event was also removed in this version of the game. The main reason for this change is that it would prolong the game more than intended. The main reason for introducing this event in the alpha version was to make the teams reconsider their strategy in the light of this new situation. In the beta version of the game, an opportunity to reconsider the strategy is still present but it is not forced by an unexpected event. It is induced by the competitive aspect of the game.

After the teams establish their initial strategy they are requested to deliver their objectives to the game master. Delivering an objective represents an action that each team is allowed to do. In total, each team has three actions which they can do, one-by-one in a turn-based system. This means that the game progresses only after each team have done one action, therefore finishing their turn and one round. In total, there are three rounds, each corresponding to a round of actions from the teams. Between the rounds, the teams are allowed to see how the market has changed based on the actions of all the teams. With this information in mind, each team can prepare their action for the next round. The main board is hidden from the teams until this point.

One of the game mechanics that is similar between the two versions of the game is the game master. In the beta version of the game, the role of the game master is more crucial than in the alpha version. Besides supervising the workshop, giving instructions, and answering questions, in the beta version, the game master has an active role in the process of the game. The game master is the one that manages the main game board which represents the market in which the three teams compete. Based on the objectives delivered by the teams to the game master, the pawns on the main board are moved.

Another responsibility of the game master is selling information to the three teams upon their request, about the niche market, the division into segments of their own customer base, and about the value curve of their competitors. Buying each of these types of information costs one action, leaving the teams with one less objective that they can deliver to the game master. This trade-off can prove to be very profitable and can give a team an advantage over the other two teams. For example, buying information about the niche market can give a team the necessary information to adjust their offering to match the needs of the niche market. Therefore, they will no longer compete directly with the other two teams for market share.

One of the design concerns from the alpha version was the duration of the game. After testing the alpha version of the game several times, it became clear that the game duration was still an issue. Although all the improvements aimed at reducing the duration of the game from the alpha version were effective, the workshops were still too long. With the beta version, several additional simplifications have been made, such as removing some of the strategy techniques used (QSPM and business case), removing the project system with the 10 coin budget, simplifying the cards, removing aspects, such as the unexpected event and switching teams. This has brought down the workshops to under two hours

which is ideal for testing the game with students at the university since classes last for one hour and 45 minutes. Furthermore, it is a reasonable amount of time for practitioners to spend on playing a game during a training.

Besides the two game boards that have been introduced in the beta version, we have also added several roles within the teams. These roles are intended to simulate the different types of roles that can be involved in the strategy process, such as Employee, Middle management, and Top management. For each of these roles we provide the participants with information regarding their responsibilities (e.g. defining the current business model of the organisation), together with explanations of where this information is available within the game. These roles were introduced to try to simulate the different roles that exist in real organisations and the differences in responsibilities and available information. The description of these roles is provided in a separate document to each participant in a team.

Another change to the game mechanics is that the teams are required to choose, without seeing the cards, nine external environment cards from a total of 18 cards. In the alpha version, each team would get all the external environment cards that exist in the game. The change in the beta version is meant to create a disparity in the information the organisations have about their external environment. Furthermore, this can stimulate teams to make different decisions than if they would have access to the information on all of the cards. This disparity also simulates reality since not all organisations have access to the same information about their external environments. Furthermore, a degree of re-playability is achieved by limiting and randomising the information about the external environments available to them.

6.1.1 Game implementation

The game implementation is fairly similar between the two versions of the game. The main differences lie in the amount of information provided and how this information is visualised in the cards and other game assets.

Most of the information about the external environment is similar to the alpha version. The main differences lie in the amount of detail that is provided regarding some possible opportunities such as destinations, offices, and agencies. These are consolidated into fewer cards that provide more focused information about these opportunities. For example, instead of offering three alternative destinations, each with predefined benefits and limitations we just introduce three destinations: Low-cost destination, Off-season destination, and a Luxury destination. We do not go into further details about the amount of commission and prospective tourists. These additional explanations were included in the alpha version of the game and did not add much variety to the decision-making process, rather they added unnecessary complexity.

Furthermore, due to the removal of the QSPM from the game, the external environment cards could also be simplified visually. In this new version, we

have also removed the notation of Opportunity and Threat from the cards in order to stimulate the participants to evaluate these cards by themselves and assign them to either Opportunities or Threats.

Moreover, several cards have been removed from the game due to them either being deemed unnecessary for the beta version or because they were considered confusing by the participants. Some of the cards that were considered confusing have been reworked and kept for beta version due to their relevance for the game. Regarding the internal environment cards, they are mostly the same as in the alpha version. Similarly as for the external environment cards, some of them have been reworked to remove some confusion that has been reported with the alpha version. Figure 6.1 illustrate a few examples of the internal (left two) and external (right one) environment cards from the beta version of the serious game.

Figure 6.1: Example internal and external environment cards for the beta version of the serious game

As can be seen from Figure 6.1, the internal environment cards have an additional notation, in the form of stars, when compared to the external environment cards. This notation, which is also present in the alpha version of the game, has been added to simplify the process of comparing the three agencies. The stars represent how well an agency is performing on a specific aspect, when compared to the other two agencies, and uses a scale from 0 to 3. Zero stars means that the organisation does not have that specific feature (marked with a black star), but one or both of the other agencies does. For example, JourneyTime (focus on a Customer intimacy strategy) has loyalty programs as a defining aspect, while none of the other two agencies have any type of loyalty programs implemented. Thus, JourneyTime has three stars on their loyalty programs card, while the other two agencies have a black star on their loyalty programs card.

Additionally, in the beta version, the teams are provided with a game board which serves several purposes. First, it contains a slightly modified BMC which the teams can "fill in" by placing the internal environment cards in the right building blocks. This can provide the teams with an overview of the business model of their organisation. Second, the team game board shows the steps the teams are expected to perform in order to finish the game. These steps are numbered from 1 through 7 on a path and are explained in the legend provided on top right corner of the board. These steps are meant to keep the teams

focused on working step-by-step and also to provide them with an overview of the whole process. Finally, several paths are available on the board, which are highlighted with the colours red and blue. The red paths symbolise the choice to either "attack" the other team's customer segment in order to steal some of their market share or to improve their own position and try to attract in this manner customers from the competitors. The blue path represents the blue ocean alternative in which the team decides to go for the niche market instead of battling with their competitors. Figure 6.2 illustrates the team board provided to each team in the beta version of the serious game.

Similarly to the alpha version, the teams also need to "fill in" a SWOT analysis by placing the environmental analysis cards on the SWOT sheet provided in the workshop. Based on this information, each team is requested to formulate two alternative strategies, choose one of them, and deliver it to the game master. This strategy is used to assess the choices made by the teams in the three rounds to come.

Figure 6.2: The team game board for the beta version of the serious game

As mentioned before, the beta version of the game is competitive in nature. In order to simulate the aspect of competition, we introduced the notions of market and market share. The market is the total number of customers available in the game, more specifically the sum of the market share of each agency and of the niche market. The market share is the amount of customers each team has at any point in the game. Each team starts with an equal market

share, which is also equal to the niche market. Thus the market is divided into four equal parts.

The market share of each team is divided into three customer segments. The teams are informed of this segmentation, but the actual number of customers which are part of each segment is not provided to them. However, the teams can choose to use an action point to buy this information from the game master. The following paragraphs present the information that can be bought by the teams regarding their customer segments. This information is presented in the form of quotes from customers which are representative for the needs of each customer segment. Furthermore, there is a distinction made regarding the size of each customer segment in the form of Main (largest customer segment), Secondary (mid-sized customer segment, smaller than Main), and Tertiary (smallest customer segment, smaller than the Secondary).

As an example, Travel Co. represents the agency which is focused on a Product leadership strategy. A customer from their **main market segment** states the following: "I am very pleased with the travel arrangements I was able to do with your organisation, but I would like the possibility to choose for a luxury cruise." A customer from their **secondary market segment** states that "Your offer is very varied and allows for a lot of customization. My main complaint is that there is no possibility to cancel a reservation, and also I would like to be able to rent a car through your organisation. I do not speak the language of most of the destinations that I choose." Similarly, a customer from their **tertiary market segment** states the following: "I am happy to be able to choose so many destinations and additional arrangements, but the whole package is a bit too expensive. I don't want to have to pay extra if I am not using everything. Also, I would like to have the possibility to choose for low-cost flights when I am not travelling too far."

As can be seen from this example, the three customer statements indicate a secondary preference that the customers have, besides the current offering of the agency. Based on this information, the teams can choose to adjust their strategies to tailor to the specific needs of their customers.

The division of the market into four main parts (three agency markets and the niche market) and the three customer segments for each team can be seen on the main board of the game. This main board is used to keep track of how the actions of each team influence the outcome of the game and is used to determine the final score for each team. The final score of a team is determined based on the number of pawns on the specific side representing each agency, after the final round. Only the game master can move the pawns on the main board, which follow a simple rule. Every objective that a team delivers needs to fall into one of the four paths designed on the team board: an attack on one of the two opponents' market share, a reinforcement of the current position of their organisation, or an advancement into the niche market.

Once the objective of the team is explained clearly to the game master and is deemed to be correct, the pawns can move in the benefit of the respective team.

With each move only half of the pawns that are affected by a specific objective move towards the team that submitted it. In order to get all the pawns from the group targeted initially, a team will have to consistently deliver objectives part of the same one path of the four available. In order for a team to successfully attract all the customers from a secondary or tertiary customer segment of a competitor, they will need to deliver three objectives which are part of the same path.

If a team decides to go after the niche market, they will be able to attract all the customers from this market by delivering only two objectives which are part of this path. It is easier to attract the customers from the niche market because the needs of these potential customers are not fulfilled by any travel agency currently. However, in order to be able to attract all the customers from the niche market, a team has to fulfil all of the needs of these customers. There are two ways that these needs can be discovered by the teams, namely by guessing or by purchasing this information from the game master in exchange for an action. The niche market has three main needs, such as off-season travelling destinations, large groups with discounts, elderly customers or businesses that want a fully arranged travelling experience. Figure 6.3 illustrates the main game board for Version 2 of the serious game.

Figure 6.3: The main game board for Version 2 of the serious game

The outcomes of the game are similar to the alpha version. However, there are two main distinctions. First of all, there is an added competitive outcome in which each team gets a final score which leads to one team being deemed the winner. Furthermore, this changes the dynamic of the game and also makes it easier to reflect on the decisions that each team made. Second of all, the teams are not choosing projects in the beta version of the game and are not

experiencing all of the strategy techniques from the alpha version. All in all, the beta version is a simplified iteration of the game in which some aspects have been removed in order to make the game more compact and the experience of the participants more focused.

6.1.2 Game testing

Similar to the alpha version, the beta version has also been developed iteratively with a smaller group of participants, mostly made up of university students. During these workshops, multiple improvements have been made, especially to the feel of the game, the scoring system, and the complexity. The questionnaire for the beta version is designed based on the guidelines of the UTAUT by Venkatesh et al. (2003). The items which are included in the questionnaire include aspects intended to assess the underlying method from the point of view of usefulness (p1.1 - p1.5), ease of use (p2.1 - p2.5), self-efficacy (p3.1 - p3.4), task-technique fit (p4.1 - p4.5), and intention to use in the future (p5.1 - p5.3). The full questionnaire is included in Appendix L.

We collected 14 questionnaires with full responses which were also included in our analysis. Table 6.1 contains the descriptive statistics for the questionnaire on the beta version of the serious game. Out of the five categories that were analysed, the ease of use and the self-efficacy categories received the best results.

Varying between the statements, between 90-100 percent of the students gave average or above score to the usefulness of the method for three of the statements (p1.1, p1.2, p1.5). The statement that received a score of average or above from the least amount of students (64.2 percent) is the third one (Using the method in my job would increase my productivity). When looking at these results, we can argue that since most of the students were positive about a majority of statements regarding the usefulness of the method, the third statement could also reflect that not all students aspire to have a job where such a method could be beneficial to their productivity.

Regarding the ease of use of the method, four out of the five statements included in the questionnaire received an average or above score from between 90-100 percent of students (p2.1, p2.3, p2.4, p2.5). The second statement regarding the ease of use (I would find it easy to get the method to what I want it to do) is the only one that received an average or above score from less than 90 percent of the students (78.5 percent). This could reflect that students see the method overall as easy to use but might be considered more difficult to use in particular situations or to tailor it to specific needs.

The ability to use the method to achieve the given tasks category (self-efficacy) has also received very good scores from students. Out of the four statements in this category, three of them received an average or above score from between 90-100 percent of the students (p3.2, p3.3, p3.4). The only statement that received an average or above statement from less than 90 percent of

the students (78.6 percent) is the first statement (I could complete a job or task using the method if there was no one around to tell me what to do). Similarly to the lowest scoring statement from the previous category, in this case, we can also argue that the overall method is regarded as easy to use but some additional guidance might be needed to be able to accomplish specific tasks.

Regarding the task technique fit, three of the five statements received an average or above score from more than 90 percent of students (p4.1, p4.3, p4.4). The statement that received a score of average or above from the least amount of students (64.3 percent) is the fifth one (The techniques incorporated in the method made the task very easy). This result can be considered in line with the previous low scoring ones, which would suggest that the aspect of the method that makes it less easy to use could come from the techniques included. This could mean that in order to make the method easier to use and to increase self-efficacy, we might need to include more detailed guidance about these techniques.

Finally, regarding the intention to use the method for a future assignment, only one statement received a score of average or above from more than 85 percent of students (p5.2). The other two statements (I intend/plan to use the method for a future assignment in which strategic alignment would play a role) scored an average or above score, given by only 64.3 percent of students. Due to the nature of the two statements that received the lowest score (more decisive), we can argue that the students were considered using the method in a future assignment but were not able to state with more certainty if that would be the case.

It needs to be mentioned that none of the average scores for any of the statements was below 2.85 on a 5-point Likert scale. As it can be seen in Table 6.1, a significant majority of the statements regarding the method received a positive score (above 3), while only three statements were scored lower (between 2.8 and 3). This suggests that the method (as included in the serious game) was scored positively for usefulness, ease of use, self-efficacy, and task-technique fit. However, improvements can be made on the selection of techniques included in the method as they did not help to make the task at hand easy enough. Furthermore, a stronger and clearer link should be made with how the method (as included in the game) can fit with strategic alignment pursuits. This disconnect could be caused by our decision to include only a fraction of the ESAM in the serious game in order to lower its complexity. Moreover, improvements can be made in the aspects of the method that received minimum scores from at least one student, namely the increase in productivity and effectiveness by using the method, and the compatibility and sufficiency of the techniques incorporated in the method (as included in the serious game).

Table 6.1: Descriptive statistics for Version 2 of the serious game

Items	Descriptive statistics			
	N	Sum	Mean	SDev
p1.1	14	48	3.4286	.64621
p1.2	14	48	3.4286	.64621
p1.3	14	43	3.0714	1.26881
p1.4	14	48	3.4286	1.01635
p1.5	14	49	3.5000	.75955
p2.1	14	54	3.8571	.66299
p2.2	14	49	3.5000	.94054
p2.3	14	52	3.7143	.72627
p2.4	14	54	3.8571	.86444
p2.5	14	53	3.7857	.69929
p3.1	14	44	3.1429	.77033
p3.2	14	57	4.0714	.61573
p3.3	14	55	3.9286	.47463
p3.4	14	53	3.7857	.69929
p4.1	14	54	3.8571	.66299
p4.2	14	52	3.7143	.99449
p4.3	14	54	3.8571	.66299
p4.4	14	51	3.6429	.92878
p4.5	14	41	2.9286	.99725
p5.1	14	41	2.9286	.82874
p5.2	14	44	3.1429	.66299
p5.3	14	40	2.8571	.77033
Average P1	14	47.2	3.37144	0.867426
Average P2	14	52.4	3.74284	0.778706
Average P3	14	52.25	3.73215	0.639995
Average P4	14	50.4	3.6000	0.8493
Average P5	14	41.67	2.9762	0.75402

Nonetheless, the results of testing the beta version of the board game show a substantial improvement over the results of the alpha version. One of the most relevant signs of this improvement is that only two statements generated results with a deviation greater than 1, with most statements having deviations ranging between 0.6 – 0.8. This indicates that the ratings given by the respondents are more closely grouped together than in the case of the alpha version of the game. Since these results are mostly above average, we can conclude that the participants in the workshop for the beta version of the game had, overall, a more positive experience with the game.

6.1.3 Discussion

One of the main aspects that need to be discussed is the use of students for testing the game. We have chosen to do this for several reasons. First, we wanted to test the game with a group of participants that we could easily have access to and that was willing to participate in a beta version of the game that might not be complete or well balanced. Usually, experienced practitioners do not have a lot of time available for this kind of testing and we did not want to exhaust our pool of potential candidates on a rough version of the game. Also, we consider university students to have the competencies needed to identify if there are any major flaws in the game.

Second, our intention was to use students to test the major mechanics in the game and see if they were well designed and intuitive enough. Usually, students have experience with playing games on different platforms and can provide valuable information regarding game mechanics that are a bit rough or unrealistic. Furthermore, they can help determine if the universe of play is well represented in the game.

Finally, the game should be suitable to be played by participants that don't know everything about strategic planning and is meant to be a learning experience. By using students, we can determine if the information we provide is sufficient for the learning experience and can help them complete the game. Having said all of this, the end goal is still to have the game tested in later stages with a group of experienced practitioners that can provide us with feedback based on their experience in organisations.

One of the main issues of the alpha version is that it feels like an assignment instead of a game, which can make it feel complex. Based on the feedback from the first large-scale test of the alpha version we made several improvements that can be seen in the beta version, such as the game being played competitively instead of cooperatively (each team can lose, maintain, or gain market share), each team member having a predefined role with specific responsibilities and knowledge (team members will need to cooperate to have the best results), participants having more liberty in the choices they can make, the usage of the strategy techniques is simplified, some game cards are reworked, and the time required to play the game fully is reduced to under 2 hours.

6.2 The HubWays online multiplayer game

The development of this serious game is part of a bigger Dinalog project focused on the digitalisation of the horticultural industry in the Netherlands, by means of a digital platform developed by HubWays. HubWays is a joint initiative within the Dutch horticultural industry. The main goal of this project is to develop a neutral coordination hub which would help optimise and cluster the processes in this industry (Figure 6.4).

Figure 6.4: Example of the HubWays platform

This is realised by working together with the Growers, the Trade and Transport organisations, and the auction houses in the different Greenports of the Netherlands. As an end result, the project should deliver a platform which can facilitate communication, provide an input function for transport orders and status update, monitor function for tracking the transport, and a mobile application for the Growers and transport companies.

The HubWays game is intended to help organisations operating in the horticultural industry to explore, in a simulated world, how the introduction of digitalisation in their strategies and business models would affect themselves and their whole supply chain. In terms of strategy, participants can experience how a shift from a Customer Intimacy strategy (in which direct contact with customers is central) to a focus on a Digital Operational Excellence strategy (in which lean operations with minimal costs and waste is central) would give them added benefits such as one-time input of information, earlier planning

possible, fewer calls between members of the supply chain, clear times of order pick-up and delivery, and transparency of arrangements between members of the supply chain.

In order for these benefits to be possible, all the members of a supply chain need to adapt their strategy and business model to incorporate a new focus on digitalisation. By using a BMC as a visualisation technique, we can identify that significant changes should occur in most of the building blocks, such as the Key activities, Key resources, Value proposition, etc. Figure 6.5 illustrates the changes that should occur in the case of organisations that produce the flowers and plants distributed within the supply chain, from here on identified as Growers.

Figure 6.5: The change in business model necessary in order to support the new Operational excellence strategy (Grower)

As can be seen from Figure 6.5, the shift from one strategy to another would have a large impact on the organisation of a Grower. Similarly, the other organisations involved in the supply chain of the Grower, namely the Trader and Transporter, would also need to make significant adjustments. Therefore, it stands to reason that many of these organisations would show some initial resistance to adopting the HubWays platform. Consequently, the ability to expe-

perience this shift in strategy and business model in a simulated environment that does not involve any real-life change can prove very valuable for changing the perception of the organisations operating in the horticultural industry.

Essentially, the main goal of the HubWays game is to allow players to experience the benefits of using the HubWays platform, such as optimisation, collaboration, connectivity, and standardisation, by comparison to the current inefficient ways of managing their supply chain. Furthermore, the participants are encouraged to draw their own conclusions regarding the potential benefits of such an investment. Moreover, participants can experience the gap between their current and future strategy and business model before they decide to invest in HubWays.

While in the case of the board game the usage of the ESAM is more explicit, by incorporating some strategy techniques and phases of the method, in the case of the HubWays game, this contribution is more implicit. We use elements of the ESAM to understand and frame the current and desired state of the horticultural industry organisations and supply chains. More specifically, we use several strategy techniques such as the Value disciplines, the BMC, the SWOT analysis, and others, in order to model the shift in strategy, business model, resources and capabilities that are needed in order to support the introduction of the HubWays platform. We use and connect these strategy techniques by using some of the phases of the ESAM, such as Environmental analysis, Business model, Strategy formulation, Implementation design, and some elements of other phases. Based on these insights, and the proposed benefits of the HubWays platform, we design our game and its mechanics, as detailed in the following sections.

6.2.1 Game requirements

In order to design the game requirements, we look at the expected benefits of using the HubWays platform, as defined by HubWays, namely ***one-time input of information*** (transport commands are received electronically and do not need to be entered into the system; also applies to logistical means), ***earlier planning possible*** (transportation orders received as early as possible), ***fewer calls between parties to request information*** (all interested parties in the chain can see in one place where a purchase/sale order is located), ***clear pick-up and delivery times*** (confirmation of these times), and ***transparency*** (by making clear and transparent arrangements in the transport assignments all the parties involved know at all times what to expect from each other).

Based on these expected benefits we formulate the requirements for the HubWays serious game and divide them into two categories: learning requirements and design requirements. The learning requirements focus on several of the expected benefits of the HubWays platform, such as ***saving time, effort and ultimately money*** (a more efficient supply chain process can eliminate the waste of valuable resources, and streamline the main activities of all parties in-

volved), ***real-time information*** (each player should have access to information that updates in real-time which leads to every party involved in the supply chain to have an accurate, equal, and complete overview of the process), ***control over the process and information*** (each player can provide input to one centralised and standardised platform, which ensures that they have full control over the information that their partners and customers have access to), and ***room for optimisation of processes*** (a fair and clear comparison between the current ways of doing business and the way provided by HubWays should showcase the current inefficiencies and emphasise that there is room for improvement of the current processes).

Based on the learning requirements we design several design requirements, such as simulating the real-life environment of the horticulture industry, allowing players to experience the two different ways of doing business (current and HubWays), being able to play the game from different points of view (Grower, transport and trade organisations), emphasizing the benefits of using the HubWays platform (automation, access to information at all times, improved communication, increased efficiency in route planning, etc.), and emphasizing the problems that can occur when doing business in the current way (limited access to information, multiple phone calls or e-mail to see where the order is, etc.).

In order to have a better understanding of the horticultural industry processes, we have developed, together with a representative from HubWays, an example of a supply chain process from the perspective of the main three roles (Grower, Transporter, Trader). This example, which can be seen in Appendix M, is used to illustrate the supply chain process without any automation (current situation) and with HubWays (possible future situation).

6.2.2 Game design

In this section, we detail aspects regarding the design of the game and specify which game mechanics have been chosen to support it. First, we differentiate between the two types of objectives that the game has, namely the learning objective and the game objective. The learning objective focuses on facilitating the participants to experience the inefficiencies of the current way of working and the benefits of the HubWays platform in an easy and safe environment. The game objective focuses on the participants handling as many orders as possible by delivering them in time to the Trader or the auction house (facilitated by a successful cooperation between the three roles). The main difference between these two types of objectives comes from who is responsible for achieving them. While the learning objective is the responsibility of the game developer, the game objective is the responsibility of the players of the game.

Furthermore, we make a distinction between the two modes of the game, which involve two different systems, namely the "Manual" system (the current way of doing things without HubWays) and the "Digital" system (using the HubWays platform).

The game mechanics represent the rules or methods that are designed to regulate the interaction of a player with the game. Therefore, they are essential to creating the gameplay of a specific game. The game mechanics can vary substantially from one game to another, depending what the purpose and requirements of the specific game are. In our case, we have chosen to include several mechanics to the HubWays game, such as role play, cooperation, tasks, questions, requests, and answers, resource management, planning, game turns, time pressure, levels, tutorial, online multiplayer, rewards and penalties, goods and information, realistic simulation, competition, and scoreboard.

Role play. The participants assume the role of the Grower, the Transporter, or the Trader. Each of these roles has a certain responsibility and a set of actions they can perform (detailed in Tasks). The Grower role is defined as the producer of plants and flowers, the Transporter role is defined as the carrier of the trolleys with flowers and plants between the Grower and the Trader/auction house, and the Trader role is defined as the intermediary between the Dutch Growers and the international market and also as the one that places the orders to the Grower.

Cooperation. The three different roles cooperate in the horticultural industry to fulfil the objective of the game. They each represent one equally important part of the logistics chain. Without proper cooperation between all the parties involved the orders cannot be delivered in time to the Trader or auction house. This cooperation is done in two way, namely the current manual way which is more personal and inefficient and the HubWays digital way which is more impersonal and efficient.

Tasks. The Grower is responsible for planting the flowers/plants, cutting the plants/flowers, placing them into trolleys, calling the Transporter to pick up and deliver an order, calling the Transporter and Trader to inform about the status of a delivery (in the case of an unexpected event/delayed delivery). The Transporter is tasked with picking a truck from their fleet, assigning the truck to a delivery, calling the driver for information in the case of a delay, and calling the Grower with the explanation about the delay. The Trader is responsible for ordering the flowers/plants from a Grower of his choice (all the available types of flowers/plants are displayed per Grower), and should contact the Grower to ask for information, in the case of a delay.

Questions, requests and answers. The manual system, especially, relies on questions, requests and answers. The Grower receives requests for orders from the Trader, sends a request for transport to the Transporter, receives questions about delays from the Trader, asks the Transporter about the reason for the delay, received answers from the Transporter about the delay, and transmits the answers about the reasons for the delay to the Trader. The Transporter receives requests for transport from the Grower, receives questions about the delay of a transport, asks the driver about the delay, and sends the answer about the reason for the delay to the Grower. The Trader sends the request for an order of flowers/plants to the Grower, asks the Grower about the delayed order, and

receives answers from the Grower about the reason for the delay.

Resource management. Resource management is the efficient and effective development/deployment of organisational resources. All the three roles of the game have aspects of resource management, to different degrees. The Grower needs to manage their time in order to complete the orders in time to be delivered to the Trader, and also needs to work with a limited number of plots and trolleys. The Transporter mostly needs to manage their fleet of trucks by planning the trucks according to the orders received. The Trader needs to manage ordering the flowers/plants from the most convenient Growers, and also needs to consider some level of time management that facilitates placing orders in a manner that allows enough time for the Grower and Transporter to complete their orders in time.

Planning. Planning refers to the thinking about the activities that are required to achieve the desired goal. Each of the three roles experiences planning in a different but connected way. The Grower needs to plan which order should be fulfilled first, in order for all of them to be ready on time (based on the time window stated by the Trader). The Transporter needs to plan which trucks to use and what route they should take in order to maximise the usage of space in their trucks. The Trader needs to plan their orders based on the Growers that are available and on the time needed to process these orders.

Game turns. A game turn is a section of the game which is supposed to happen before another section of the game can take place. In terms of the HubWays game, a turn is represented by a Grower, Transporter, or Trader doing all the required tasks to bring an order from the starting point to the ending point. The turn of a Grower starts when the Grower receives the order from the Trader and the turn ends when the order has been picked up by the Transporter and delivered at the Trader. The turn of the Transporter starts when the Grower orders a transport and it ends when the order is delivered to the Trader. The turn of the Trader starts when the Trader receives the order from a customer (an entity outside of the Netherlands) and the turn ends when the order is sent to the end customer (the transport arrangements for this part are not visible in the game).

Time pressure. The time pressure in the game is used to simulate the time pressure that (especially for the Growers) is experienced in real-life. The time pressure in the game is generated by the limited time window for delivery of an order. The roles experience the time pressure in different ways. The Grower experiences very high time pressure especially when using the "manual" system because every order has to be treated as equally urgent. The "digital" system provides the exact information of when the order needs to leave the Trader (to go abroad) and thus, the time window for delivering can be greater than when using the "manual" system. The Transporter experiences time pressure as equally important for the "manual" and "digital" systems because the Trader has a set deadline for sending the order abroad. The main difference comes from the planning the delivery of the order from the Grower to the Transporter and

finally, to the Trader. Thus, a better planning should be a result of the "digital" system.

Levels. The game has two levels. The first level is where the participants can play the game by using the "manual" system. Therefore, they can experience some of the inefficiencies of this system. The second level is where the participants can play the game by using the "digital" system. Thus, in this level, they can experience some of the benefits of using the HubWays platform.

Tutorial. The tutorial level is intended to familiarise the players with the main game mechanics (their tasks, their responsibilities, the gameplay, the visuals, etc.). Each of the roles has their own tutorial level. The tutorial runs during the gameplay and can be turned on or off. The Grower receives instructions on how to answer a call from the Trader, on planting the flowers/plants, cutting the flowers/plants, calling the Transporter/filling in the HubWays form, and on calling the Transporter in the case of a delay. The Transporter receives instructions on how to answer a call from the Grower/receive an order for a transport from the Grower via HubWays, on receiving a call from the Grower about a delay, calling the driver about the delay, and on calling the Grower about the delay. The Trader receives instructions on how to call the Grower to place an order, on calling the Grower about a delay, receiving a call from the Grower about the delay, and on moving the flowers/plants from the trolley of the Grower to their own trolley to be sent abroad.

Online multiplayer. The game can be played by multiple players at the same time which can either be in the same location or in different locations with access to the internet. Each of the players needs to have their own computer to be able to play. In order for the game to be played, at least three players are needed, one for each role. The number of players that can play the game at one-time is between three and 45 players.

Rewards and penalties. Rewards are positive stimuli that are presented to the players as a compensation for performing certain tasks. Penalties are the opposite of rewards and are intended as negative stimuli for failing to perform certain tasks within the allotted time. The Grower receives rewards in the form of money and reputation gain when the order is ready for pick-up in time by the Transporter and gets penalties in the form of money and reputation loss when the order is not ready for pick-up in time or when the goods are not in time at the Trader's location. The Transporter receives rewards in the form of money and reputation gain when the order is delivered in time to the Trader, according to the planning and gets penalties in the form of money and reputation loss when the delivery is delayed beyond the time that the Trader requires. The Trader receives rewards in the form of money and reputation gain when the order is sent in time to the customer abroad and gets penalties in the form of money and reputation loss when the order cannot be sent in time to the customer abroad.

Goods and information. Goods and information are exchanged throughout the whole game between the players. The Grower receives information about the order (from the Trader) and sends information about the order (to

the Transporter). Furthermore, the Grower sends goods in the form of flowers/plants to the Trader, and requests information about a delay from the Transporter which is also sent to the Trader. The Transporter receives information about the order (from the Grower) and delivers the goods from the Grower to the Trader. Moreover, the Transporter requests information about a delay from the truck driver and sends this information to the Grower. The Trader sends information about an order to the Grower and receives information about the status of a delayed order.

Realistic simulation. A simulation is the imitation of the operation of a real-world process or system over time. Realism in games refers to a simulation of situations that are close to reality. In the HubWays game, realism is one of the central design aspects, which is implemented with adequate and recognisable visuals, activities, situations and problems.

Competition. The competitive aspect of the game is one of the secondary mechanics of the game. The players that are able to perform best (handle the most/all of the orders received) will have the best score. The competition is most relevant between the players with the same role and not in between the different roles.

Scoreboard. The purpose of the scoreboard is to provide an overview of the performance of each player, in both the "manual" and "digital" systems. Furthermore, it should provide, once the game is finished, a comparison between the results of the two levels. This facilitates the players to judge for themselves in which of the two systems they were able to achieve the game objective (handling as many orders as possible in a successful manner) the best. The scoreboard contains information about the amount of money the player has at the end of the game, their reputation, how many orders they handled, average time per order, customers lost, etc.

6.2.3 Game implementation

The HubWays game is implemented as an online web (Flash) game. The server code is hosted on the Player.IO servers ¹. In order to access the data, analytics, and configuration properties of the game, login credentials are needed (user name and password).

In this section, we detail the implementation of the game, as the player would experience it. We link the game implementation to the aspects that were presented in the game design section. It should be noted that although the game was developed in English, in the final version all the text has been translated in Dutch. This was done in order to be more suitable to the core audience of the game, the members of the horticultural industry, which are not all equally versed in the English language. Therefore, all the text that can be seen in the figures included in this section is in the Dutch language.

¹http://playerio-a.akamaihd.net/hubways-urckaeohfksoedpt4moura/HubWays._v50.swf

One of the core elements of the game is the ability to play it from the point of view of multiple roles, the Grower (Kweker), Transporter (Vervoerder), and Trader (Handelaar). Figure 6.6 illustrates the three roles that are playable in the HubWays game.

Figure 6.6: The different roles playable in the HubWays game

Each player can choose a different role or the same role. However, the game will not start until there is at least one Grower, one Transporter, and one Trader. The game can host a maximum of 45 players at one time and there can be multiple games running at the same time. It is worth noting that the game starts (by default) in the manual system but this setting can be adjusted on the server side.

The recommended number of players is between 7-9 players. Furthermore, it is advised that there are more Growers in the game than Transporters or Traders. The reason for this is that the Growers are usually the busiest in the game and cannot keep up with the other two roles. Therefore, if there are the same number of players for each role, the ones playing the Transporter and/or Trader roles will have periods of downtime in which the only thing they have to do is wait for the Growers to prepare the order.

Each role has their own custom screen with which they can interact in order to play the game. The screens are designed based on what activities we identified in the game design section (under tasks). These activities are based on the real-life activities performed by these roles. Figure 6.7 illustrates the explanation for the Grower screen.

As it can be seen in Figure 6.7, there are elements which are specific to the role of a Grower, such as a selection of flowers they can grow, fields where they can plant and grow these flowers, and the trolleys with buckets where they can store the flowers or use for transporting them. The trash bin, similarly, to other aspects of the game, is an addition that has been introduced for the purpose

Figure 6.7: Explanation of the Grower screen

of simplification. We consider that it is not as important to recreate exactly the environment of each of the roles, as it is to emphasise the learning aspects and the gap between the current way of working and the way of working with HubWays.

Besides the role specific elements, there are also some common aspects to all the roles. These are the values that can be seen at the top (Reputation, Money, and Time), and the green button which can be seen at the bottom left corner of the screen (Phone button). The values are used to show the progress of each role and to compare the scores at the end between the two different systems (manual and digital). The Phone button is used to call between the roles and give information about the orders, in the manual system. In the digital system (HubWays system), another common element is added to the screens of the different roles, namely the HubWays monitor tab. More details about the monitor tab are presented at a later point in this section.

Figure 6.8 illustrates the starting screen of the Transporter. On this screen, we can see both the common elements (as discussed in the previous paragraph), and the Transporter specific elements, such as the trucks they have at their disposal to fulfil the orders, and a map where the locations of the Growers and Traders are displayed.

Figure 6.9 illustrates the starting screen of the Trader. On this screen we can also see both the common elements (values at the top and green Phone button), and also the Trader specific elements, such as the trolleys which can be reserved for the orders placed to the Growers, and the blue button that can be pressed to summon the next order (bottom right corner).

At the start of the game the players receive a tutorial in the form of tips displayed on their screens. These tips are meant to guide the players through the basics of the game in order to learn what is needed to play the game. Each

role has their own custom tutorial. The players receive further instructions once they have correctly completed the instructions mentioned in the Tips.

Figure 6.8: Explanation of the Transporter screen

The action in the game starts when a Trader starts with placing an order with a Grower. The types of orders a Trader needs to request are generated based on the flowers that can be grown by the Growers that are active in that instance of the game. Similarly, the kind of flowers the Growers have available at the start of the game is generated randomly out of a pool of 15 available predefined flowers. A Grower can start with any number of flower types (between 1 – 3).

Figure 6.9: Explanation of the Trader screen

After the Grower accepts the order, the Trader can call them and give the full information regarding the order. It is also the responsibility of the Grower to make sure they received all the information they need from the Trader in order to successfully fulfil the order. In the "manual" system, the Grower needs

to remember all of this information received from the Trader. The only information that the Grower does not need to remember is displayed next to the trolley assigned to the order, namely the place where the order needs to be delivered (on the top of the trolley), the type of flowers that should be delivered (to the right of the trolley), and the name of the Transporter assigned to the order (under the trolley). In the "digital" system, all the information that the Grower needs is displayed around the trolley that is assigned to each order.

From this point on, there are three steps that the Grower needs to go through to prepare the order, which are identical for both the "manual" and the "digital" systems. The specific actions, which involve the planting, cutting, and placing of flowers in trolleys, are also detailed in the previous section (tasks). It is up to the Grower to manage how many flowers and of what type they put in one trolley in order to make sure they match the order received from the Trader. Furthermore, the Grower needs to manage the time they take to complete the order as not to go beyond the agreed upon delivery time. However, in the Tutorial phase of the game (the first complete order for all the players) no mistakes can be made with the order, as the game does not allow the Grower to put the wrong amount and type of flowers in the trolley.

The last step of completing an order for the Grower is to contact a Transporter to fulfil the delivery of the order to the Trader. This step differs in between the two systems, with the "manual" one consisting of the Grower calling the Transporter, while in the "digital" system the Grower only needs to click a button (representing a RFID scan of the tags attached to the trolleys) which confirms the order is ready to be picked up by the Transporter.

In the "manual" system, the Transporter needs to wait to pick up the order until the time indicated by the Grower during the Phone call, whereas in the "digital" system, the Transporter can pick up the order immediately when Hubways platform pushes the notification that the order has been loaded onto the trolleys. Furthermore, since all the information regarding the expected delivery times of all the orders is available, the Transporter can plan to combine several orders in one truck, while still ensuring that all the orders are delivered in time to the Traders.

In the case that an order has been delivered too late, all of the three roles (Grower, Transporter, Trader) involved in that order will lose both money and reputation with their customers. In the case that the wrong order has been delivered to a Trader with either the wrong number or type of flowers, both the Grower and the Transporter lose reputation with the Trader. However, in this situation, the Grower is allowed to fix their mistake by sending a second delivery of flowers that complements the missing number or type of flowers from the initial delivery.

One of the main aspects that needs to be emphasised by the game is how important and beneficial real-time information is for this industry. Therefore, we introduced a simple event that can showcase how much extra effort and time needs to be put in in the current way of working (as illustrated by the

"manual" system) compared to how it could be if the members of the horticultural industry decided to digitalise parts of their process with the help of the HubWays platform (as illustrated by the "digital" system). This event involves an accident that is sustained by one of the trucks of the Transporter. This accident is designed to cause a delay in the delivery of the orders and is used to symbolise any number of real-life situations, such as a flat tire, traffic jams, etc.

In the "manual" system, a chain of events surrounding the accident starts by the Trader noticing (by himself or via a notification) that one of the orders they should have received is running late or close to the deadline. This triggers a series of phone calls between the Grower, Transporter, the Truck driver involved in the accident (simulated by the game), and the Trader. During these phone calls, the players cannot perform their tasks according to their normal process, which might cause issues and perhaps even delays with other orders. Furthermore, this chain of phone calls is not only time-intensive but also effort-intensive due to the large number of actions that need to be performed in order to get the right information from one end of the supply chain to the other.

However, in the "digital" system, such an event prompts an immediate notification on the screens of all players informing them, in real-time, that an accident has occurred and that there will be a certain delay. In this system, not only do the players have access to real-time information but also are not required to invest much time and effort to inform each other, since this is handled by the notification.

The default setting of the game, in the "manual" system, allows for the players to experience two accident scenarios, one with guidance provided by the tutorial and one without. After these two accidents, all the players, one by one, will transition to the "digital" system. In order to facilitate that all the players transition at the same time, once one player has transitioned, there is a maximum waiting time of 2 minutes until the other players are automatically transitioned as well. Once all players have transitioned, the Activate HubWays button becomes active for everyone, and needs to be pressed in order to begin the game in the HubWays system.

After the HubWays system is activated, the game continues from where it was before the transition to the second system. Each player receives several tips regarding the new game system, including an explanation of the new feature, namely the HubWays monitor tab (Figure 6.10). The HubWays monitor tab includes real-time, complete information regarding all of the orders in which one player is involved. Each of the other players involved in one order receives the same information regarding the order in the HubWays monitor tab. The information displayed contains details about the order number, the status of the order, the delivery details (destination, current location, expected delivery time, estimated delivery time), and the names of the parties involved in the order (Trader, Grower, Transporter).

The HubWays monitor tab pops-up whenever there is an update to one of the orders a player is involved in. In the monitor tab, the updated information is

Figure 6.10: Example HubWays monitor tab (Trader)

highlighted shortly in green. This kind of information is only possible if all the parties involved are using the same system, in this case, HubWays. By using a system like HubWays, the different roles involved in an order do not need to spend unnecessary time and money to contact each other via the phone. Furthermore, all the information displayed in the monitor tab is always real-time, accurate and complete.

Since all the players involved in an order receive real-time information, each of them can choose to optimise their processes according to the situation at that time. For example, a player with the Transporter role can choose to send out a truck to the Grower when there is a notification of multiple orders being ready for delivery, as long as it is still in the time frame allotted for delivering all of them. This kind of logic allows for optimisations based on bundling of orders.

In the case of an accident, the process is very simple. The driver of the truck needs to make a note in the HubWays system that there will be a delay and mention the estimated amount of time for the delay. This information is then automatically updated in the HubWays monitor tab for all the players involved in the order(s) affected by this delay. Since the driver is not explicitly included in the game, rather he is symbolised by truck, in case of an accident, all the parties involved receive an immediate notification generated by the game, including the estimated time of the delay. In the case of the Transporter, they get to see on top of the truck involved in the accident the amount of time remaining until the truck is up and running again.

One final element of the game is the scoreboard. This contains a summary of the most important statistics in the game, namely total amount of orders

handled, number of correct/faulty orders, amount of money made in total, and amount of money per order (Figure 6.11).

Figure 6.11: Example results screen for Grower, Transporter, and Trader

Two of the roles (Grower and Transporter) also have an extra statistic, namely amount of wasted money for the Grower (based on the flowers thrown in the trash bin) (1) and the fuel costs for the Transporter (based on the total amount of fuel consumed by both trucks) (2). Furthermore, the results screen shows the statistics for both systems (manual and digital) so that players can make a comparison of their performance in these two modes. The main purpose for this results screen is to confirm the benefits of the HubWays system above the manual system by means of measurable and relatable statistics. Furthermore, these statistics can be used by players with the same role as a way to compete with each other to see who had the best results for their category.

6.2.4 Game testing

In order to develop the HubWays game we have had multiple iterations and testing workshops with different purposes and participants, as proposed in the ADR process of Sein et al. (2011). These workshops varied in amount of participants and purpose. Regarding the number of participants, the workshops ranged from 3 participants to 8 participants. Regarding the purpose of the testing, the workshops were either focused on testing the main mechanics, testing the full mechanics, bug testing, or a combination of the aforementioned purposes.

The development and testing of the initial concept for the game was done by the core development team of the game, namely the game designer (author of the dissertation) and game implementer (programmer). According to the ADR, this phase corresponds to the pre-alpha development. Furthermore, several workshops were organised with 3-4 participants, which included the ADR team (as identified by Sein et al. (2011)), consisting of the game designer, the game implementer, the project coordinator (Jos van Hillegerberg), and the representative from HubWays (Henny van Hamersveld).

At first, these workshops were used to experiment with the main mechanics of the game in order to improve them to a final version. A few examples of main mechanics are the calling system, or the order placing system. Once the main mechanics were thoroughly tested, we proceeded with testing, with the same group, the most advanced mechanics in the game. An example of an advanced mechanic is the game economy and how it is linked to the activities included in the game. Every testing workshop with the ADR team had also a secondary purpose, namely bug testing. In some situations, bugs were discovered on accident, and other times the game was stress-tested to ensure that it did not contain any bugs in a specific area.

Once the game was considered ready to be tested with participants outside of the ADR team, a larger scale testing workshop was organised. The version of the game used in this workshop can be considered the first alpha version. For this workshop, we invited participants with different backgrounds (Computer science, Business administration, Business Information Technology), levels of education (Bachelor, Master, PhD), ages (25-50), and genders. In total, 7 participants joined this workshop.

The main purpose of this workshop was to play the game in its entirety, with an uneven number of players per role (3 Growers, 2 Transporters, 2 Traders), and to identify as many issues and bugs as possible. This was the first larger scale testing workshop with a group that had never experienced the game before. We also used this workshop to document the number of instructions players would require in order to play the game unassisted, since the game did not contain a tutorial in this version. Furthermore, we used the feedback regarding some game mechanics to simplify parts of the game that seemed unnecessarily complicated, such as the initial calling system which involved people needing to do extra steps in the form of clicks on multiple buttons or the same button multiple times.

Moreover, during this testing workshop we experienced problems with switching to the HubWays system, more specifically, not all of the players switched to the second game mode automatically. Therefore, some players were playing in with the HubWays system and others were not. Contrary to our expectations, the participants kept playing the game even though not all of them were able to experience the "digital" system. The participants argued that they enjoyed the game mechanics and the game overall. Furthermore, they compared results between the ones that switched to the HubWays system and the ones that

didn't, which led them to conclude that the ones who transitioned to the digital system were more productive. Moreover, the participants that transitioned to the "digital" system expressed their appreciation because it simplified their work and made their tasks more enjoyable. These participants were able to experience the difference between the two systems and realise how beneficial a digital system would be for the scenario presented in the game.

The issue with not all players transitioning automatically to the "digital" system was addressed in the next alpha version of the game. We added a fail-safe that will automatically transition all the players in a game to the "digital" system after at least one of them has transitioned. This is done by implementing a timer of 2 minutes that triggers after at least one player transitions. After the 2 minutes expire, all of the players in that game are automatically transitioned to the "digital" system.

After making several improvements based on the feedback received from this workshop, the second alpha version was created. This version was used for the second large-scale testing workshop, conducted with 8 participants, a majority of which did not take part in the first testing workshop (only two participated in the first workshop). Similar to the first testing workshop, we had participants with different backgrounds, educations, ages and genders.

The main purpose of this workshop was also to play through the whole game, get as much feedback as possible, and identify as many bugs as possible. Furthermore, we provided in this workshop structured instructions (verbally) about the most important aspects of the game, since the tutorial was not included in this version as well. The structured instructions were based on the feedback gathered from the first alpha version test. We used this opportunity to refine the kind of information we should provide in the form of instructions in the game.

One example of such instructions is the one which can be seen in the lobby of the game when creating a new game. The participants are instructed to decide as a group who should create a new game so that there are not multiple games created. Furthermore, the participants are instructed to create a new game if there is none available, or to select an already available one and click the "Join game" button next to the name of the game. These instructions were created as a response to some confusion in the testing workshop, when participants would not know if they each needed to create a new game or just one of them. Furthermore, some participants clicked on the "Create a new game" button instead of the "Join game" button next to the name of the game.

In this testing workshop, similar to the previous one, there were some issues with transitioning to the HubWays system. In this case, the players had to play for a very long time before they transitioned to the second game mode. This was due to the high requirements that needed to be fulfilled before the transition, namely that all of the Transporters needed to experience two accidents. Because of the slower pace that the orders were being fulfilled and the high requirements for transitioning, playing in the "manual" system took

around 45 minutes, instead of the scheduled 15-20 minutes. In order to avoid this situation from happening again, we reduced the requirements for the transition to one Transporter experiencing 2 accidents. By combining this with the automatic transition after 2 minutes for everyone in the game, we managed to create a more controlled and predictable experience with the "manual" system.

Another aspect that resulted from this workshop was regarding the economy in the game, and more specifically the amount of flowers per order. In some cases, the Growers seemed to make loss or not make barely any monetary gain at all. In order to fix this issue, we reduced the range for the numbers of flowers that can be ordered per type, reduced the maximum amount of flowers that can be ordered, and also increased the amount of money received by the Grower per flower sold. This has also helped with reducing slightly the amount of work the Growers had to do to complete an order, which was disproportionately large compared to the Traders and Transporters.

Last but not least, similar to the first alpha version test, the participants were quite positive about the game. They enjoyed the mechanics, saw the value of automating some parts of their collaboration with complementary roles, experienced the big difference between the "manual" system and the "digital" one, and were eager to compare their end results with each other.

After the second alpha version, we made several improvements to the game, including adding a tutorial and a results screen, which were included in the beta version. This beta version was used to stress-test the game by the members of the ADR team. During these testing workshops, we discovered some small last bugs that were addressed before the final version of the game, which can be considered the official release. In total during the development of this game, we produced 50 versions of the game, a majority of which were pre-alpha and alpha versions. Furthermore, before the first pre-alpha version, several mock-ups were made in PowerPoint to identify the main mechanics and design of the game.

Although we did not test the game with end-users from the horticultural industry, until this time, we do consider that the two alpha tests can still be considered as tests with end-users. The participants were able to relate to the mechanics and assets that were included in the game. Furthermore, they were considered as appropriate for a game representing the horticultural industry in a simplistic manner. However, testing workshops with the real end-users of this game, members of the horticultural industry, are still intended to be done at a later date. However, due to changes within the HubWays management, we cannot be certain of this.

6.2.5 Discussion

The main goal of this project has been to develop a game that can illustrate the benefits of implementing a digital system, such as HubWays, while emphasising the gap to current way of working. In order to achieve this, we have designed an

online multiplayer game that contains two game modes, which represent two systems, namely the "manual" and the "digital" system. The "manual" system symbolises the current way of working in the horticultural industry, namely by phone, fax, etc., while the "digital" system symbolises the way things could be done with the help of a digital platform that can help automate a part of the process.

In order to design this game, we have reviewed numerous documents related to the horticultural industry (including process models, interviews, etc.), we had several discussions with the representative from HubWays, we have studied the documentation regarding the HubWays platform, and investigated which mechanics would be most suitable for inclusion in this game. This resulted in the development of a PowerPoint-based mock-up which was used as a basis for developing the digital version of the game.

The development of the game involved multiple iterations which were based on internal testing workshops (ADR team), and external testing workshops (participants of the two alpha version workshops). In total, 50 versions of the game were created, each containing an improvement compared to the previous version.

The internal testing workshops were mostly aimed at testing the game mechanics, identifying any bugs that might be present, and stress-testing the game. The external testing workshops were mostly focused on testing the entirety of the game, with a special focus on aspects such as the ideal number of players, the amount of instructions needed, the economy of the game, and any bugs that might be discovered.

As a conclusion of the two external testing workshops, the participants were quite positive about the game. They enjoyed the mechanics, saw the value of automating some parts of their collaboration with complementary roles, experienced the big gap between the manual system and the "digital" system, and were eager to compare their end results with each other. Furthermore, the participants were engaged enough by the game to continue playing the game even after several bugs were experienced.

From the point of view of the development team, we consider that the game emphasises very well the benefits of using the HubWays platform, by allowing the participants to experience by themselves, in a safe environment, the gap between the current way of doing business and the digital way offered by the HubWays platform. Furthermore, since the game has been approved by the HubWays organisation, it will be offered to potential users of the HubWays platform to learn about the advantages of the platform. The game will be made available for all parties in the horticulture industry via the HubWays Website.

6.3 Summary and Conclusions

Within this chapter, we have presented the development of the two serious games which can be used to support the ESAM and also to communicate about it. First, we discuss the board game developed for the strategy process. The main scope of the board game is to allow players to experience the benefits of using interlinked strategy techniques for the strategy process, in an easy manner. The main advantage of using a board game to simulate such an experience is that participants can freely experiment with their decisions without real-life consequences. Within our serious game, we have used the phases of the ESAM as a guideline for how the gameplay should evolve, and we have used several of the strategy techniques included in these phases as tools that the participants can use. The main premise of the game is that organisations need to compete against each other to gain market share. Participants need to use the strategy techniques included in the game to help guide their decision-making process. Therefore, we argue that the board game is designed to demonstrate how the strategy techniques and phases of the ESAM could be used in a realistic situation.

We have developed two versions of the board game, one with co-operative and one with competitive elements. In order to test these two versions, we have organised several workshops with students from the University of Twente. Within these workshops, the students were divided in three different groups, each representing a distinct organisation within the economy of the game. Furthermore, in order to evaluate the board game, we have used two survey questionnaires, which served different purposes. The first questionnaire was aimed at evaluating aspects related to the how the game was designed, while the second one was aimed at assessing how useful, easy to use, etc. the underlying method was, as included in the board game. The results of the first questionnaire have provided us with enough feedback in order to improve the serious game and create the beta version. The results of the second questionnaire have provided us with information regarding the opinions of participants, which have been fairly positive in regards to the game and underlying method.

Second, we present the online multiplayer game developed for HubWays and the horticultural industry. The main purpose of this game is to help organisations operating in the horticultural industry to explore, in a simulated world, how the introduction of digitalisation in their strategies and business models would affect themselves and their whole supply chain. While this game does not have such an explicit connection with the ESAM as the board game, the method was used to understand and frame the current and desired state of the horticultural industry organisations and supply chains. More specifically, we used several strategy techniques such as the Value disciplines, the BMC, the SWOT analysis, and others, in order to model the shift in strategy, business model, resources and capabilities that are needed in order to support the introduction of the HubWays platform. Therefore, we argue that with this on-

line multiplayer game we apply the ESAM in a different way than normally expected, in order to create a mind shift with the help of experimentation in a safe environment.

For the HubWays game, we have developed 50 versions, in an iterative manner. Each of these versions has been based on feedback from the ADR team or from the larger testing workshops that we have organised. However, the game has not been tested with end-users, due to some unexpected circumstances within HubWays. Nonetheless, our intention is to still test and evaluate the game with a group of end-users, if the opportunity arises.

Part III

Validation of the research

Chapter 7

Validation of the ESAM

This chapter is based on the contents of the following papers:

Aldea, A., Iacob, M.E., van Hillegersberg, J., Quartel, D. & Franken, H. Aligning Strategic Management, Enterprise Architecture and Capability-based Planning: An Enterprise Strategic Alignment Method (ESAM). Submitted to the *Business & Information Systems Engineering (BISE) Journal*.

Aldea, A., Iacob, M.E., van Hillegersberg, J., Quartel, D. & Franken, H. Strategy on a Page: Management dashboards made with ArchiMate. Submitted to the *Business & Information Systems Engineering (BISE) Journal*.

In order to validate the ESAM, we have conducted three case studies, with three substantially different organisations, namely an Insurance organisation, a Public university, and an Investment fund. These organisations also differ in size, maturity, the sector and industry they operate in, and last but not least the focus of the case study, as can be seen in Table 7.1.

Table 7.1: Overview of the three case studies used to validate the ESAM

	Industry	Sector	Size	Maturity	Case study focus
Case 1	Insurance	Private	Large (≈3.000 employees)	Established (>20 years)	Modelling strategy, value and capability-related concepts
Case 2	Education (University)	Public	Large (≈4.500 employees)	Established (>50 years)	Alignment between Strategy, EA, and Projects with CBP
Case 3	Investment	Private	Small (6 employees)	Start-up	Strategy formulation with strategy techniques

In the following sections, we present in more detail the three case studies, which we use for validating the different aspects of the ESAM. Due to the confidentiality agreements signed with the case study organisations, the information that is presented in this chapter is anonymised and generalised. Furthermore, some sensitive information that could not be generalised and anonymised has not been included in this report.

7.1 Case study 1 - Insurance organisation

The Insurance organisation case study focuses on translating the strategic intent of the organisation into their architectural models. Therefore, we consider this case to be used for validating the ESAM from the perspective of **Challenge 4: Strategic intent to EA**. Furthermore, in order to plan the implementation of the strategic intent we use aspects of CBP theory. Therefore, we consider this case to also be used to validate the ESAM from the perspective of **Challenge 3: Strategy implementation**.

7.1.1 Context

The Insurance organisation is strongly influenced by major changes in distribution channels, customer behaviour, product portfolio and regulations. A new direction and strategy have been formulated but there is no link, at the moment, between these strategic plans and their EA.

The main reason for this new strategic intent comes from the organisation noticing an opportunity to provide their self-developed knowledge as a service for other insurance organisations that might require assistance with managing their products and services. Several of the external drivers that lead to this decision are the complexity of information regarding products, financial challenges to insurance organisations, difficulties with maintaining continuity and quality of life insurances, etc. Consolidation of servicing between insurance organisations is seen as a possible solution to these challenges.

The Insurance organisation considers that they are suitable for providing this service because of their focus on simplicity, efficiency, and continuous improvement, which are seen as core values of the organisation. The primary customer of the Insurance organisation, in this new business model, is any insurance institution that requires their services. Some example services include Contract administration, Marketing support, Sales and Distribution, Customer Call Centre, etc. The Insurance organisation considers also a secondary business model aimed at the individual, where they focus on the administrative services and interactions.

Strategic management. Decisions are made at management level based on the experience and intuition of managers. Their decisions are well documented but spread over multiple documents. The architecture team has made

an overview of all the important strategic information by using strategy techniques and concepts (SWOT, DEPEST, strategy, KPI, etc.). This has been made for their own use (to see where the organisation is heading) but has also been distributed to management. Management has received this overview in different ways, with some thinking it is very useful, while others not as much.

Capability-based planning. A capability map has been developed and modelled in ArchiMate by using the business function concept to model capabilities. Based on this capability map, a heat map has been made that outlines in colours what needs to be improved. This assessment is relatively high-level and is not based on KPIs. At the time of starting the case study, there was no direct relation between the capability map, the strategy and the EA.

Enterprise Architecture. An extensive EA has been developed with the help of ArchiMate modelling language. Several plateaus have been modelled, which can be used for performing a gap analysis and for designing roadmaps. The EA has been enhanced with an extensive cost-price model. This is being used to evaluate and compare different versions of the plateaus.

Portfolio Management. There is no portfolio management technique used at the moment, but there is a wish to do so. There is also interest in modelling the portfolios with ArchiMate and linking them to strategy, CBP, and EA.

7.1.2 Scope

The main scope of this case study is to help the Insurance organisation translate their high-level strategic intent into more actionable information, which can be modelled and related to their EA. Therefore, the case study has two related focuses: (i) using aspects of CBP to translate the strategic intent into more actionable information, and (ii) modelling the strategic and capability-related information with the help of the ArchiMate standard.

In terms of the strategic alignment perspectives proposed by Henderson & Venkatraman (1999), during this case study, we focus on the Strategy execution perspective, which states that the IT manager is responsible for implementing the already defined strategy. In the case of the Insurance organisation, the new strategic intent had already been defined by the time we started the case study. Our role was to assist two Enterprise Architects with getting a better understanding of some CBP techniques and with modelling and relating them to the new strategic intent. Our results were also presented to a Program Manager in order to see how they can relate to his needs.

7.1.3 Methods

During this case study, we have used the extended case method (Burawoy, 1998) and some elements of ADR (Sein et al., 2011). Therefore, we have used the case study not only as a validation for the ESAM but also as a means to improve the method, in an iterative manner.

The two parties involved in this case study are the researchers performing the case study (the author of this dissertation and her supervisor from BiZZdesign) and the participants from the Insurance organisation, which are henceforth referred to as the representatives.

The representatives in this case study (the two Enterprise Architects) have been chosen based on their role in reaching strategic alignment, as proposed by Henderson & Venkatraman (1999). Namely, they represent the IT managers that are responsible for implementing the strategic intent of the organisation. The Program Manager was included as a participant in one of our sessions at the recommendation of the two Enterprise Architects. The main reason for this is their close collaboration within the organisation in all matters related to strategy implementation.

In order to gather the necessary information we have used multiple methods of data collection, as suggested by Yin (2003). We have used the semi-structured interview to gather relevant information regarding the context of the organisation and the representatives' requirements regarding the case study. The semi-structured interview was mostly used in the first meeting with the representatives from the Insurance organisation, in order to gather information regarding the context of the organisation at that time and about the case study requirements of the two representatives.

Furthermore, we have used the documentation provided by the representatives in order to gain a better understanding of the Insurance organisation and of their strategic intent. Additionally, we have used the information gathered from these documents as input for demonstrating how strategic and capability-related information can be modelled with the help of the ArchiMate language.

Moreover, with the help of several workshops, we have discussed our results with the representatives in order to receive relevant feedback regarding specific parts of the ESAM, such as CBP and modelling of strategic and capability-based concepts with ArchiMate. Similarly, in these workshops, the representatives from the Insurance organisation presented their progress since the last workshop. In most cases, this progress represented an implementation of our suggestions from the previous workshops. In total, five different workshops were organised, each of them with the length of 2 hours.

Finally, we have used direct observations to study the response and general behaviour of the representatives from the Insurance organisation when presented with our progress since the last workshop. We have used this information to assess which aspects of the ESAM they considered satisfactory and which would require more attention.

Regarding the duration of the case study, it was performed during one year and a half. This allowed the researchers to propose guidelines to the representatives, and to observe how they implemented them in practice.

7.1.4 Results

The initial collaboration with the Insurance organisation was started with a meeting in which the context of the organisation and their current interests were discussed. During this meeting, we have used a semi-structured interview approach in order to ensure that the conversation provided all the information needed for starting the case study.

One of the aspects emphasised during this interview was, identifying the interests of the representatives related to the ESAM. This resulted in the following list of wishes:

- Relating CBP to strategic plans, to EA, and to PM;
- Modelling strategy with ArchiMate;
- Assessing capabilities;
- Relating the capability concept to other ArchiMate concepts;
- Relating CBP and roadmaps;
- Using the cost/price model to evaluate goals and strategies.

As a result of this meeting, a report was produced, containing the most important aspects discussed during the meeting. Furthermore, we included in the report a small example reflecting our view on CBP and on the modelling of strategy, value and capability-related concepts. In terms of the ADR, the research included in this report can be considered a pre-alpha version which has been developed only within the research team.

The two Enterprise Architects provided feedback on the content of this report, suggesting several improvements to the CBP method and to the modelling, based on their experience from years of practice. The main feedback received was concerning several idealistic assumptions that were made in the example, such as the grouping of several core elements into one capability inventory. This kind of grouping suggested that the core elements could be used only for realising only one capability, whereas in practice it would be difficult, if not impossible, to make this kind of segmentation.

Furthermore, in the example we provided, we proposed that there should be a 1-to-1 relationship between plateaus and capability increments. The feedback we received from the representatives regarding this proposal suggested that they would not see an added value in making the effort of modelling the capability increment if the plateau concept can be used as a replacement, based on the 1-to-1 relationship. A similar comment was made regarding the 1-to-1 mapping between capabilities and programs.

Moreover, the metamodel we proposed in the report received several comments. First, the explicit relationship between the core element and the capability concept was missing. Second, the positioning of the capabilities and the existing ArchiMate concepts created slight confusion. Finally, the views of the two Enterprise Architects on the relationship between capability increment and plateau diverged. While one suggested that the capability increment and plateau concepts could overlap in practice, the other argued that the two con-

cepts can be used to provide separate views on the core elements. Appendix K contains the final version of this metamodel, as used in the ESAM.

As a result of this first feedback received from the two Enterprise Architects we have improved both the CBP method and the modelling of strategy, value and capability-related concepts, which resulted in an alpha version, according to ADR (Sein et al., 2011). In this context, the two Enterprise Architects represent the practitioners which are involved in creating the alpha version of the method.

Besides the feedback regarding the content of the report, we have also received a confirmation from the two representatives that our view on CBP and modelling of strategy, value and capability-based concepts was in line with their own understanding and ideas. Therefore, our collaboration would deliver added value to their work by providing additional clarification and guidance in areas that they were unsure of.

Each of the workshops was characterised by a structure in which one party (the representatives or the researchers) took the lead in presenting the progress they made since the last workshop. The role of the other party would be to provide feedback, questions, and new insights relating to the presented materials. This first part of the workshop usually was assigned the majority of the time allotted to the session. After all participants were satisfied the new materials were discussed sufficiently, the second part of the workshop would start.

This second part of the workshop was usually shorter than the first one and it constituted a reversal of roles between the two participating parties. For example, if the researchers presented their results in the first part of the workshop and the representatives provided feedback, the roles would be reversed for the second part. This meant that the representatives would briefly present their progress while the researchers would provide feedback.

In most cases, the party that would present their results in the first part of the workshop would alternate, based on which party had more progress to present, or which party required more feedback. The alternation of roles occurred naturally and was extremely beneficial for ensuring the efficiency and effectiveness of the workshops. This aspect was regarded as very important since the representatives had very busy schedules which did not allow for meeting very often.

In the course of the five workshops, we were not only shown the progress of the representatives but were also provided documents including the strategic intent of the Insurance organisation. Due to the sensitive nature of the information included in those documents, the examples provided in this section have been anonymised and generalised.

Based on these documents, we were tasked with modelling the strategy, value and capability-related concepts in a manner that can be used by the representatives. Therefore, we used the ArchiMate modelling language, enhanced with our proposed extensions (Appendix K). Furthermore, we were asked to provide feedback on the representatives' implementation of some CBP tech-

niques, such as the capability map, the capability heat map, etc. Moreover, we could provide feedback regarding some aspects that could be improved relating to the information included in the documents.

Therefore, we have interpreted and modelled the information we received from the representatives and provided them with an ArchiMate model containing several strategy, value and capability-related views. Furthermore, we have included an analysis of this information which was used to provide feedback. An overview of the modelling results, per purpose and feedback we provided, can be seen in Table 7.2.

As can be seen in Table 7.2, there are many aspects that presented problems, when attempting to model the information received. When presented with these results and feedback, the representatives argued that in most cases the information existed, but was not made explicit in the documents that we were provided. Furthermore, the representatives found this feedback useful to determine which aspects needed more attention or explanation in their documentation. Moreover, they stated that the results of the modelling exercise (the views) provided them with guidance on how they could model specific aspects that were not clear, such as metrics, heat maps, etc.

Regarding their own efforts with CBP, we have provided feedback to the representatives regarding the naming of capabilities and several best practices regarding capability maps, such as not having more than three abstraction levels, using consistent naming of capabilities, etc. Furthermore, we have showcased how the assessment of capabilities can be done with the help of PM. Figure 7.1 illustrates the capability heat map of the Insurance organisation, for the business model of Business-to-Business (B2B), as modelled using the ArchiMate standard. Another type of assessment that was presented is an impact analysis, where the estimated impact of change is illustrated on a capability map, similarly to the first heat map.

Figure 7.1: Capability assessment based on amount of attention needed to develop capabilities, for the B2B business model of the Insurance organisation

Table 7.2: Overview of the modelling results, per purpose and feedback, provided to the Insurance organisation

Strategic planning		
ESAM phase	Purpose	Feedback
Visioning process	Mission, Vision, Value	Complete
Environmental analysis	Internal and external factor analysis	Assessments can also be made based on capabilities and resources
Strategy (option/choice)	Strategy modelling	No link between goals and assessments
Business model	BMC modelling Value network Service offering	Incomplete alignment with the Capability map, Value network, and Service offering
Strategy elaboration	Goal decomposition	No clear decomposition of goals/objectives
Strategic measurements (initiatives)	Goal realisation	No information about KPIs, initiatives
Capability-based planning		
ESAM CBP activity	Purpose	Feedback
Mapping capabilities	Capability map	Complete
	Strategic capabilities	Missing link between goals/requirements and capabilities
Assessing capabilities	Capability metrics	Advised to use metrics that are in line with KPIs
	Capability assessments	Complete
Planning capability developments	Capability increments	Unclear link between plateaus and capabilities
	Capability roadmap	Unclear link between plateaus; missing timeline

Green = Complete information

Orange = Some missing/incomplete information

Red = Information missing completely

Moreover, during the workshops, the representatives of the Insurance organisation reported on the successful usage of the capability map and heat map to communicate with managers regarding the impact of the new strategic intent. The capability map was considered high-level and simplistic enough to be

understood by all the different stakeholders while being able to convey a rather complex message coded into the colours of the heat map.

7.2 Case study 2 - Public university

The Public university case study focuses on improving the alignment between different aspects of the organisation, such as their Strategy, EA, and their Project Portfolios, with the help of CBP techniques. Therefore, we consider that this case can be used for validating the ESAM from the perspective of **Challenge 3: Strategy implementation**. Furthermore, in order to relate the Strategy of the University to their EA and Project Portfolios, we use the ArchiMate modelling language. Therefore, we consider that this can also be used to validate the ESAM from the perspective of **Challenge 4: Strategic intent to EA**.

7.2.1 Context

The Public university is a relatively young organisation, with only half a decade of history. It has a distinctive entrepreneurial character, and a strong focus on new technology development and its significance for people and society. However, in the past few years, the University has suffered from several internal and external challenges which have forced a significant change in the overall strategic intent. The following are a few examples of external challenges (first three) and internal challenges (last three) faced by the Public university:

- Changing regulations (universities should have a distinctive profile);
- Low market share (significantly smaller than competing universities);
- Reduction of government funding (significant cutbacks in available funds);
- Unclear university profile (fairly similar to competing universities);
- Education quality (relatively low graduation rates of students);
- Valorisation (relatively undervalued research performed at the university).

It is worth mentioning that since 2008, the University has developed a very detailed strategic plan, which covers solutions for improving on all of the challenges mentioned above. However, this strategic intent of the Public university needs to be successfully translated into projects. Furthermore, these projects need to have a clear and traceable impact on the University, and from an Information management point of view on the application landscape of the University.

7.2.2 Scope

The main scope of this case study is to help the Public university improve the alignment between their high-level strategic plans, and their Information strategy (called i-Strategy), their application landscape, and their Project Portfolio. Therefore, the case study has two related focuses: (i) using aspects of CBP to

translate the strategic intent into more actionable information, such as projects, and (ii) modelling the strategic and capability-related information with the help of the ArchiMate standard. An additional focus, which is also covered in Chapter 8, is related to improved communication with the help of the University's Information capability map.

In terms of the strategic alignment perspectives proposed by Henderson & Venkatraman (1999), during this case study, we focus on the Technology transformation perspective, which states that the IT manager is responsible for designing an appropriate IT strategy and implementing the required IT infrastructure. In the case of the Public university, the new high-level strategic intent had already been defined by the time we started the case study. Our role was to assist an Information manager with refining the University's i-Strategy, and with getting a better understanding of how some CBP techniques can help with improving the alignment between the i-Strategy, the application landscape, and the Project Portfolio. Furthermore, we supported the representative of the University with using the Information capability map we developed to communicate and discuss with his colleagues. Our intermediary results were also presented to the head of the Information management department at the University in order to see how they can relate with other endeavours within the department.

7.2.3 Methods

Similarly to Case study 1, in this instance, we have also used the extended case method (Burawoy, 1998) and some elements of ADR (Sein et al., 2011). However, the iterations and improvements to the ESAM were less numerous and were mostly aimed at how specific visualisations can be used to communicate and discuss certain topics. Nevertheless, this case has also been used to validate parts of the ESAM, namely the aspects relating to Strategy implementation with the help of several CBP related techniques, and the modelling of strategy, and capability-related concepts with the help of ArchiMate.

The two parties involved in this case study are the researchers performing the case study (the author of this dissertation and her intern at the time, a bachelor student at the University) and the Information Manager from the Public university, which is henceforth referred to as the representative.

The representative in this case study has been chosen based on his role in reaching strategic alignment, as proposed by Henderson & Venkatraman (1999). Namely, he represents the IT manager that is responsible for designing the i-Strategy of the University and for implementing it. The head of the Information management department was included as a participant in one of our workshops at the recommendation of the representative which considered that our progress at the time was sufficient and valuable enough to share.

In order to gather the necessary information, we have used multiple methods of data collection, as suggested by Yin (2003). We have used a semi-

structured interview to gather relevant information regarding the context of the organisation and the representatives' requirements regarding the case study. The semi-structured interview was mostly used in the first meeting with the representative from the Public university.

Furthermore, we have used the documentation provided by the representative of the Public university in order to gain a better understanding of the organisation, and of their strategic intent, current application landscape, and Project Portfolios. Additionally, we have used the information gathered from these documents as input for demonstrating how all of this information can be modelled and related with the help of the ArchiMate language.

Moreover, with the help of weekly meetings organised as workshops, with a duration between one and two hours, we have discussed our results with the representative in order to receive feedback about our progress with applying parts of the ESAM to the University case. Similarly to Case study 1, in these workshops, the representative from the University also presented his progress since the last meeting. However, unlike the previous case study, the collaboration between the researchers and the representative from the University was much more frequent, at shorter intervals, and more involved. Therefore, the representative had more control over the final result of the case study, and over the deliverables that were created during our collaboration.

Finally, we have used direct observations to study the response and general behaviour of the representative when presented with our progress since the last meeting. Similarly, we have used direct behavioural observations to assess the reaction of several teachers/researchers at the University when presented with the University Information capability map and also when they were asked to discuss based on this capability map.

Regarding the duration of the case study, it was performed during four months, with an average of one workshop per week, with the exception of a few weeks during the summer holiday when no meetings took place. This allowed the researchers enough time to give extensive guidelines and demonstrations of how parts of the ESAM could be used to assist the University, and more specifically, the Information manager with their challenges.

7.2.4 Results

The initial collaboration with the Public university was started with a meeting in which the context of the organisation and their current interests were discussed. During this meeting, we have used a semi-structured interview approach in order to ensure that the conversation provided all the information needed for starting the case study. One of the aspects emphasised during this interview was identifying the interests of the representative related to the ESAM. This resulted in the following list of wishes:

- Refining the i-Strategy of the University;
- Introducing CBP concepts at the University;

- Using EA for strategic purposes;
- Relating the projects of the University with the i-Strategy.

As a first step of the collaboration with the representative, we started by defining the capability map of the University, from an Information Management (IM) perspective, as requested by the representative. This implies that only the capabilities that are relevant to IM were included. To develop the capability map, we have used several reference architectures for higher education (application, information, and process) from the Hoger Onderwijs Referentie Architectuur (HORA), as a starting point. Throughout the case study, we have iterated the capability map multiple times, based on the i-Strategy, the project portfolios, and the application landscape of the University. Figure 7.2 illustrates the final version of the Public University's Information capability map.

Next, we investigated how the i-Strategy of the University could be further refined, which has helped us to discover that their objectives were still too high-level to be considered actionable. After adjusting these objectives, with the help of the representative, we noticed a significant difference in relating capabilities to the objectives, which became easier. Furthermore, during this process we further refined the naming and positioning of the capabilities in the Information capability map.

Moreover, with the help of the relationships between objectives and capabilities, we could identify that not all objectives were defined on the same level of abstraction, which lead to some of them being broader than others (related to more capabilities). The differences were quite substantial, considering that one objective was related to 11 capabilities, while another was related to only one capability. This type of insight can also be used to determine which objective should be given more attention, and perhaps even a higher budget. Additionally, the amount of capabilities related to an objective can also be used as criteria to ensure that each objective is defined on the same abstraction level.

One other pursuit within this case study, has been to relate the projects of the University to the capabilities they help improve. Due to the multiple iterations of the Information capability map, this task proved to be significantly easier than the previous ones, with a few exceptions. The main issues arose from the projects that did not have a direct correspondence to any capabilities defined in the Information capability map. To address these issues, after careful consideration, we decided to add two extra capabilities. One such example is the "Student admission management" capability which was reflected in the projects of the University, but the HORA application reference architecture, which is used as a basis for the Information capability map, did not include such an application/category.

Nonetheless, the relative ease of mapping the projects of the University to the capabilities included in the Information capability map was considered as a sign that the capability map was in a mature enough state. Therefore, with the addition of the two missing capabilities, identified with the help of projects, we considered the development of the capability map to be complete, for the

Figure 7.2: Capability map of the University participating in Case study 2

time being. Further refinement of the capability map would be done by the representative of the University based on discussions with his colleagues.

The final aspect of this case study, was related to using the Information capability map as a means of communication and as a generator of discussion. We investigated the usefulness of the Information capability map by using it to communicate and discuss with several teachers, which are also researchers, at the University. To do this, we arranged two sessions in which we used the Information capability map to determine which capabilities of the University the two teachers had an interest in and therefore, would like to receive progress updates about. This small experiment was created due to the issues reported by the representative with creating a progress update report that can be used to communicate with all his colleagues, and not just with management.

The results of these two sessions were better than expected. The two teachers felt immediately engaged into discussing about the capabilities of the University. So much so, that the discussion evolved from only identifying the capabilities they had interest in, to also adding details about how they perceived the performance of these capabilities. Furthermore, the teachers also offered small examples which highlighted why they had a certain opinion about these capabilities. The performance assessment of the capabilities and the examples were unexpected results of this session, which reinforced our belief that capabilities can be used for communication and discussion about important topics in a simplistic manner. We presented the differences between the opinions and interests of the two teachers with the help of a gap analysis, which was considered very useful by the representative from the University. If further implemented, this kind of visualisation could be used to determine which employees should be consulted in relation to which capability. Figure 7.3 illustrates the gap analyses between the interests and opinions of the two teachers, which are represented by the two anonymised names (Ana and Carla).

As a finalization of the case study, the representative received a presentation with all the materials that were created during our collaboration and the ArchiMate models that were used as a basis for these materials. Furthermore, in order to assess the ESAM and how it helped the representative of the University, we conducted a qualitative assessment, as detailed in Chapter 8.

Figure 7.3: The gap analyses (interest and opinion about performance of capabilities) based on the sessions with the two teachers

7.3 Case study 3 - Investment fund

The Investment fund case study focuses on the **Challenge 2: Strategy formulation** aspects of the ESAM. Similarly to the other two case studies, we were involved with the cases study organisation for multiple months. However, due to the relatively small size of the organisation, we were able to progress at a faster pace with the practical application of the ESAM.

Furthermore, we used several aspects of CBP, such as the Capability map, Capability heat map, and Capability gap analysis. However, we did not explore the planning aspects of CBP, such as the Capability development plan, since the case study is mostly focused on assisting the Investment fund with detailing their high-level ambitions. Nevertheless, we can consider that this case study also provides partial validation for **Challenge 3: Strategy implementation** with the help of CBP.

7.3.1 Context

The Dutch Student Investment Fund (DSIF) is the first student-run Investment fund in the European Union. Located in Twente, its aim is to invest in high potential student start-ups from the University of Twente and Saxion. Aside from this, their goal is to develop the local entrepreneurial community, by organising and participating in events. The DSIF is run by a team of 6 students which are supervised by a senior board, comprised of three experienced investors.

Currently, the DSIF operates with a capital of 300.000 euros from its 4 shareholders: The University of Twente, Saxion, The Student Union and Stichting ter Bevordering Ondernemerschap in Twente (SBOT). The fund offers Investment packages of up to 50.000 euros in the form of convertible loans, to student entrepreneurs who wish to establish a business in Twente.

Since the start of their operations on April 7th, the DSIF had laid the groundwork for defining their internal activities. However, the organisation was lacking a strategy for the upcoming years, which was considered a problem by the members of the DSIF. Furthermore, the members of the organisation were advised by their coaches to consider formulating their strategy in order to get a better grasp of where the fund should be heading towards in the next few years. Therefore, the DSIF agreed to apply parts of the ESAM in order to help with their efforts regarding the formulation of their strategy.

Regarding the usage of the different disciplines included in the ESAM, due to the DSIF being a start-up, no previous efforts have been made towards integrating aspects of SM, CBP, EA. However, some aspects of portfolio management have been introduced, mainly for managing their investment portfolios.

7.3.2 Scope

The main scope of this case study is to help the Investment fund with formulating their strategy. In order to do this, we provide assistance and guidance in three different instances relating to Strategy formulation, namely with elaborating their strategy, exploring a new business idea, and analysing the impact of a strategic decision.

Strategy elaboration refers to stating and detailing the strategy of the DSIF, both long-term (mission, vision) and short-term (objectives, initiatives, measures). The New business idea relates to assisting the organisation with specifying, in more detail, one of their ideas for organising events in order to attract and interact with potential customers. Lastly, the impact analysis refers to analysing the impact of a particularly challenging decision that the Investment fund was facing at that time, namely reducing the loan threshold in order to attract more potential customers.

7.3.3 Methods

Similarly to the previous case studies, in this instance, we have also used the extended case method (Burawoy, 1998) and some elements of ADR (Sein et al., 2011). However, unlike the previous two case studies, the iterations and improvements to the ESAM were mostly aimed at the Strategy on a Page templates, as detailed in Chapter 5. Nevertheless, this case study has also been used to validate parts of the ESAM, namely the aspects relating to Strategy formulation with the help of strategy techniques, and the usage of several CBP related techniques.

Similarly to the previous two instances, the two parties involved are the researchers performing the case study (the author of this dissertation and a Bachelor student from the University of Twente) and the participants from the Investment fund, which are henceforth referred to as the representatives.

The Bachelor student involved in this case study is also a member of the DSIF, holding the position of President of the Investment fund. During the case study, the Bachelor student worked closely with the author of this dissertation on developing the Strategy on a Page templates, and other aspects related to the software tool. Based on this collaboration, the Bachelor student proposed to the other members of the DSIF to be involved as part of a case study for the validation of the ESAM.

The representatives in this case study consist of all the members of the DSIF, namely the President of the Investment fund (the Bachelor student), the Director of Portfolios, the Director of Finance, the Director of Marketing and the two Junior Investors.

Similarly to the previous case studies, we used different methods of data collection, as suggested by Yin (2003), namely semi-structured interviews, observations, and workshops. However, unlike the previous two case studies,

since the Investment fund was still in the start-up stage, not much documentation had been created by the organisation. Nevertheless, we had access to the knowledge possessed by the President of the DSIF, which was able to provide a complete picture of the organisation.

7.3.4 Results

The initial collaboration with the Investment fund started when the President of the DSIF (the Bachelor student) realised the potential of improving the operations of his organisation with the help of the ESAM. Based on several discussions, three issues faced by the organisation were identified, namely an unclear strategy for the next few years (only mission and vision defined), a low deal flow (the organisation struggled with generating new deals and was considering a new business idea which had not been further detailed into implementable options), and a very high minimum investment threshold (this option had an unknown impact on the organisation which needed to be investigated).

Based on these three organisational issues, we were able to apply different parts of the ESAM and to customise our solution to the needs of the Investment fund. For each of these organisational issues we identified a matching case study goal which could be supported with the help of the ESAM, as follows: strategy elaboration (based on the issue of no clear strategy for the next years), new business idea assessment (based on the issue of low deal flow), and an impact analysis of removing the lower Investment threshold (based on the issue of very high lower Investment threshold).

In the following paragraphs, we detail the results of the workshops carried out with the representatives of the DSIF. Based on the information provided by the members of the Investment fund, we also designed several Strategy on a Page dashboards which provide an overview of how the specific case study goals have been achieved.

Strategy elaboration. For this purpose, a three-hour workshop was organised with all the representatives of the DSIF. The workshop was organised in a structured manner, which involved defining a mission and vision, followed by formulating a strategy based on the Value disciplines technique, and ending with the elaboration of a full BSC. Figure 7.4 illustrates the results of the strategy elaboration workshop, as presented in a Strategy on a Page dashboard.

The main aspect that caused difficulties in this workshop was related to defining the mission and vision of the DSIF, due to a divergence in understanding these concepts by the representatives. The ESAM facilitated them with identifying that there was an issue (different understanding of the terms), by focusing the discussion on a specific set of concepts (mission, vision), and by requiring the representatives to reach an agreement regarding how these concepts would be defined and used for the purposes of the Investment fund. As a result, a clear mission and vision of the DSIF have been defined.

Figure 7.4: Strategy elaboration dashboard (Investment fund case study)

In the case of formulating a strategy, the Value disciplines technique was considered very useful since it was able to assist the representatives in focusing their attention on the right type of strategy that they should formulate, by presenting three generic alternatives for types of strategies. This has helped the representatives which had less experience with the business domain to be able to participate in the choice of a strategic direction. However, the elaboration of this strategy into implementable objectives proved to be fairly challenging due to the increased level of detail for the information that needs to be filled into a BSC. Nonetheless, with the help of suitable guidance, the members of the DSIF were able to formulate four objectives for each perspective of the BSC, each of them accompanied by at least one measurement, target, and initiative.

New business idea assessment. This assessment was developed over a period of three weeks, with participation from three representatives of the DSIF (the President, the Financial Director, and a Junior investor), and also three members from a collaborating organisation, namely Hardstart Entrepreneurs. During these three weeks, the representatives used several parts of the ESAM, such as a resource and capability assessment, a MoSCoW analysis as a custom technique introduced in the Environmental analysis phase of the ESAM, a definition of core values based on the mission and vision, and last but not least an evaluation of alternative options with the help of Multiple-Criteria Decision Analysis (MCDA), as a custom technique introduced in the Strategic choices phase of the ESAM.

While most techniques that were used during these workshops were considered very useful and appropriate, in the case of the capability and resource

maps, the opinions of the representatives diverged. One representative argued that since the organisation is small, most of its members are aware of which resources and capabilities are available, and therefore, there is no need to explicitly detail them in maps. Nonetheless, at the advice of the other Investment fund members, which considered this step to be helpful, the two maps were completed.

In the case of the MoSCoW analysis, this technique was able to focus the efforts of the representatives on making a ranking of aspects they considered mandatory for organising their upcoming event, which proved to be very valuable in the following steps. With the support of techniques, such as the MCDA, the representatives managed to create multiple alternative solutions created based on different combinations of possible implementations of MoSCoW factors. As an example, different options for locations were proposed (Performance factory, Gallery, Holland Casino, etc.), of which the Performance factory was selected due to its relatively low cost and varied time slot availability. With the help of the MCDA, the representatives managed to have a good overview of potential alternatives and were able to design a solution that was most suitable to their interests.

Figure 7.5: New business idea assessment dashboard (Investment fund case study)

The full results of the New business idea use case can be seen in Figure 7.5, presented in the form of a Strategy on a page dashboard. After completing this assessment, the representatives developed a plan and proceeded with the implementation of the event. As a result, the Funding Nemo event took place,

which helped the DSIF reach the target of their "Increase deal flow" objective, with six new start-ups being added to the portfolio of the Investment fund. Furthermore, all of the participants involved in the event (entrepreneurs, students, jury members, and organisers) were pleased with the outcome.

Impact analysis of removing the minimum investment threshold. The motivation behind this impact analysis is strongly related to the low deal flow of the organisation, which could also be caused by the minimum investment threshold being too high. Since the Investment fund would like to be highly responsive to their customer's needs (in line with their Customer intimacy strategy), the representatives wanted to determine the impact of removing the minimum investment limit of 10.000 euros. This analysis spanned over a period of two weeks, in which the President of the DSIF and one Junior Investor used parts of the ESAM to analyse the impact of such a decision. During this period, the options and intermediary results were communicated and discussed with all of the members of the DSIF.

Figure 7.6: Impact analysis dashboard (Investment fund case study)

The techniques which were used in these workshops involved an assessment of resources and capabilities based on how they would be impacted by the decision, a product and cost analysis performed with the help of the BCG matrix and the Pareto analysis, a gap analysis and MCDA. With the help of these techniques the representatives were able to determine that, indeed, removing the minimum investment threshold is the best decision for the organisation. Furthermore, they were able to identify additional improvements, such as introducing more options on the website that do not involve asking for an in-

vestment directly, which could potentially increase their deal flow even more. Figure 7.6 illustrates the dashboard for the impact analysis of removing the minimum investment threshold.

The decision of removing the minimum investment threshold was subsequently approved by the senior board of the DSIF and was also greatly appreciated by the potential customers of the Investment fund, as most of them required investments between 2.000 and 5.000 euros.

7.4 Summary and Conclusion

Within this chapter, we present the results of our three case studies, which we use for validating the ESAM. We discuss each of the three case studies in a structured manner in which we detail the context of the organisations, the scope of the case studies, the methods used to gather information within the case studies, and finally the results in which we present what has been achieved during the case study.

First, in Case study 1 (Insurance organisation), we collaborated with the representatives of the organisation on translating their strategic intent into EA models. Therefore, we consider this case to be used for validating the ESAM from the perspective of **Challenge 4: Strategic intent to EA**. Furthermore, in order to plan the implementation of the strategic intent we use aspects of CBP theory. Therefore, we consider this case to also be used to validate the ESAM from the perspective of **Challenge 3: Strategy implementation**. Consequently, this case study is mostly used for the validation of aspects related to the modelling of strategy, capability, and value-related concepts. Furthermore, there is a focus on capability techniques and how they can be used to communicate to managers.

Second, in the case of the Public University, we have collaborated with the representative of the organisation on improving the alignment between different aspects, such as their i-Strategy, EA, and Portfolio of Projects, with the help of CBP techniques. Therefore, we consider that this case can be used for validating the ESAM from the perspective of **Challenge 3: Strategy implementation**. Furthermore, in order to relate the Strategy of the University to their EA and Project Portfolios, we use the ArchiMate modelling language. Therefore, we consider that this can also be used to validate the ESAM from the perspective of **Challenge 4: Strategic intent to EA**. Consequently, this case study is mostly used for the validation of aspects related to the alignment between different disciplines of the organisation. Moreover, there is a focus on the capability map, how this can be used as a connection point to strategy, EA, and projects, and how it can be used to communicate with different types of employees.

Third, the Investment fund case study focuses on the **Challenge 2: Strategy formulation** aspects of the ESAM. Similarly to the other two case studies, we collaborated with the representatives of the organisation for multiple months in

which we applied the ESAM in three instances relating to strategy formulation, namely elaborating their strategy, exploring a new business idea, and analysing the impact of a strategic decision. Consequently, this case study is mostly aimed at validating aspects related to strategy formulation with the help of interlinked strategy techniques, while providing information regarding several possible use cases for our method. Furthermore, within this case study, capabilities also play a central role. However, besides helping organisation members with communicating, they also facilitate decision-making based on performance, relevance, and impact analyses of capabilities.

Chapter 8

Evaluation of the ESAM

This chapter is based on the contents of the following papers:

Aldea, A., Iacob, M.E., van Hillegersberg, J., Quartel, D. & Franken, H. Aligning Strategic Management, Enterprise Architecture and Capability-based Planning: An Enterprise Strategic Alignment Method (ESAM). Submitted to the *Business & Information Systems Engineering (BISE) Journal*.

Aldea, A., Iacob, M.E., van Hillegersberg, J., Quartel, D. & Franken, H. Strategy on a Page: Management dashboards made with ArchiMate. Submitted to the *Business & Information Systems Engineering (BISE) Journal*.

In this chapter, we present the evaluation of the ESAM based on the challenges identified with the help of the literature review (Figure 8.1). From this perspective, we analyse if the design of the method follows the requirements that we formulated (Challenges 1–4).

Furthermore, we assess if and how the ESAM has helped the case study organisations depicted in Chapter 7 to improve their strategic alignment. In order to perform this evaluation, we have developed an instrument based on the enablers of strategic alignment, as identified in the literature review presented in Chapter 3. The first section of this chapter introduces the evaluation of the method design, while the following sections are used to discuss and evaluate the method based on the three case studies.

Figure 8.1: Challenges which the ESAM should help address

8.1 Evaluation of the method design

Within this section, we analyse how well the ESAM fulfils the design requirements we formulated for the method. Therefore, we look at the first four challenges illustrated in Figure 8.1, and at the two chapters that present their implementation within the method (Chapter 4).

8.1.1 Challenge 1: Cross-domain solution

Challenge 1 is mostly covered in Chapter 4, in which we present an overview of the ESAM. Within this chapter, we focus on introducing the phases of the method with their supporting strategy techniques, methods, models, etc. Furthermore, we emphasise how the different disciplines interact within these phases. Therefore we present for each of the phases, both with text and in a simplified table which disciplines play a role and what information they need, provide, and exchange within the phase.

Challenge 1 and its requirements are mostly based on one of the most fundamental aspects of the SAM by Henderson & Venkatraman (1999), which states that strategic alignment should be a cross-disciplinary effort. The main reason why this is a challenge in itself is because of the importance and impact this has on the design of the ESAM. It is one of the main premises and contributions of the ESAM, which distinguishes it from other proposed methods. Current literature mostly includes solutions which are based on two disciplines at most, and are very often skewed towards one discipline or another.

The first requirement of this challenges depicts one of the main premises

of this dissertation, namely it emphasises the importance of a collaboration between the different disciplines. Within the ESAM, we present how the method can support this collaboration by identifying for each of its phases which disciplines play an active or passive role. We indicate what information each discipline might need, provide, or exchange within each phase. Based on this, we pinpoint which techniques included in the ESAM can help provide the information required in each step.

The second requirement relates to using knowledge from multiple domains in order to ensure strategic alignment. As it can be seen in Chapter 4, for each of the phases of the ESAM we have used knowledge from all of the four domains that we consider should play a role in achieving strategic alignment, namely SM, EA, CBP, and EPM. This is illustrated also in the structure of the phases, which discusses them from the perspective of all the four disciplines.

The third and fourth requirements relate to having a solution which combines knowledge from two or more disciplines. Within the ESAM, this is well reflected by the phases of the method being designed based on a combination of theory gathered from four disciplines. We consider that the method represents a combined solution that benefits from the strengths of all of these domains and improves on their main weaknesses.

8.1.2 Challenge 2: Strategy formulation

Challenge 2 is also depicted in Chapter 4 where we demonstrate how the strategy techniques included in the ESAM can be used to formulate the strategy of the ArchiPharma example case. One of the first requirements of Challenge 2, is that the ESAM should guide organisations through a formal strategy process that is also flexible. Although the two aspects of this requirement might seem slightly contradictory, as also mentioned in literature, they are considered to be very beneficial when combined. In order to design the phases of the ESAM we have used and combined several steps for the strategy process, as suggested in the literature. Furthermore, in order for the ESAM to be considered flexible, we have designed it as a toolbox which contains techniques specific for each phase of the method. Therefore, the ESAM can be considered modular, with each module offering the possibility of being used independently, or in combination with others. Additionally, since we identify in Chapter 4 which information is needed as a result of each phase, the techniques included in the ESAM, can be replaced or complemented with others that serve a similar purpose.

The second requirement is related to the objectivity of the strategy process. This comes as a result of organisations identifying the lack of transparency and objectivity in decision making as a cause for their problems with strategy formulation. In the ESAM, we address this by supporting and encouraging the documentation of decisions and motivations in a manner that supports traceability. Furthermore, we include, in the method, several techniques that are known for promoting more objective assessments and decision making, such as

the QSPM. Moreover, several of the techniques included in the ESAM encourage collaboration and brainstorming, which should provide more transparency to the process since decisions are made based on the knowledge and interests of more members of the organisation.

The third requirement is related to one of the unique aspects of the ESAM, namely the inclusion of many strategy techniques which are linked to each other, as opposed to existing literature which mostly considers these strategy techniques individually. This requirement has been included due to concerns both in practice and literature that organisations are using strategy techniques incorrectly in combinations. Furthermore, even though literature includes examples of strategy techniques used in combinations, these mostly revolve around strategy techniques which are intended by the authors to complement each other, such as the BSC and the Strategy map. Within the ESAM, we provide a clear overview and explanation in Chapter 4, of how these strategy techniques can complement each other and can be used in combinations.

The final requirement is related to improving strategic alignment with the help of strategy techniques. Within SM literature, some strategy techniques are singled out as possible solutions for improving strategic alignment, such as the BSC and the BMC. Therefore, we have chosen to include these strategy techniques within the ESAM.

8.1.3 Challenge 3: Strategy implementation

Challenge 3, similarly to the previous two, is also depicted in Chapter 4 where we demonstrate how the ESAM can support organisations with implementing their strategies, with the help of the ArchiPharma example case. In this section, we focus on the aspects of the method which relate mostly to the CBP discipline.

The first requirement of this challenge is based on one of the biggest problems faced by organisations nowadays, namely the implementation of their formulated strategy. Furthermore, it is also identified by SM literature as one of the most problematic and understudied areas of the strategy process. Therefore, with designing the ESAM, we have paid special attention to providing adequate support for strategy implementation. In order to achieve this, we have used knowledge from literature and practice on the topic of CBP, mostly relating to the defence sector. Since the methods, methodologies and frameworks gathered from the defence sector are not completely suitable for application in other industries, we have designed our own CBP method which is fully integrated within the ESAM. Moreover, the CBP method is designed in the same spirit as the rest of the ESAM, namely as a toolbox with techniques that can be used for certain purposes, as can be seen in Appendix J.

The second requirement is related to another problem faced by organisations nowadays, namely communicating strategic intent throughout the organisation. In literature, one of the suggested solutions for this problem is to use an easy to understand, relatively high-level and standardised manner of com-

munication. Some studies identify capabilities, and more specifically capability maps, as a technique that fulfils these criteria. Therefore, within the ESAM, we propose the use of capabilities as means for communicating within the organisation and have included support, amongst others, for the design of capability maps.

The third requirement is somewhat related to the previous one, namely it focuses on providing different techniques revolving around capabilities. The main reason for this is related to the need identified from literature and practice for more elaborate techniques that support the usage of capabilities beyond the capability map. Some applications mentioned in the literature include the design, assessment, planning, implementation and monitoring of capabilities. Within the ESAM, as mentioned before, we have included a full CBP method which offers support for designing (capability map), assessment (capability heat map, capability gap analysis), planning (capability development plan), implementation (link to the EA that realises a capability), and monitoring (capability metrics, spider chart).

The final requirement refers to capabilities being used as intermediaries between the strategic intent of an organisation and its EA. The main reason for this requirement is motivated by the literature identifying that the strategic intent of an organisation is usually too high-level to be linked directly to its EA. Some authors identify capabilities as having the right abstraction level and potential to be used for relating these two layers of an organisation. Within the ESAM, we demonstrate how capabilities can be used as an intermediary between strategy and EA, by considering them both during strategy formulation (predominantly in the Environmental analysis phase) and during strategy implementation (predominantly in the Implementation design and Business transformation planning phases).

8.1.4 Challenge 4: Strategic intent to EA

Challenge 4 is also mostly depicted in Chapter 4, where we demonstrate how the ESAM can be used to translate the strategic intent of an organisation into its EA, with the help of the ArchiPharma example case. This challenge can be seen as an extension of the last requirement from Challenge 3, where we focus on capabilities as intermediaries between strategy and EA. In order for this requirement to be fulfilled, the concepts of capability and strategy need to be supported both by the strategy techniques included in the ESAM and also within the EA modelling language ArchiMate. Since the ArchiMate 2.1 specification of the language does not support the modelling of strategy and capability-related concepts, we consider this a separate challenge in which we focus on concepts and techniques specific to the EA modelling language ArchiMate.

The first requirement of this challenge deals with identifying the impact of strategy on existing EA. This is motivated by both literature and practice identifying the problem of the strategy being unsupported by information sys-

tems as one main issue relating to strategy implementation. Within the ESAM we address this by offering ways to link the strategy of an organisation to the supporting EA in a traceable manner with the help of an extended ArchiMate language. This traceability relies on modelling of relationships between concepts which can be used for impact analyses. This kind of modelling is not common in within SM literature and practice, which can make it very difficult to perform impact analyses.

The second requirement relates to linking strategy techniques and ArchiMate, which is mostly based on the decade-long struggle of both academics and organisations with strategy formulation and implementation being seen as two separate processes. While this issue might seem more like a conceptual exercise rather than a practical one, it has some very practical consequences. Namely, it can create a very large gap within an organisation, where decisions are made unrelated to the reality of the organisational environment, where the impact of certain decisions is unknown, where projects are being implemented without knowing what they contribute to, and lastly it can create a culture where all the decision-making power is skewed towards the top of the organisation while all the knowledge is with the executors. Within the ESAM, we try to address this issue by supporting direct links and mappings between strategy techniques and architectural models, with the help of the ArchiMate modelling language. In order to achieve this, we provide a mapping between the concepts of the strategy techniques and the ArchiMate concepts.

The third requirement deals with the planning and monitoring of change with the help of the ArchiMate standard. One of the main concerns relating to the SAM of Henderson & Venkatraman (1999) is that it does not provide any guidance on how to identify and correct misalignments. Within the ESAM, we have included several aspects that deal with the identification and correction of misalignment, in the form of metric definitions and assessments at multiple levels with the help of techniques such as the BSC, capability heat maps, spider charts, etc. Furthermore, we support the planning and modelling of organisational transformations in a structured manner with the help of techniques such as the BSC, capability development plans, roadmapping, etc. For all of these aforementioned techniques, we also provide support and guidance for modelling with ArchiMate.

Finally, the last requirement is one of the most fundamental ones within this challenge, namely the proposal of additional concepts, relationships, and views that can support the aforementioned modelling. Multiple studies, including our own, have identified that the ArchiMate 2.1 specification of the language is incomplete and lacking crucial concepts that are needed for modelling strategy, value, and capability-related aspects. Within the ESAM, we propose de addition of several new concepts, the improvement of existing concepts and relationships, and the usage of existing concepts and relationships in new ways, as detailed in Appendix K.

8.1.5 Summary and conclusion

At it can be seen from the previous subsections, we have considered and implemented all of the requirements defined for the first four challenges for the ESAM. Furthermore, all of the defined requirements are designed to address either theoretical or practice-oriented issues or both. Moreover, we provide for all of the requirements either a conceptual explanation (Challenge 1) or a demonstration of a practical application based on an example case study (Challenges 2–4). The following table provides a simple overview of how the first four challenges are addressed within the design of the ESAM (Table 8.1).

Table 8.1: Challenges which the ESAM should help address, with the concerns that motivate them

Challenge	Requirement	How it is addressed in the ESAM
Challenge 1: Cross-domain solution	Cross-domain relationships	Emphasis on how and what collaboration is possible within the phases of the method
Chapter 4	Cross-domain knowledge	The phases, techniques and collaborations are based on knowledge from multiple domains
	Two or more domains	Four domains (SM, CBP, EA, EPM)
	Combined solution	Phases and techniques combined from multiple disciplines
Challenge 2: Strategy formulation	Flexible strategy planning process	Formal process designed in a modular manner (toolbox)
Chapter 4	More objective strategy process	Support for documenting decisions, brainstorming, objective decision-making
	Linked strategy techniques	Extensive combinations of multiple strategy techniques
	Alignment through strategy techniques	Inclusion of strategy techniques which promote alignment
Challenge 3: Strategy implementation	Support for implementing strategies	Complete CBP method
Chapter 4	Capability-based communication	Capability map and guidelines for defining and using capabilities
	Techniques for capabilities	Support for designing, assessing, planning, implementing, and monitoring capabilities
	Capabilities as intermediaries	Relationship between strategy and EA via capabilities
Challenge 4: Strategic intent to EA	Impact of strategy on existing EA	Traceable relationship between strategy and EA modelled with ArchiMate
Chapter 4	Linking strategy techniques and ArchiMate	Mapping between strategy technique concepts and ArchiMate concepts
	Planning and monitoring change with ArchiMate	Support for BSC, roadmapping, etc. with ArchiMate
	Additional concepts, relationships, views	Several suggestions for new concepts and improvements to existing concepts/relationships

8.2 Discussion of the case study results

Within this section, we present a discussion of the case study results illustrated in Chapter 7. We discuss these results through the lens of the challenges that the three case studies were intended to validate, namely Challenge 2: Strategy formulation, Challenge 3: Strategy implementation, and Challenge 4: Strategic intent to EA.

8.2.1 Case study 1 - Insurance organisation

The case study performed with the representatives of the Insurance organisation fulfilled two roles in developing the ESAM. First, it provided initial feedback that allowed us to improve the pre-alpha version of the method, based on the years of practical experience of the representatives (practitioners, as identified in the ADR proposed by Sein et al. (2011)).

Second, it allowed us to validate multiple aspects of the ESAM, in the context of two of the challenges identified in the literature review, namely Challenge 4: Strategic intent to EA which is related to the modelling of the strategic intent with the help of ArchiMate, and Challenge 3: Strategy implementation which is related to providing support for implementing strategies with the help of CBP. An overview of the specific aspects of Challenge 3 and 4 that were (partially/not) addressed in Case study 1 can be seen in Figure 8.2.

Figure 8.2: Overview of the aspects of Challenge 3 and 4 that were (partially/not) addressed in Case study 1

It is worth mentioning that aspects relating to Challenge 5: Strategic alignment are discussed in the following section (Section 8.3), where we present the evaluation of the ESAM from the point of view of Strategic alignment. The assessment of how well the method fulfils the requirements of Challenge 5: Strategic alignment, is done based on an evaluation instrument which helps perform a qualitative assessment of the method.

In terms of Challenge 4, we were able to provide guidance to the representatives of the Insurance organisation on how to model their strategic information with the help of the additional concepts we proposed for the ArchiMate standard. Furthermore, we demonstrated how strategy techniques, such as the BMC, can be modelled with the help of the ArchiMate language. Moreover, we were able to provide insights into what kind of strategic information was missing or incomplete, which could potentially hinder an impact analysis.

In regards to Challenge 3, we were able to provide guidance and confirm the already existing ideas of the representatives regarding the modelling of capabilities. Furthermore, we demonstrated how the information regarding the Insurance organisation can be modelled in order to link their strategic intent, their capability-base, and aspects of their EA. Moreover, we provided guidance on how to make high-level assessments of capabilities by using the Metric concept (as a specialisation of Driver). Finally, the representatives of the Insurance organisation reported to us the successful usage of the capability map and heat map to communicate the implication of a new strategic intent with their management team.

There are also several aspects that we did not manage to address with this case study. First, we did not validate whether the ESAM helps with determining the impact of strategy on the existing EA. We did, however, provide feedback on what aspects could present a problem in the case the representatives would attempt an impact analysis based on the information available at that time. This aspect could not be validated mostly due to the limited amount of time available to perform this case study, both on the side of the representatives and of the researchers.

Second, we did not fully address the aspect of planning and monitoring of change with the help of the ArchiMate standard. Similarly to the previous limitation, this aspect of Challenge 4 was also not addressed due to time limitations. However, we did provide the representatives some guidelines for how the planning and monitoring of change can be done with the help of capabilities.

Third, the link between strategic intent, capabilities and EA was not fully explored. At the time of performing the case study, the main priority was to demonstrate how the capabilities of the Insurance organisation can be linked to their EA, in a more generic manner, represented by plateaus and high-level work packages. We did not explore how capabilities can be linked to more specific aspects of their EA, such as applications, business processes, etc.

Finally, we consider that with this case study we have fulfilled a majority of the representative's wishes, as were detailed in Chapter 7. More specifically, we

consider that the only aspect that was not covered at all, is the last one, relating to the usage of a cost/price model to evaluate goals and strategies. The main reason for this is that it did not fit well with our overall vision for the case study, and was also stated by the representatives of the Insurance organisation as a topic of interest, but not mandatory.

8.2.2 Case study 2 - Public university

The case study performed with the representative of the Public university fulfilled four roles in developing the ESAM. First, it provided valuable insights into how a capability map can be developed in practice, and how it can be integrated with existing EA models, strategic documents, and project portfolios. Second, we were able to observe first hand the potential benefits of the capability map and the gap analysis. The very enthusiastic reactions and positive opinions of the representative and the two teachers confirmed that these techniques could be very valuable for facilitating communication and discussions. Third, we were able to test the concept of the Strategy on a page dashboard with real information from the University, which was received very positively by the representative, especially due to the semi-automatic way of creating it and also due to the highlighting function. Finally, this case study allowed us to validate multiple aspects of the ESAM, in the context of Challenge 3: Strategy implementation and Challenge 4: Strategic intent to EA. An overview of the specific aspects of Challenge 3 and 4 that were (partially/not) addressed in Case study 1 can be seen in Figure 8.3. Similarly to the first case study, the aspects relating to Challenge 5: Strategic alignment are discussed in Section 8.3.

In terms of Challenge 3, we were able to provide guidance on how to develop a capability map and also how it can be used to communicate and discuss with other members of the organisation. Furthermore, we have used other CBP techniques, such as the gap analysis, to visualise the differences and similarities between the interests and opinions of two University teachers. Moreover, we used capabilities as an intermediary between the i-Strategy of the University, their application landscape, and their project portfolios. As mentioned by the representative, this has also helped with showing how EA can be used at a strategic level.

In terms of Challenge 4, we were able to demonstrate how the University's i-Strategy and capabilities could be modelled with the help of several concepts which help extend the 2.1 specification of the ArchiMate language. Furthermore, we were able to demonstrate which parts of the University's EA would be affected by their i-Strategy with the help of the highlighting function of the Strategy on a page dashboard and the underlying relationships between the concepts. Moreover, by relating the projects of the University to their strategic intent, capabilities, and EA, we provided a solid foundation for starting to use the ArchiMate language for more advanced functions, such as the planning and monitoring of change.

Figure 8.3: Overview of the aspects of Challenge 3 and 4 that were (partially/not) addressed in Case study 2

There are also several aspects that we did not manage to address with this case study. First, we did not validate that the ESAM from the point of view of linking strategy techniques and the ArchiMate language. The main reason for this is that strategy techniques were outside the scope of this case study. Furthermore, the representative of the University did not have an explicit interest in this topic, at the time of performing the case study.

Second, we did not fully address the aspect of planning and monitoring of change with the help of the ArchiMate standard. The main reason for this is that the University representative did not consider this aspect to be of interest, at that time. Furthermore, the University already had a very comprehensive project planning and monitoring system, which was considered sufficient. Therefore, an additional technique for planning and monitoring change was considered unnecessary.

Third, the impact of the University's i-Strategy on their existing EA was not fully explored. One of the reasons for this is the relatively limited amount of time that we had at our disposal for the whole case study. Furthermore, this was also not considered a priority due to the very low level of the University's EA maturity. At the time of performing the case study, only the application landscape had been defined, which was not complete from a conceptual point of view (only the application landscape), and also from a content point of view (not all applications were modelled), since it was still under development.

8.2.3 Case study 3 - Investment fund

The case study performed with the representatives of the Investment fund fulfilled two roles in developing the ESAM. First, it provided valuable insights and feedback into the development of the Strategy on a Page templates. Due to the strong interest of the President of the DSIF in our method, we were able to get a better understanding of how three templates could be applied in practice. Furthermore, we were able to observe how practitioners use several strategy techniques included in ESAM, and which of them are preferred. Naturally, this does not imply that all practitioners will prefer the same strategy techniques, but it does provide us with a good indication of which ones could be considered relevant for organisations similar to the Investment fund.

Second, this case study allowed us to validate multiple aspects of the ESAM, in the context of the two challenges identified in the literature review, namely Challenge 2: Strategy formulation, and Challenge 3: Strategy implementation. An overview of the specific aspects of these two challenges that were (partially/not) addressed in Case study 3 can be seen in Figure 8.4. Similarly to the first two case studies, the aspects relating to Challenge 5: Strategic alignment are discussed in Section 8.3.

Figure 8.4: Overview of the aspects of Challenge 2 and 3 that were (partially/not) addressed in Case study 3

In terms of Challenge 2, with the help of the strategy techniques included in the ESAM, we were able to provide sufficient support in each of the three instances described in Chapter 7. The representatives were able to follow a more objective and structured strategy process, which allowed them to have

a transparent decision-making process and to focus discussions on the topics that required the most attention. Furthermore, they were able to experience first-hand the flexibility of the ESAM, which allowed them to customise which strategy technique they used, as long as they still fitted within the scope of the phases of the method. Moreover, by using the strategy techniques suggested by the ESAM, the representatives managed to experience the benefits of combining strategy techniques in a logical manner. Therefore, they could use the information from one strategy technique and incorporate it into the following one without much effort or issues.

In terms of Challenge 3, we were able to use CBP techniques and incorporate them seamlessly in the three instances. Most of the representatives of the DSIF (with the exception of the President, which had prior knowledge) were able to use these techniques without having specific knowledge of CBP concepts, theories, or methodologies. CBP techniques, such as resource and capability heat maps and gap analyses, were considered very useful by most representatives, with one exception.

There are several aspects of the two challenges that we did not address during the case study. First, we did not validate the aspects of the ESAM which are related to the implementation of strategies. The main reason for this is that strategy implementation was not considered of interest at that time. However, the representatives of the DSIF did complete a BSC, which is considered in the literature as a strategy technique that supports strategy implementation (Decoene & Bruggeman, 2006; Asli et al., 2013; Schelp & Stutz, 2007).

Second, even though throughout the case study we have used capability-based techniques quite often, we only related them to the strategic intent of the organisation, and not to other more operational or architectural aspects. The main reason for this is that, at the time, the Investment fund did not have their architecture or operations explicitly detailed, and also did not intend to pursue this the near future.

8.3 Evaluation of the case study results

Within this section, we present an assessment of the ESAM with the help of the strategic alignment evaluation instrument introduced in the conclusions of Chapter 3, in the context of **Challenge 5: Strategic alignment**. With this instrument, we evaluate how well the ESAM has provided support to the case study organisations with improving strategic alignment.

The following subsections focus on the three case studies presented in Chapter 7, and on identifying what enablers of strategic alignment were facilitated by using the ESAM. It is worth mentioning that the following analysis is qualitative in nature and is based on statements made by the representatives regarding their experience and usage of parts of the ESAM and on observations made by the researchers during workshops, meetings, and discussions.

8.3.1 Case study 1 - Insurance organisation

In the case of the Insurance organisation, more or less, all of the categories of enablers played a role, with the main emphasis on **Communication**, followed by **Governance** and **Architecture**, and lastly by **Partnership** and **Measurements**. The main reason for this is related to the scope of the case study, which falls under Challenge 4: Strategic intent to EA, and partially Challenge 3: Strategy implementation. An overview of which enablers of strategic alignment have been facilitated by the ESAM, in the case of the Insurance organisation, can be seen in Figure 8.5.

In this figure we can see that some enablers are coloured in green (representing a direct effect), some in orange (representing an indirect/partial effect), some in black (representing no effect), and some greyed out (representing items that were not applicable to the case study). This distinction is made in order to separate the effects that could be documented beyond doubt, and the ones that showed positive signs but not sufficient to conclude that the ESAM had reached its goal. It is worth mentioning that in some cases, due to a time constraint, we could not observe the organisation for a sufficiently long time period that might have provided the necessary evidence to confirm these indirect effects.

Figure 8.5: Enablers of strategic alignment facilitated by the ESAM, in the case of the Insurance organisation

In the case of the enablers related to **Communication**, as can be seen in Figure 8.5, we consider that the ESAM facilitated four of the five enablers of

strategic alignment. This assessment is based on statements made by the representatives of the Insurance organisation which have reported their usage of several aspects, such as a capability map, heat map, and gap analysis in discussions with their management. These discussions were reported to have been successful, the participants were able to have a ***shared language and understanding*** regarding the current situation of the organisation and their future plans. Furthermore, the representatives were able to ***share their knowledge*** on how crucial different aspects of the organisation would be for the new strategy. All in all, the representatives were able to ***effectively communicate*** their knowledge and experience with their management team, in the context of an organisational transformation plan.

Regarding the enablers related to **Architecture**, we consider that two of the five were facilitated directly by the ESAM, while for another two we consider that the method has helped with laying a good foundation. One of the main purposes of the case study with the Insurance organisation was to provide the representatives with support in translating their strategic intent into their EA. As a result, based on the documents that were provided to us, we were able to model the strategic intent of the organisation (with the help of some additional concepts). With this exercise, we were able to translate the ***drivers of the organisation*** into an ArchiMate model and link them to other organisational aspects. Furthermore, by showcasing how new concepts such as capabilities can be modelled and related to their strategic intent and to elements of their EA, we consider that we have helped improve the ***maturity of the organisation's EA***. Moreover, even though we were not able to fully observe this phenomenon, we consider that if the organisation continues to use capabilities and elements of CBP, it will enable them to improve their ***architectural agility and flexibility***. Additionally, we consider that the organisation can use capabilities and CBP to determine, assess and even improve their ***IT capabilities***, similarly to how they implemented it for their whole organisation.

Relating to the enablers in the **Governance** category, we consider that the ESAM was able to directly facilitate two out of the five, while for another two we consider that the ESAM had an indirect effect. By introducing aspects of CBP, we were able to facilitate the usage of additional planning methodologies by the representatives. We consider that this has increased the ***planning sophistication*** of the Insurance organisation. Furthermore, we have provided insights on how ***planning based on capabilities can be aligned*** to other types of planning already implemented, such as EA planning with plateaus, and project planning. Moreover, during the case study at the Insurance organisation, we mostly focused on the link between strategy and capabilities, and less on the link between capabilities and the EA of the organisation, which was represented only by plateaus and linked to generic projects. Therefore, we consider that if the Insurance organisation would continue pursuing an alignment by linking their capabilities to more detailed architectural models, they will be able to facilitate a more ***strategic IT planning***. Additionally, for the same reasoning as

for the IT capabilities enabler, we consider that the *IT governance* of the organisation can be improved by continuing with the integration of CBP and of strategic concepts into their models.

In the case of the enablers related to **Partnership**, we consider that the ESAM has facilitated directly one out of the five enablers of strategic alignment, while two are considered to have been influenced indirectly. During the discussions with the representatives we have learned that besides using capabilities to discuss with management, they have also used them with other colleagues, such as the program manager that was invited for one workshop. One of the main purposes for using capabilities has been the *pursuit of alignment* between the different roles/departments of the organisation. Furthermore, even though we could not observe a direct effect on the *relationship between the two representatives and their management*, we consider that using capabilities for communicating could improve their relationship since they can facilitate higher-level strategic discussions. Similarly, if the relationship between the representatives and their management team is affected positively by being able to have high-level discussions, it could facilitate the representative's *participation in strategic planning*.

Lastly, regarding the enablers relating to **Measurements**, we consider that one out of the five were facilitated by the ESAM, while for another two we consider that the method helped with laying a good foundation. One of the aspects that were discussed during the case study was related to the definition and usage of metrics. Although we were provided with very generic metrics, we were able to demonstrate how these can be used for the assessment of capabilities, with the help of visualisations, such as the spider chart. We consider these metrics could be used to *assess and monitor the planning* of their transformation if the organisation would continue and extend their usage of CBP. Furthermore, we exemplified how these *capability metrics can be aligned* with other types of metrics, such as business metrics. Moreover, we consider that by demonstrating how these metrics can be aligned and modelled we have provided some guidance for interpreting and using of *business metrics*.

One of the aspects that we consider to be problematic regarding the method, reflect in this case study, is convincing other members of the organisation to use capabilities. While the two representatives that we collaborated with were fairly positive about our method, when discussing with the Program Manager, his opinions were slightly different. In this situation, the possible benefits of using the method were not as apparent. One possible reason for this could be that we did not include in our method specific support for aspects related to program/project management. Therefore, we consider that the opinion of the Program manager could be related to our method not being completely relevant to his needs. This is in line with our expectations since the topic of EPM has only somewhat been covered in our method.

8.3.2 Case study 2 - Public university

In the case of the Public university, more or less, all of the categories of enablers played a role, with the main emphasis on **Communication**, followed by **Partnership** and **Architecture**, and lastly by **Measurements** and **Governance**. The main reason for this is related to the scope of the case study, which falls under Challenge 3: Strategy implementation, and partially under Challenge 4: Strategic intent to EA. An overview of which enablers of strategic alignment have been facilitated by the ESAM, in the case of the Insurance organisation, can be seen in Figure 8.6.

The direct and indirect enablers of strategic alignment illustrated in Figure 8.6 have been identified with the help of the Information Manager from the Public university, which has participated in all the meetings. An explanation of the intended meaning of the enablers has been provided in order to ensure that they are considered in an appropriate manner.

Figure 8.6: Enablers of strategic alignment facilitated by the ESAM, in the case of the Public university

It is worth mentioning that not all of the enablers included in the evaluation instrument were considered appropriate for evaluating the results of Case study 2. A few examples of this are enablers C5 (IT Strategic Planning - Governance), D3 (Relationship CEO/CIO - Partnership), and E5 (IT Capability - Architecture). The main reason for these enablers not being considered appropriate is that they relate strictly to IT, which was not the main focus of the case study. We consider this to be a consequence of the literature that has been used

to develop the evaluation instrument, which has a large focus on the Business-IT alignment, rather than Strategic alignment as a whole. Therefore, since the main scope of the ESAM is strategic alignment and not Business-IT alignment, during the evaluation interview with the representative from the University, we have adjusted the evaluation instrument by replacing IT with Information (Management). By making this change, it enabled the representative from the University to offer an evaluation of the ESAM based on all the enablers included in the evaluation instrument.

Furthermore, the evaluation done by the representative reflects not only what he experienced during the case study, but also what could be obtained in the coming months. Similarly to Case study 1, the results are visualised by using colour-coding. The colour green represents the direct effects that have been experienced by the representative during the case study. The colour orange represents the partial or indirect effects that show potential for better results in the future. The colour black represents the items that the representative considered to have been unaffected by the usage of the method. Finally, the colour grey represents the items that fell outside the scope of the case study.

From the Figure 8.6, it can be seen that the enablers relating to **Communication** were considered, by the representative from the University, as the ones that have been facilitated the most by the ESAM. The main reason for this is the emphasis on developing and using the Information capability map of the University as a means to provide overviews and generate discussions. In the beginning of the case study, the capability map was not used very much, but as the understanding of the representative of this technique grew, so did its usage. It has been used by the representative as a means to improve *shared understanding* with EA and PM colleagues, and might also be used in the near future with the higher management boards. Furthermore, within meetings in which colleagues with different backgrounds and from several domains were involved, it helped to structure the meetings and get a commitment on the IT strategy by improving *share domain knowledge* among participants. Moreover, the capability map provides nice visualisations that can be used for discussions, which contributed to *communication effectiveness*. Additionally, the capability map provided a *shared language* that contained easy words that could be used to communicate with colleagues. Finally, the communication frequency was considered only partially influenced by the method, due to the University representative already *communicating frequently* with this colleagues. However, it facilitated the representative to engage his colleagues more often regarding the capabilities of the University and how they can be used.

In the case of the enablers related to **Partnership**, four of the five were considered, by the representative from the University, to have been facilitated by the ESAM. Of these, one is considered to have been influenced directly, and for the remaining three, an indirect/partial effect is identified. The representative considered that the method had helped emphasise the *commitment that management had towards IT and Information Management*. However, it was

also mentioned that the level of commitment depends highly on which management person is being considered in this evaluation, and any method, not matter how good, cannot change this aspect. Furthermore, it was considered that the method had a partial effect in facilitating a ***mutual understanding about the role of IT*** by using capabilities as an abstraction of the application architecture of the University. However, the Information Management function is relatively new at the University, and therefore, with time, the representative hopes that capabilities can be further used for this purpose.

Moreover, in the case of ***participation in planning***, the representative argues that even though he does not make the planning himself, he does discuss the planning with the project owners. Some resources are very rare at the University, and capabilities can be used to identify which resources are used just by one project or are shared between multiple projects. The representative considered that the ESAM helped in this matter by aiding him with prioritising projects. Additionally, the method helped the representative with ***championing alignment*** by being able to illustrate the link between the interests and needs of the employees of the University (the two teachers), and the project portfolio of the University. Using capabilities for this makes discussions clearer, but more experimentation needs to be done in order to find out how much it helps since there is already a working mechanism in place. The method did, however, not have any influence on the last enabler identified as the relationship between the representative (an equivalent of a CIO) and his manager, that could represent the function of CEO, due to the relationship already being very good.

Relating to the enablers in the category of **Architecture**, the representative from the University considered that the ESAM facilitated their organisation directly with one of the five, while two are considered to have been indirectly influenced. The representative argued that the method facilitated gaining a better understanding of the ***IT and Information capabilities*** of the University, by mapping them in a capability map. Furthermore, the method helped in an indirect manner to determine the ***traditional factors*** that can play a role in their industry by creating a capability map based on the HORA. However, the University is still exploring how to implement the HORA, since it is a reference model for the whole sector. Moreover, the representative considered that the method helped partially in regards to the ***maturity of their EA***. He argued that the method facilitated thinking about whether they were doing the right things or not at the University, which he considered being a typical maturity question. The final two aspects relating to Architecture either fell outside the scope of the case (Managing emerging technologies) or were considered unaffected by the method (Architectural agility, flexibility).

Relating to the enablers in the **Governance** category, the representative from the University considered that the ESAM was able to indirectly facilitate three out of the five, while the remaining two were identified as not applicable. The representative considered that the ***planning sophistication*** at the University was indirectly influenced by the method. He argued that by connecting the

capabilities to the i-Strategy and projects, it helped with prioritising projects. Therefore, the planning of the University became more mature. However, a lot of planning is done at the University, and this aspect was not addressed in detail during the case study. Furthermore, the representative considered that the method indirectly facilitated **IT Governance**, due to helping with getting more commitment on the board level, and possibly at management level, at a later time. Moreover, the method was considered to have helped in the case of **IT Strategic Planning**, by providing better insights into what to do first and what to do next, with the help of the relationship between strategy, capabilities, and projects.

Finally, the enablers in the **Measurements** category were considered by the representative of the University to have been influenced the least by the ESAM, with only one out of five being identified as indirectly facilitated by the method. The remaining four were considered to be not applicable or not influenced by the method since they fell outside the scope of the method. The representative argued that the discussions that took place during the case study helped to give him ideas on how he can improve the **business metrics** included in the monitor document that he creates periodically, and also regarding what aspects should be measured. Therefore, this item was considered to have been only partially facilitated by the method. Furthermore, the **assessment of planning** item was considered to have not been affected by the method. One reason for this is that planning did not have a central focus within the case study.

One of the aspects that were considered to be problematic regarding the method is the amount of time needed to use it. The representative argued that it takes time to understand what capabilities are about and how to use them. Furthermore, it takes even more time to convince other colleagues about their potential benefits and about using them. The representative argued that he was lucky to have had enough time to spend on this case study since his schedule is usually very busy. However, he mentioned that he did create more room in his agenda for this purpose since he considered it to have high potential.

8.3.3 Case study 3 - Investment fund

In the case of the Investment fund, four of the five categories of enablers played a role, with the main emphasis on **Communication**, followed by **Measurements**, next by **Governance**, and lastly by **Partnership**. The main reason for this is related to the scope of the case study, which falls under Challenge 2: Strategy formulation. An overview of which enablers of strategic alignment have been facilitated by the ESAM, in the case of the Insurance organisation, can be seen in Figure 8.7. As it can be seen, the enablers in the category of **Architecture** are not identified as playing a role in the case study. This is related to the maturity level of the Investment fund (start-up), which motivates the lack of any EA related methodology (or their interest in implementing one).

Figure 8.7: Enablers of strategic alignment facilitated by the ESAM, in the case of the Investment fund

The direct and indirect enablers of strategic alignment illustrated in Figure 8.7 have been identified with the help of the President of the DSIF, which has participated in and chaired all of the workshops. An explanation of the intended meaning of the enablers had been provided in order to ensure that they are considered in an appropriate manner.

From Figure 8.7, it can be seen that the enablers relating to **Communication** are considered (by the President of the Investment fund) to be the ones that have been facilitated the most by the ESAM. The main reason for this is related to the mixture of different backgrounds of the representatives and the purpose of the case (strategy formulation), which involves ample communication. Due to the very different backgrounds of the representatives (Human Media Interaction, International Business Administration, Technical Business Administration, International Financial Administration, Biomedical Engineering, and Creative Technology), the ESAM has played a big role in enabling the members of the DSIF to develop a *common language*. The ESAM provided the representatives with a standard set of concepts they could use to communicate and make decisions. Furthermore, the method ensured they had a *shared understanding* of very important business concepts, such as vision and mission. Moreover, with the help of the ESAM, the representatives were able to *share their domain-specific knowledge* in a structured manner and at the moments when it would be most valuable for discussions. Lastly, because of the structured approach to strategy formulation, the ESAM was able to facilitate a more

effective communication which revolved around clear themes, concepts and strategy techniques.

In the case of the enablers related to **Measurementss**, three of the five are considered (by the President of the DSIF) to have been facilitated by the ESAM. Within the first use case, the representatives of the DSIF were guided by the method in the process of elaborating their strategy, which involved, amongst others, identifying several *business measurements* for their newly defined objectives. Furthermore, under the guidance of the ESAM, the representatives defined several balanced metrics for each of the perspectives of the BSC. Moreover, in the context of the second use case, the representatives were guided by the method to *assess several alternative planning options* for the event aimed at increasing their deal flow.

Relating to the enablers in the category of **Governance**, the President of the DSIF considers that the ESAM facilitated their organisation with two of the five, while one is considered to have been indirectly influenced. This support has been provided in three instances (identified in the case study), which according to the President of the fund has facilitated them directly with improving their *planning of their business strategy*. Furthermore, he considered that by using the ESAM, the DSIF has been able to improve the *sophistication of their plans*, which until that time were either non-existent or not sufficiently elaborated. Moreover, the President of the Investment fund considered that if more information about the portfolio and marketing planning would have been available, they would have been able to easily *align them to the business planning*.

Finally, regarding the enablers related to **Participation**, small adjustments needed to be made in order to be relevant for the case of the Investment fund. The main changes related to adjusting the wording that it does not specifically relate to the Business-IT partnership, but to generalise it to encompass the partnership between any roles/departments. With this small change in mind, the President of the Investment fund considered that one of the five enablers of strategic alignment has been facilitated directly by the ESAM, while two others indirectly. As mentioned before, in the workshops carried out during this case study all the members of the DSIF were present, each of them holding a different function within the fund. Under the guidance provided by the ESAM, each of the members was able to *participate in the discussions* and were able to provide relevant input during the different aspects of strategy formulation. Furthermore, the President of the fund considered that even though the ESAM did not directly improve the relationship between the members of the organisation, it did, however, have an indirect positive effect by facilitating their collaboration and contributions. Moreover, within the context of applying the ESAM, the President of the DSIF was able to emphasise the *importance of an alignment* between all roles and plans. Even though this championship towards alignment was not a direct effect of the method, it did provide the right setting to have such as discussion.

One of the aspects that was considered to be problematic regarding the method was its apparent complexity. As could be seen in Chapter 7, the first reaction of some members of the DSIF to the method was more negative due to not understanding how it could help them or why they should use it. However, after they experienced several parts of the method, the general opinions changed towards the positive. Therefore, in order to have any hopes that our method can help organisations improve their strategic alignment, we first need to make sure that it is easily understandable and usable. A similar feedback was also obtained from the students that played the beta version of the strategy process board game. Therefore, we can conclude that the complexity of the method lies in the techniques that are included and not necessarily in its phases or logic. Furthermore, this provides, even more, argumentation for the need of layering the method based on complexity levels. This type of approach can make the ESAM more approachable to a greater variety of users.

8.4 Cross-case analysis

In the previous sections, we have evaluated the ESAM from different points of view, such as its design and the three case studies. Within this section, we combine these different viewpoints into one, in order to generate some generic insights into how the method stands up to each challenge, independently of case study. In order to accomplish this, we use and combine the results of the previous sections.

8.4.1 Challenges 2, 3, 4

The first figure illustrates the results of the analysis, based on the aspects of Challenges 2, 3 and 4 that have been validated in the three case studies (Figure 8.8). We use colour-coding to present our results, namely Green (validated in all three case studies), Light Green (validated in two case studies), Orange (validated in only one case study), and Red (partially validated in some case studies).

As it can be seen in Figure 8.8, the only two aspects that have been validated in all three case studies are part of Challenge 3, namely, item 3.2 (capability-based communication), and item 3.3 (techniques for capabilities). We consider that these two aspects of the ESAM were able to be validated in all three case studies due to the strong interest of all three case study organisations in exploring and experimenting with capabilities, in different forms. Furthermore, improvements in the area of communicating with management and colleagues have proven to be a very important topic in all the three case study organisations. Therefore, in all three cases, there has been an interest in exploring and experimenting with capability-based techniques, such as the capability map, the capability heat map, and in some cases even the capability gap analysis.

Figure 8.8: Cross-case analysis of the ESAM validation (Challenges 2, 3, 4)

Another conclusion that can be drawn from Figure 8.8, is that two aspects of the ESAM have been validated in only two of the case studies, namely item 3.1 from Challenge 3 (Strategy implementation support), and item 4.4 from Challenge 4 (added concepts, relationships for ArchiMate). We consider that these two aspects were validated in only two of the case studies since they did not fall within the boundaries of the third case. While in the first two case studies we had as participants two mature organisations which both used, to different degrees, EA and ArchiMate, in the third case study we collaborated with a start-up organisation which had no interest and intention of using EA approaches. Therefore, in the third case study we could not validate any aspects of the ESAM which relate to EA. Nonetheless, this has provided us with valuable insights into what aspects of the method might not be considered interesting and useful by start-up organisations, as a comparison to more mature organisations.

Figure 8.8 also emphasises which aspects of the ESAM have been validated in only one of the case studies. This is mostly the case for the four items contained in Challenge 2: Strategy formulation (flexible strategy process, more objective strategy process, linked strategy techniques, and alignment with strategy techniques), but also to some items of the other two challenges, namely item 3.4 from Challenge 3 (capabilities as intermediaries), and item 4.2 from Challenge 4 (linking strategy techniques and ArchiMate). We argue that the main reason the items in Challenge 2 were only validated in one case study (Investment fund) is related to both the maturity of the organisations and also

to the roles of the representatives, within their organisations. In the case of the Investment fund, the organisation was a relatively new start-up without a proper specification of their strategy, while in the case of the two other more mature organisations, their strategies had already been thoroughly defined. Furthermore, in the case of the Investment fund, we collaborated mostly with the President of the organisation and other business-oriented representatives, which were involved in defining the business strategy of their organisation, while in the other two case studies we mostly collaborated with two Enterprise Architects and one Information Manager, which were not as involved in defining their organisation's business strategy. Therefore, this difference in scope of case studies is reflected in the four items from Challenge 2 being only validated in one case study. By using a similar reasoning, we can also argue why the validation of the two items, from Challenge 3 and 4, were also validated in only one case study.

As it can be seen in Figure 8.8, two aspects of Challenge 4 (impact of strategy on existing EA, and planning/monitoring of change with ArchiMate) have only been partially validated in some case studies. The main reason for this is that these two aspects of the ESAM fell outside of the scope of the three case studies. As the representative of the University argued, organisations that already have a good solution for planning and monitoring change might not easily consider using yet another technique that supports this. Furthermore, the impact of strategy on existing EA could only be partially addressed in one of the three case studies, due to time limitations, both on the researcher's side and on the side of the Insurance organisation's representatives. Moreover, in the case of the other two case studies, the specification of the EA was either non-existent or not complete. Therefore, in these two cases, we did not attempt to explore the impact of strategy on the EA of the organisations.

As a conclusion, the aspects that received the most validation are related to using capability-based techniques for communicating within the organisation, while the aspects that received the least validation are related to planning and monitoring of change with ArchiMate and the usage of impact analyses. Furthermore, the main reason for some aspects being validated in only one case study is strongly related to the different focuses of the three case studies. Moreover, the partial validation of some aspects of the ESAM can be related to time limitations, both on the researcher's side and on the representatives' side.

8.4.2 Challenge 5

Figure 8.9 illustrates the cross-case results of Challenge 5, based on the evaluation instrument used to assess the ESAM. Similarly to the previous figure, we use colour-coding to represent the similarities and differences between the three case studies. However, unlike Figure 8.8, in Figure 8.9 we use an additional colour (Grey) to denote items that were not facilitated (directly/indirectly) in any of the case studies.

Figure 8.9: Cross-case analysis of the ESAM validation (Challenge 5)

As it can be seen in Figure 8.9, the aspects that were validated in all three case studies are all related to the category of Communication. Within this category, the first four items (shared understanding, shared domain knowledge, communication effectiveness, and shared language) are the ones that were considered to have been directly and positively influenced by the ESAM. These results are in line with our previous findings which identified communication as a main topic of interest for the three case study organisations. Therefore, we can argue that in the case of these three organisations, the ESAM facilitated the representatives with most aspects related to communication, which in turn are considered as positive influencers of strategic alignment.

Another conclusion that can be drawn from Figure 8.9, is that two enablers of strategic alignment were considered to have been facilitated by the ESAM, in the case of only two case study organisations. These two items are C2, from the Governance category (planning sophistication), and E1, from the Architecture category (traditional, enabler/Driver, external). We argue that these items were not facilitated in all three case studies for several reasons. First, the planning sophistication is related to improving the maturity of the planning that is done within an organisation. While in Case study 1 and 3, we were able to contribute with the ESAM to this endeavour of the organisations, in Case study 2, it was emphasised by the representative of the University that from his perspective there was, at that time, no need to improve in this area. Second, the

architectural enabler is related to connecting drivers (internal or external) to the EA of an organisation. While in Case study 1 and 2, we were able to contribute with the ESAM to this endeavour of the two organisations, in Case study 3, it was emphasised that the Investment fund had no interest or intention, at that time, to use EA. Therefore, we can argue that the ESAM can facilitate organisations on these two topics, which are considered as positive influencers of strategic alignment, as long as the organisation has interest in them.

With the help of Figure 8.9, we can also identify which enablers of strategic alignment were considered to have been facilitated by the ESAM, in the case of only one organisation. As it can be seen, there are many items that fall in this group, with the main emphasis on items from the Measurements and Partnership categories. In the case of items from the Measurements category, we argue that this can be explained by the main scope of these items, namely metrics that are mostly related to the planning and monitoring of change. As we could see from Figure 8.8, this has not been the main focus of any representative from the three case study organisations. Even though we cannot state that the ESAM can help organisations improve strategic alignment by facilitating the definition and alignment of metrics, we can still draw some conclusions. First, these items were considered in different cases to have been facilitated by the ESAM, which can relate to the scope of the case studies. For example, items B2 (business metrics), B3 (balanced metrics), B4 (planning assessments) were all considered to have been facilitated by the method in the case of the Investment fund. This is in line with the interest of the organisation in formulating their strategy and defining a high-level plan. Furthermore, some of these aforementioned items, such as B2 and B4, were considered to have had only a partial or indirect effect in other case studies, which is not reflected in Figure 8.9. We argue that this partial or indirect effect can be motivated by time limitations which did not allow us to follow and observe the progress of the case study organisations for a sufficiently long period of time. Similar arguments can also be made in the case of the items in the Partnership category. For the other items, we argue that these results reflect the difference in the interests of the representatives of the three case study organisations.

As it can be seen in Figure 8.9, there are also some items that were considered to have been only partially/indirectly facilitated by the ESAM, in multiple case studies. We argue that the main reason for this is the scope of the case studies not covering these items sufficiently. Therefore, we cannot draw any conclusions on whether the ESAM can help organisations with improving strategic alignment by facilitating the topics mentioned in these items. However, we can identify that these items are related to either IT (B1 - IT/IS metrics, C4 - IT governance, C5 - IT strategic planning, D3 - relationship CEO/CIO) or EA (E3 - architectural agility, flexibility). From this, we can conclude that within the scope of the three case studies there was no explicit emphasis on IT, which resulted in the evaluation instrument not being fully relevant for evaluating these cases. One reason for this is the available literature on strategic alignment that

was used as a basis for designing the evaluation instrument, which still has a strong emphasis on the Business and IT side of strategic alignment.

Finally, one item (E4 - managing emerging technologies) from the evaluation instrument was considered to have not been facilitated by the ESAM, in any of the case studies. Furthermore, in two of the case studies, this item was considered as not applicable. Therefore, we can conclude that this item was considered to fall outside of the scope of all three case studies.

As a conclusion, we argue that the ESAM can facilitate organisations in different aspects of Communication, which are identified in literature as very important enablers of strategic alignment. Furthermore, it can facilitate organisations with other enablers of strategic alignment, depending on the interests of the organisations and the amount of time spent on using the method. Moreover, since the ESAM is designed to help improve strategic alignment, items specifically related to IT might not be suitable for evaluating the full contribution of the method.

8.5 Summary and Conclusion

Within this chapter, we evaluate the ESAM from multiple points of view. First, we assess the method design based on the first four challenges that it should help address, namely providing a cross-domain solution which can assist organisations with formulating and implementing strategies, and also with translating strategic intent into their EA. Our conclusion of this analysis is that the design of the ESAM fully complies with the requirements that we defined for each challenge. Furthermore, we detail how each of these requirements is implemented within the method.

Second, we discuss the results of the three case studies from the point of view of Challenges 2, 3 and 4. We focus on identifying which aspects have been fully, partially, or not addressed at all, during the case studies. We conclude that in all cases, a majority of applicable aspects have been addressed, while only a few have been partially addressed, and only one has not been addressed in any of the case studies. However, these aspects vary from case to case, which implies that at least every aspect of the ESAM has been addressed in at least one case study.

Third, we present the results of the case study assessments from the point of view of Challenge 5. For this purpose, we use the evaluation instrument we have designed in order to be able to compare the otherwise incomparable three case studies. We focus on presenting which aspects have been enabled directly, indirectly/partially, or not enabled at all. We conclude that the differences in scope of the three case studies are also reflected in the results of the evaluations. Consequently, not all items included in the evaluation instrument are applicable to the three case studies. Similarly, not all items are determined to have been facilitated in a direct manner by our method. However, the indirect/partial

relationships can also be motivated by the limited amount of time that we could devote to these case studies since some effects might be able to be observed only after longer periods of using the ESAM.

Last but not least, we perform a cross-case analysis in which we compare the results of the three case studies from the point of view of Challenges 2, 3, 4, and 5. Based on this, we conclude that the main aspects that have been addressed in all three case studies are the usage of capability techniques for the purpose of improving communication. This is followed by the support for strategy implementation and the usage of additional ArchiMate concepts for the purpose of modelling strategy, capability, and value-related concepts. The aspects that received the least amount of validation are the ones related to strategy formulation (Challenge 2), which have only been applied to one case study (Case study 3). Similarly, the usage of capabilities as intermediaries between strategy, EA, and projects (Case study 2) and the relationship between strategy techniques and ArchiMate (Case study 1) have also only been addressed in one case study. The main aspects that were only partially addressed in some case studies relate to the impact of strategy on existing EA and the planning and monitoring of change. One reason for this is that these aspects fell outside the scope of all case studies. Furthermore, from the point of view of strategic alignment (Challenge 5), the items related to Communication were considered to have been facilitated the most by the ESAM. Similarly to Challenges 2, 3, and 4, for the case of Strategic alignment (Challenge 5), we can also identify that there are several aspects that are validated in two case studies or less. Furthermore, there are also several aspects that are only partially validated in some case studies, or not validated at all, such as the managing emerging technologies item.

Chapter 9

Conclusions

Within this chapter, we present the final conclusions of this dissertation. We start by focusing on the most important discussion points in relation to the research questions addressed in our research. Furthermore, we identify the main limitations of our research and propose ways in which additional research could help improve or extend our work. Finally, we present how our research contributes to the larger body of available knowledge, both from a theoretical and practical standpoint.

9.1 Discussion

In Chapter 1 we defined the main goal of our research, namely to propose a method that can help organisations improve their strategic alignment. In order to achieve this goal, we have identified three disciplines that can be used for this purpose, namely Strategic Management (SM), Capability-based planning (CBP), and Enterprise Architecture (EA). Additionally, we consider Enterprise Portfolio Management (EPM) as a relevant discipline but choose not address it in detail in order to keep the scope of the dissertation manageable. We formulate our main research question as follows:

How can organisations improve their strategic alignment by relating Strategic management, Capability-based planning and Enterprise Architecture?

Within this main research question, we can identify all of the aforementioned elements, which constitute the focus of our research. In order to determine more specific deliverables of our research, we formulate several sub-questions. These sub-questions are either intended to provide knowledge on a specific topic (Knowledge questions - K) or to provide insights into the design

of a possible solution for the research problem (Design question - D). In the following paragraphs, we discuss how the sub-research questions identified in Chapter 1 are addressed in our research.

SQ1: What is the current thinking regarding strategic alignment? (K)

As the phrasing of the question might suggest, the main scope of SQ1 is to investigate the state-of-the-art theories, models, methods, and techniques related to strategic alignment. Furthermore, the question is also categorised as a knowledge question, which implies that it should deliver specific knowledge regarding strategic alignment. Therefore, the answers related to this question can be found in Section 3.1 of Chapter 3, where we detail the results of our literature review.

Within this section, we discuss three main aspects related to strategic alignment. First, we identify from literature the main influencers of strategic alignment, in terms of enablers and inhibitors. We use these influencers as a basis for investigating which strategic alignment factors play a role in practice, with the help of a survey questionnaire. This questionnaire is mostly aimed at identifying the problems with strategic alignment, which falls under the premises of SQ2. Therefore, we present more details about the survey and other inhibitors of strategic alignment when we discuss SQ2. Furthermore, we use the enablers identified from the literature to design the evaluation instrument that is used for assessing our proposed method, in terms of specific improvements to strategic alignment.

Second, we focus on the aspect of cross-domain relationships, which is identified by Henderson & Venkatraman (1999) as a pre-requisite for strategic alignment within an organisation. Within this context, we discuss the current trends and research related to using knowledge from multiple domains. Our main conclusion is that four main trends can be identified, namely extending strategy techniques with concepts from other domains, using capability-based techniques as an intermediary between strategy and EA, enriching EAFs and EA languages with strategic concepts, and finally using EPM as a strategic and operational way to manage organisational change. However, we conclude that most of the studies covered by these trends share the same limitations, namely that they are not truly cross-domain and that they are still very fragmented in scope.

Third, we discuss several approaches, identified from literature, developed for helping organisations with improving strategic alignment. We analyse these approaches from multiple points of view, as proposed by Doumi et al. (2011), such as the construction of alignment, modelling support, evaluation of alignment, and more. We conclude, similarly to the case of cross-domain relationships, that most of these approaches share the same limitations such as, top-down predominant solutions, lack of alignment evaluation and correction techniques, predominantly informal modelling support, and the most important, a large emphasis on the Business-IT alignment, and not strategic alignment as a whole.

In order to gather more specific insights into the trends identified as part of the cross-domain relationships aspect of strategic alignment, we formulate three additional knowledge research questions.

SQ1.1: *What is the current thinking on business strategy? (K)* This sub-question serves a similar purpose to SQ1 but has a strong focus on aspects related to business strategy. We discuss this research question in Section 3.2 of Chapter 3, where we emphasise three aspects related to business strategy, in the context of strategic alignment. First, we discuss the strategy process as a means to guide the formulation and implementation of organisational strategies. We present several contrasting and complementing views on how this process should be managed and what kind of phases it should contain. We conclude that the strategy formulation process can be divided into multiple phases, based on guidelines from literature, while the strategy implementation process cannot be specified in too much detail due to the lack of SM research on this aspect. This knowledge is used in the later stages of our research to shape the phases of the ESAM.

Second, we focus on the aspect of value creation and exchange as one important scope for organisations. We present the origins of the concept of value and discuss several available approaches from literature. We argue, aligned with literature, that creating value for all stakeholders should be the main goal of organisations. Therefore, it is also considered as an important component of the ESAM and is supported by such techniques as BMC, Value streams, Value network, etc.

Third, we present an overview of which strategy techniques are considered by practitioners are useful, and therefore applied in their organisations. We conclude that current literature has a focus on investigating the usefulness of strategy techniques in practice, finding new ways to use them, and also on discovering new means to combine them. However, the main limitations of these studies lie in their focus on only one or two strategy techniques at a time, on the generic approach to relating the strategy techniques to the strategy process, and also on the apparent lack of focus on relating strategy techniques to other disciplines. This knowledge is used in the subsequent chapters to shape which strategy techniques are included in the phases of the ESAM, how they are included in their respective phases, and how we relate these strategy techniques to each other and to techniques from other disciplines.

SQ1.2: *What is the current thinking on Enterprise Architecture? (K)* Similarly to SQ1.1, in order to answer this sub-research question we focus on aspects related to EA. We present the results of this research question in Section 3.3 of Chapter 3, where we focus on three viewpoints, in the context of strategic alignment. First, we discuss the EAFs as a main component of EA, with an emphasis on the alternatives developed throughout the years. Furthermore, we present several studies that have investigated which of these alternatives are preferred in practice. Our conclusion is that even though, there are some clear favourites, such as TOGAF, Zachman EAF, and FEAF, a new trend is de-

veloping. This trend involves organisations not using these EAFs as standard packages, but rather customising them or combining elements of them in a fully custom solution.

Second, even though organisations are inclined to using custom EAFs, the TOGAF standard is still considered one of the most popular EAFs. This is also reflected by organisation's identifying it as one of the EAFs that they use the most components out of, in order to develop a custom solution. While investigating the available literature on the TOGAF standard, we conclude that there are two main trends developing in recent years, relating to strategic alignment, which revolve around the ADM and the Content Metamodel. In both cases, there is an emphasis on new developments for the Motivation extension and the Business Architecture, in order to align them better with strategic concepts and practices. Furthermore, other aspects that present interest are the focus on customers, and the value generation and delivery to these customers. We conclude that these are efforts to bring TOGAF closer to the business world in an attempt to minimise the gap between the two domains. We use this knowledge to also direct our efforts towards the Motivation and Business aspects of the TOGAF standard.

Third, similarly to the TOGAF standard, the ArchiMate standard is also considered as one of the most popular modelling languages for EA. Therefore, we investigate literature on the ArchiMate standard, from the viewpoint of strategic alignment, and identify several research trends in the recent years. Comparable to the TOGAF standard, current literature focuses on the metamodel aspect of the ArchiMate standard, and more specifically on the Motivation extension and Business layer, on the proposal of new strategic, capability and value-related concepts, on improvements with the usage and definitions of current concepts, and on assessing EAs with the help of metrics and scenarios. Similarly, these trends are in line with our vision for how the ArchiMate standard should progress in the future, and are used to guide our efforts with developing the ESAM, mostly by focusing on the Motivation extension and the Business layer.

SQ1.3: What is the current thinking on Capability-based planning? (K)

Similarly to the previous two, in order to answer this sub-research question we focus on aspects related to CBP. We present the results of this research question in Section 3.4 of Chapter 3, where we emphasise two aspects of CBP, in the context of strategic alignment. First, we discuss the concept of capability, and its relationship to other concepts, such as strategy and resource. Furthermore, we present several popular techniques for capabilities, including the capability map, which can be used to map, decompose, and stratify capabilities. Other techniques include the heat map, gap analysis, and the capability development plan. Our conclusion regarding these techniques is that besides the capability map, which has been becoming more popular recently, there is only limited research available to describe or exemplify how these techniques can be used, outside of a military purpose. Therefore, within the ESAM we have a special

focus on detailing these specific techniques and providing examples of how they can be used in organisations.

Second, we investigate which approaches for CBP are currently available. Based on the results of the literature review, we can conclude that only limited research is available on the topic of CBP. However, the main focus of these studies is the military application of CBP, which is not completely suitable for organisations. Similarly, when analysing grey literature, such as white papers and technical reports, we find very comprehensive CBP approaches, that are developed for the defence sector. Nonetheless, we are able to find a few attempts at an application of CBP to organisations. The most notable one comes from the TOGAF standard, which only includes several suggestions for how CBP can be used in the context of EA. We conclude that scientific literature is highly lacking on the topic of CBP, which is strongly contrasting the apparent need of organisations for such an approach. Therefore, with the ESAM, we focus on developing a CBP method which is suitable for application in organisations, which includes some of the techniques suggested by the military-oriented approaches, and which can be easily integrated with strategy and EA.

Enterprise Portfolio Management. Even though this discipline does not have a strong focus in our research, while performing the literature review (Section 3.5 of Chapter 3), we have identified several relevant studies on this topic. We choose to include a small analysis of studies investigating EPM, in order to be able to relate the ESAM to this discipline as well. We do not claim that our method can fully support EPM, but we do provide several connection points, that can serve as a starting point for further investigations.

SQ2: Why is there a problem with strategic alignment? (K) In order to answer this research question, we investigate both academia and practice. We start by discussing what literature indicates as influencers of strategic alignment, with a focus on the inhibiting factors. We identify inhibitors such as unclear communication, information overload, management not involved in the execution, no understanding of strategic plans by employees, etc. Therefore, we use these factors for designing a survey questionnaire targeted at investigating practitioners, as mentioned in the discussion of SQ1. We present the answer to this research question in Section 3.1 of Chapter 3.

The main results of our survey indicate that Conflicting priorities regarding strategic goals are considered the most problematic by organisations. Nonetheless, the majority of items included in the top 10 are related to Communication, such as unknown individual responsibilities to reaching strategic goals, the majority of the organisation does not understand the strategy, there is unclear communication about the strategy, etc. These findings are in line with other quantitative and qualitative studies identified with the help of the SLR.

Furthermore, we investigate the enablers of strategic alignment mentioned in the literature, which identify Communication, IT/IS project planning, Knowledge sharing, Information strategy, and others, as the main positive influencers. We combine this knowledge with the SAMM by Luftman & Kempaiah (2007) in

order to develop an evaluation instrument. We use this instrument to perform a qualitative assessment of the ESAM based on the three case studies we carry out during our research. The main purpose of this evaluation instrument is to determine which aspects of strategic alignment are positively influenced by the ESAM, within the case studies.

Moreover, we use this knowledge from theory and practice to determine several challenges that should be addressed by the ESAM, in the context of improving strategic alignment. As a result, we identify five main challenges that the ESAM should help address, namely Challenge 1 (Cross-domain relationships), Challenge 2 (Strategy formulation), Challenge 3 (Strategy implementation), Challenge 4 (Strategic intent to EA), and Challenge 5 (Strategic alignment). For each of these challenges, we detail several requirements that our method should fulfil in order to address the concerns identified from both literature and practice.

SQ3: How can strategic alignment be improved? (D) This research question represents the first design-based question. This implies that in order to answer it, we need to present the design of our proposed method. Within our research, we address the ESAM from three points of view namely, the method, the serious games, and the software tooling support. The design of these three aspects of the ESAM is guided by three design sub-questions.

SQ3.1: How to design an effective method to improve this alignment? (D) As the phrasing of the question might suggest, the main focus of this research question is on designing our method. We present the results of this research question in Chapter 4. where we present an overview of the ESAM, from the point of view of the first four challenges. Therefore, within this chapter, we focus on how the phases of the ESAM have been designed to support the exchange of cross-domain knowledge, in order to address Challenge 1: Cross-domain solution. Furthermore, we present which types of cross-domain relationships are possible in each of these phases. Moreover, within this chapter, we focus on illustrating the possible relationships between all four previously identified disciplines (SM, CBP, EA, and EPM) in order to ensure that our solution truly represents a cross-domain, combined solution.

Within Chapter 4, we also focus on demonstrating how the different elements included in the phases of our method can be used and related to each other, with the help of the ArchiPharma example case. We present this demonstration from the viewpoint of the following three challenges defined for the ESAM namely, Challenge 2: Strategy formulation, Challenge 3: Strategy implementation, and Challenge 4: Strategic intent to EA. Since in the context of the ESAM we integrate all these challenges in a seamless manner, they are not explicitly identified in the section of Chapter 4. Rather these challenges are addressed within each phase of the method, in which we combine aspects of strategy techniques, modelling with ArchiMate, and CBP techniques.

First, we introduce how strategy formulation can be supported with the help of several strategy techniques, by demonstrating which strategy techniques can

be used within the phases of the ESAM. We argue that these strategy techniques can be replaced or modified as long as they still fit with the purpose of the phase, in order to promote the flexibility of our method. Furthermore, we illustrate how these strategy techniques can be linked to each other, in order to provide a stream of information from one to another, and also to facilitate traceability of decisions. Moreover, we argue that our proposed combination of strategy techniques can enable organisations to have a more objective process due to included support for documenting decisions, for brainstorming, and even for more objective decision-making with the help of some strategy techniques.

Second, we present how strategy implementation can be supported with the help of CBP, by focusing on several aspects included in Challenge 3, such as CBP techniques, mostly based on knowledge from grey literature. Furthermore, with the help of the ArchiPharma case, we demonstrate how strategic intent identified can be used and related to CBP. Additionally, we illustrate how capabilities can be related to EA concepts (such as service, process, and application) without using the ArchiMate language notations. Last but not least, we demonstrate how several CBP assessment and planning techniques can be applied and visualised.

Third, we illustrate how strategic intent can be brought closer to EA with the help of ArchiMate by focusing on several aspects included in Challenge 4, such as using additional concepts and relationships for the ArchiMate language. With the help of additional concepts and some changes to existing concepts we can enable endeavours such as linking strategy techniques to ArchiMate, and impact analyses of strategies on existing EA. Furthermore, we present how several planning and monitoring techniques can be supported with the help of the ArchiMate modelling language.

As a conclusion, within Chapter 4 we present an overview of the ESAM as cross-domain solution that facilitates collaboration between different disciplines (Challenge 1) and demonstrates how the method can be used with the help of an anonymised case of a real organisation (Challenges 2, 3, 4).

SQ3.2: How can a software tool be used to support this method? (D)

The main focus of this research question is to develop support for the method in the form of a software tool. The main purpose of this software tool is to provide practitioners with an implementation of the ESAM that can be used without having prior knowledge of the underlying theories and techniques. We present the results of this question in Chapter 5, which is divided into two sections. The first section covers the different aspects of the management dashboard tool (Strategy on a Page), while the second section covers the actual software tool implementation.

The main purpose of the Strategy on a Page is to assist organisations with designing, analysing, and visualising strategies with the help of well-known strategy techniques and ArchiMate-based dashboards. In order to design this tooling support, we have focused on four distinct, but inter-related aspects. First, we developed support for visualising strategic information in a manner

that includes only the most relevant details, supported by additional features, such as highlighting of the relationships between the different concepts presented (Section 5.1.1). Second, we design several templates, for the Strategy on a Page, that can be used for specific purposes, such as Strategy elaboration, New business idea, Impact analysis, and CBP (Section 5.1.2). Third, we design software support for several popular canvases which are also often used in practice, such as the BMC, SWOT analysis, BSC, etc. (Section 5.1.3). Finally, we investigate how organisations can be guided through the strategy process in a manner that is easy and approachable for them, in order to ensure that strategic information is generated and gathered in an appropriate manner, with the help of a spreadsheet-based tool (Section 5.1.4).

In the second section (Section 5.2), we demonstrate the implementation of the ESAM within the software tool, with the help of two case studies, namely the case of the Public university and the case of the Investment fund. For each of these cases, we detail how we used both the Strategy on a Page and also the computer-aided canvases. Furthermore, we also present how the strategy design tool (Strategy Blueprint) was applied to the case of the Public university.

As a conclusion, within Chapter 5 we have presented an overview of the different aspects related to the software tool support designed for the ESAM. This includes several aspects related to the management dashboard tool, such as the Strategy on a Page prototype with several custom templates, multiple computer-aided canvases, a spreadsheet-based strategy design tool, and also the actual implementation of the software tool, as demonstrated with the help of the Public university and Investment fund case studies.

SQ3.3: How can serious gaming be used to support and disseminate this method? (D) This final research question relates to the development of several serious games which can be used to support the ESAM and communicate about it. We present the results of this question in Chapter 6, which is divided into two parts.

First, we discuss the board game developed for the strategy process. The main scope of the board game is to allow players to experience the benefits of using parts of the ESAM, such as some strategy process techniques (e.g.: SWOT analysis, PEST analysis, BMC, etc.). The main advantage of using a board game to simulate such an experience is that participants can freely experiment with their decisions without real-life consequences. Within our serious game, we have used the phases of the ESAM as a guideline for how the gameplay should evolve, and we have used several of the strategy techniques included in these phases as tools that the participants can use. The main premise of the game is that organisations need to compete against each other to gain market share. Participants need to use the strategy techniques included in the game to help guide their decision-making process. Therefore, we argue that the board game is designed to demonstrate how some of the strategy techniques and phases of the ESAM could be used in a realistic situation. It is also one of the more practical contributions of our research, in which participants can experience

the phases of the ESAM which are focused on strategy formulation.

Second, we present the online multiplayer game developed for HubWays and the horticultural industry. The main purpose of this game help participants explore, in a simulated world, how the introduction of digital strategies and business models would affect themselves and their whole supply chain. While this game does not have such an explicit connection with the ESAM as the board game, the method was used to understand and frame the current and desired state of the horticultural industry organisations and supply chains. More specifically, we used several strategy techniques, such as the Value disciplines, the BMC, the SWOT analysis, and others, in order to model the shift in strategy, business model, resources and capabilities that are needed in order to support the introduction of the HubWays platform. Therefore, we argue that with this online multiplayer game we apply the ESAM in a different way that normally expected, in order to create a mind shift with the help of experimentation in a safe environment.

Therefore, we can conclude that the two serious games serve a complementary function, both demonstrating a different aspect of using the ESAM. On the one hand, the board game demonstrates how strategy can be formulated with the help of the ESAM, while on the other hand, the HubWays game focuses on demonstrating the impact of implementing a formulated strategy and business model.

As a conclusion, within Chapter 6 we have presented an overview of the two serious games developed to support and disseminate the ESAM. While these two games can be considered fairly distinct based on how they use aspects of the method, we consider both of them to be very useful ways to demonstrate different aspects of the method.

Validation and Evaluation of the ESAM. Even though these two aspects are not explicitly mentioned as a research question, we consider them essential to answering SQ3, since we cannot argue that our method can help improve strategic alignment without any proof. Therefore, within Chapter 7 we investigate how the ESAM can be applied to real organisations, with the help of three case studies. Due to these three case studies being fairly different, based on the type of organisation investigated and scope of the case study, we are not able to fully validate our method in all cases. However, since the ESAM has a very broad scope and high flexibility, we consider that not every organisation needs to use every aspect of our method, but rather should apply the aspects that fit best with their needs at the time. Furthermore, by having such a diverse application of the ESAM, we can identify which aspects of our method can be used in by all three types of organisations, and which can be considered more situational. As a result, within all three cases, capabilities have played a central part, while aspects such as strategy formulation, modelling with ArchiMate, and relationships to projects can be considered situational. Therefore, we have validated all aspects of the ESAM in one case or another, but only a few aspects have been validated across multiple cases.

Within Chapter 8, we discuss the evaluation of our method from multiple points of view. First, we assess it based on the requirements identified for each challenge, in order to determine if the final design of the method includes all necessary aspects. We conclude that the design of the ESAM does indeed fulfil all of the requirements needed in order to address the challenges identified from literature and practice. Furthermore, we discuss the results of the case studies, with regards to what aspects were addressed or not, based on the aforementioned challenges. This evaluation is intended to determine which aspects of the ESAM have been validated or not, and also to provide an argumentation for why this might be the case.

Moreover, we discuss the evaluation of the ESAM from the point of view of strategic alignment, with the help of a qualitative evaluation instrument. This assessment highlights what aspects of strategic alignment were positively influenced by our method in the three case studies. Our evaluation instrument has been developed based on the SAMM of Luftman & Kempaiah (2007), which is used to assess the Business-IT alignment maturity of organisations. In order to account for strategic alignment as a whole and not only for the Business-IT alignment, we have enhanced the SAMM with knowledge from current literature which investigates the influencers of strategic alignment. The resulting evaluation instrument, while not focused on the Business-IT alignment, still includes several Business-IT alignment focused items (e.g.: IT Governance, IT Strategic Planning, etc.). This reflects the fact that the Business-IT alignment represents just one aspect of strategic alignment, which we do not address explicitly in this research.

Finally, we perform a cross-case analysis in which we investigate which aspects of the challenges have been validated in all three case studies. Our results indicate that the aspects of the ESAM which received the most validation are related to using capability-based techniques for facilitating organisations in different aspects relating to Communication, which are identified in literature as very important enablers of strategic alignment.

Furthermore, as identified by Moody (2009), notations with a strong cognitive effectiveness can also contribute to improving Communication. In our method, we have a strong focus on modelling support with the help of the notations provided by the ArchiMate language. Therefore, we consider that our choice for notational support has also had a positive influence on Communication. For the remaining influencers of strategic alignment (Measurements, Governance, Partnership and Architecture), the influence of the ESAM can be considered to be situational, and determined by the scope of the case study and the type of the organisation.

Throughout this section we have discussed how we addressed the research questions within our study. Now, we would like to discuss shortly about how the ESAM can be used by practitioners. Since it is a method intended for improving strategic alignment, we can argue that many organisations could benefit from applying it. Especially when looking back at the results of our strategic

alignment survey and also at other available research that have investigated this topic.

Even though, the ESAM could prove very useful for many organisations, we argue that the best results can be obtained by those who already have some experience with EA, EPM, and some maturity in the formalisation of strategies. However, this does not mean that organisations, such as start-ups, cannot benefit equally from the method. This does mean that more time and effort might need to be invested in order to reap the full benefits of what the ESAM can offer.

Nonetheless, when looking at the case of the Investment fund, a start-up organisation who did not have any EA practices in place, we were still able to provide needed support by applying only the parts of the ESAM which were relevant for their needs. This is mainly due to how the method was designed, as a toolbox that contains a variety of supporting techniques. Additionally, the modular nature of the ESAM allows and facilitates the usage of parts of the method at a time, based on the needs of practitioners. We consider this to be a distinguishing aspect of the method, which also helps with making the ESAM more useful for a greater range of organisations and applicable to a wider variety of problems.

Another aspect that makes our approach unique is the two practical applications that have been developed throughout this research. The software tool, once it is fully implemented, can prove to be an invaluable support for the method. The main benefit it can provide is that it can hide all the complexity of the method and can even provide some level of automation to the strategy process. Furthermore, if used on a larger scale within an organisation it can help maintain one central source of information that can be seen, modified and shared by all relevant stakeholders in a simplistic manner.

In the case of the two serious games, we see them as a simple and fun way to introduce practitioners to the ESAM. Similarly to the software tool, the two games are designed to hide some complexity of the method, while focusing on providing direct guidance to applying the method. We consider these serious games to be useful promotional tools for the method and have the potential to be incorporated within training sessions.

9.2 Limitations

Within this section, we discuss the limitations of our research from the perspective of the ESAM, the serious games, and the software tool. We consider that one of the main limitations of our work is related to the validation. Even though we have used three case studies to validate the method, we do not cover all aspects of the method in each case. This could cause skewed results in which certain aspects or opinions regarding the method are more favourable or unfavourable, depending on the situation. Therefore, the results of the validation

cannot be generalised to all types of organisations or industries. However, due to such big distinctions between case study organisations, we are able to gather insights into the aspects related to the method that might differ or are shared between them. Based on these insights, we can determine which aspects of the method might be applicable or generalisable for more types of organisations and industries.

Second, during the three case studies we were able to successfully collaborate with representatives that had different roles within their respective organisations. Based on this, we can argue that our method is suitable for supporting the needs of these types of roles. However, one other important aspect of the method is supporting the collaboration between different roles within an organisation. We were not able to directly observe if and how the collaboration between the representatives and their colleagues was improved by using the method. Nevertheless, we were provided by the representatives with examples of how this collaboration had been facilitated in certain situations. Therefore, we can conclude that at least in certain situations, our method can facilitate the collaboration between different roles within an organisation.

Third, the evaluation instrument has been developed based on current literature, with an emphasis on the SAMM of Luftman (2004). However, as we discovered when applying it in practice, not all items were equally relevant to evaluating our method in the context of our case studies. The items that were identified to be the most problematic are the ones relating to IT. Nevertheless, these items were identified by literature as having high relevance in organisations nowadays, and also as influencers of strategic alignment. Therefore, we consider that even though it is based on literature, our evaluation instrument was not completely relevant for the three case studies. Nonetheless, it can still be considered applicable in other cases in which IT plays a bigger role in the scope of the study.

Finally, the amount of time and guidance required to use the method has been identified by representatives from the case study organisations as a limitation of the method. We consider these as issues that are shared also by many other solutions that are more complex. Furthermore, as identified previously, these issues could also be inherent to the strategy techniques and techniques that are included in the method and not only to the method itself.

9.3 Future work

Within this section, we discuss the possible solutions for the aforementioned limitations, in the form of suggestions for future research. First, in order to address the issue of the validation, we recommend that further research should investigate how the method can be applied to more types of organisations. Furthermore, we propose that the full extent of the method should be applied in as many cases as possible. This can help ensure that the results of the case studies

are better comparable than in our current research. Moreover, we suggest that further investigations should be made into determining which aspects of the method can be used for only specific types of organisations in certain industries, and also which ones can be generalisable to many types of organisations and industries.

Second, we recommend that further research should investigate more closely how the method facilitates the collaboration between different roles within an organisation. Although promising results have been found in our current research, currently, we cannot draw any generic conclusions about the benefits of the method in this respect. Furthermore, we suggest that further investigations should be made to identify which aspects of the method facilitate this collaboration the most, and also which ones are preferred by each role. This information could help shape a future version of the method that is completely tailored to the needs of its potential users.

Third, based on the limitation relating to the evaluation instrument, we recommend that further research should be done into determining the relevance of the IT related items included in the instrument. In this respect, we propose that further investigations should be done to determine if the three case studies included in our research are outliers, or can be considered as a good representation of other organisations. Based on these results, further research can adjust the measurement instrument included in our research to better suit the needs of a wider range of organisations.

Finally, in order to address the concerns identified in the case studies regarding the amount of time and guidance required to use the method, we recommend that further research should investigate how the method can be simplified. In our research, we have already considered several aspects that can serve as a starting point, such as layering based on complexity, and creating pre-defined smaller solutions targeted at specific needs and questions of organisations. Furthermore, we suggest that further investigations should be in order to determine which aspects of the method are considered to be the most difficult to use and require the most assistance. Based on this, further research could propose improvements in these areas, on the lines of different techniques and better customisation possibilities for the method.

Besides the future work based on the limitations of our method, we consider that valuable research can be done in relation to the two serious games and the software tool support designed for the ESAM. Both of these types of support for the method have been considered as very promising, and further investigation is needed in order to explore their full potential. These two applications of the ESAM are especially suitable for practitioners to familiarize themselves and explore what the method has to offer in a simplistic manner.

In the case of the two serious games, they have been tested mostly with students, which implies that the results might not be applicable to other types of users. Therefore, we recommend that future research should investigate whether the board game, in its current version, can generate similar results

with practitioners. Furthermore, in the case of the HubWays game, we suggest that further investigation with end-users is needed in order to determine if it can actually be used to create a mind shift in the horticultural industry.

From a practical standpoint, the two games are suitable for usage as training materials to educate practitioners about various aspects, such as how to define a strategy in a structured manner, what kinds of strategy techniques are suitable for each phase of strategy formulation, how these techniques can be used in combinations, and also how the decisions made with these strategy techniques can impact an organisation. Therefore, for future work it would be recommended to investigate how these games can be incorporated into the standard training materials that strategy consultants already use, in order to add a more practical and fun aspect to these sessions.

In the case of the software tool support, future research should be done in order to determine whether the software tool, as included in our research, can be used successfully by practitioners to support different aspects of strategic alignment. During our research, we have developed several mock-ups and have implemented a part of the needed features in the software tool. Nonetheless, the remaining features are planned to be implemented in the months after the finalisation of the dissertation.

From a practical standpoint, the software tool can be very useful as a support for consultancy since it presents a simplified version of the method, where all the complexity is hidden from the user. With this in mind, a consultant or a practitioner does not need to have extensive knowledge of the underlying theories, but rather only of what they want to achieve with the software tool. Therefore, we recommend for future work to investigate what are the typical questions that a practitioner might have, which can be answered with the help of the software tool. Furthermore, we suggest that additional investigations can be made to determine how the software tool can be further developed, in terms of functionality that should be added in order to provide better and more advanced support to practitioners.

Additionally, the current version of our software tool does not include support for quantitative analytical features. We consider this would be a valuable addition to our work, which would enable practitioners to design advanced dashboards. Therefore, for future research, we suggest to explore how advanced analytical features can be added to the software tool, to facilitate cross-model analysis and traceability, based on the linked information from strategy techniques, EA models, and EPM charts.

Finally, our research has a strong focus on the conceptual modelling of the enterprise. Therefore, we do not explore areas, such as how the communication process would be structured when using our method, how teams can be assembled and managed in order to use our method, etc. Future work in these areas could prove very valuable to practitioners by providing guidance beyond the pure enterprise engineering aspects of strategic alignment that were covered in our research. We suggest, as good starting point for this future work,

the BSc thesis of Scriciu (2016), one of the students which contributed to our research.

As a concluding statement, within our research, we have investigated multiple aspects of strategic alignment, which we have used to develop a method, accompanied by two serious games, and software tool support. We have validated and evaluated the ESAM with the help of three case studies, which has revealed that our method had a positive influence in all three cases on Communication, which is one very important enabler of strategic alignment.

Appendices

Appendix A

Publications and other contributions

Scientific publications

- Aldea, A., Iacob, M.E., Quartel, D., & Franken, H. (2015). Strategic planning and Enterprise Architecture. In *Proceedings of the 1st IEEE Enterprise Systems Conference (ES 2013)* (pp. 1-8).
- Aldea, A., Iacob, M.E., van Hilleghersberg, J., Quartel, D. & Franken, H. (2014). Serious gaming for the strategic planning process. In *Proceedings of the 16th IEEE Conference on Business Informatics (CBI 2014)* (pp. 183-190).
- Aldea, A., Iacob, M.E., van Hilleghersberg, J., Quartel, D., Franken, H. & Bodestaff, L. (2015). Modelling strategy with ArchiMate. In *Proceedings of the 30th ACM Symposium on Applied Computing (SAC 2015)* (pp. 1211-1218).
- Aldea, A., Iacob, M.E., van Hilleghersberg, J., Quartel, D. & Franken, H. (2015). Capability-based planning with ArchiMate," In *Proceedings of the 17th International Conference on Enterprise Systems (ICEIS 2015)* (pp. 352-359).
- Aldea, A., Iacob, M.E., van Hilleghersberg, J., Quartel, D. & Franken, H. (2015). Modelling Value with ArchiMate. In: A. Persson & J. Stirna (Eds.), *Advanced Information Systems Engineering Workshops: CAiSE 2015 International Workshops, Stockholm, Sweden, June 8-9, 2015, Proceedings* (pp. 375-388). Springer International Publishing.
- Roelfsema, M., Aldea, A., Lankhorst, M. and Franken, H. (2015). How about Strategy? A survey into the pitfalls of strategic alignment, *Journal of Enterprise Architecture (JEA)*, 12(1), pp. 7-18.

Submitted for publication

Aldea, A., Iacob, M.E., van Hillegersberg, J., Quartel, D. & Franken, H. Aligning Strategic Management, Enterprise Architecture and Capability-based Planning: An Enterprise Strategic Alignment Method (ESAM). Submitted to the *Business & Information Systems Engineering (BISE) Journal*.

Aldea, A., Iacob, M.E., van Hillegersberg, J., Quartel, D. & Franken, H. Strategy on a Page: Management dashboards made with ArchiMate. Submitted to the *Business & Information Systems Engineering (BISE) Journal*.

Febriani, T.R., Aldea, A., Iacob, M.E. & Daneva, M. Strategic Planning Process Using Reasoning Tree-Based Approach. Submitted to the *7th International Symposium on Business Modeling and Software Design (BMSD 2017)*.

Scrieciu, M.V., Aldea, A. & Iacob, M.E. The Infinity Method – Improving Strategic Alignment through Mutual Understanding. Submitted to the *7th International Symposium on Business Modeling and Software Design (BMSD 2017)*.

Non-scientific publications and contributions

Lankhorst, M., et al. (2016). *Enterprise architecture at work, 4th ed.*. Berlin: Springer-Verlag. (Credited contributions to Chapters 4, 5, 9)

The Open Group. (2016). *ArchiMate 3.0 standard*. Zaltbommel: Van Haren. (Credited contribution to the new version of the standard)

Aldea, A., Wimsatt, B., Quartel, D., Iacob, M., Lankhorst, M. and Franken, H. (2016). *Capability-based planning: The link between Strategy and Enterprise Architecture* (White paper No. W16C). The Open Group.

Roelfsema, M., Aldea, A., Lankhorst, M. and Franken, H. (2015). *How about Strategy? A survey into the Pitfalls of Strategic Alignment* (White paper No. W151). The Open Group.

Aldea, A. (2014). *Strategy analysis and design*. Amersfoort: BiZZdesign Academy.

Aldea, A. (2016). *The HubWays online multi-player game* (Dinalog Report).

van Velzen, A., Aldea, A., Rikken, M., Lankhorst, M., Roelfsema, M., Kosman, R., Sealy, T. and Janssen, W. (2015). *Eigen Data Delen – Personal Data Stores – concept, techniek en gebruik* (Digital We report).

Sealy, T., Rikken, M., Roelfsema, M. and Aldea, A. (2016). *Data as a Service - Open data, fast data en de API economie* (Digital We report).

Aldea, A., Wimsatt, B. and Gonzalez, S. (Feb 8, 2017). *Capability-Based Planning: The Link between Strategy and Enterprise Architecture* (Open Group webinar No. D183). The Open Group.

Blom, R. and Aldea, A. (Dec 15, 2014). *Effective strategy implementation* (Open Group webinar No. D119). The Open Group.

Supervised MSc and BSc theses

Roelfsema M. (2014). *A survey into the strategic alignment efforts and experiences of organisations & A method for assessing strategic alternatives based on expected return and associated risk* (MSc thesis). University of Twente.

Cheng S. (2015). *Translating strategy into implementation via capability-based planning* (MSc thesis). University of Twente.

Ding H. (2016). *Integrating value modelling into ArchiMate* (MSc thesis). University of Twente.

Febriani T.R. (2016) *Strategic planning using the reasoning tree-based approach* (MSc thesis). University of Twente.

Scrieciu M. *The infinity model – Achieving strategic alignment through mutual understanding* (Unpublished BSc thesis). University of Twente.

Kusumaningrum, M.C. *Digital business ecosystem modelling and analysis* (Unpublished MSc thesis). University of Twente.

Masyhur, L.H. *Analytics for Capability-based planning and Project Portfolio Management* (Unpublished MSc thesis). University of Twente.

Appendix B

Summary

The environment of organisations is changing more rapidly in the recent years, which makes it increasingly more difficult to stay competitive. Organisations need to ensure that when they make transformations, they focus on maintaining or improving the alignment between the competitive position of the organisation and their design of an appropriate strategy and structure, also known as strategic alignment. However, this pursuit for strategic alignment can prove very challenging for organisations, which, as seen from literature, can in many cases lead to issues with designing a suitable strategy and/or problems with implementing it successfully. The most common issues with strategic alignment, as identified from literature, are related to formulating appropriate strategies and implementing them within the organisation.

One very important question when discussing strategic alignment is why it is considered crucial for organisations to pursue it. A simple answer to this is, as identified from literature, that it helps improve business performance, in the form of increased sales revenues, improved operational efficiency, cost reductions, and enhanced customer value.

Throughout the years many models, methods, frameworks, etc. have been developed to help organisations improve strategic alignment. However, most of these proposed solutions share the same limitations such as, predominantly top-down solutions, lack of alignment evaluation and correction techniques, informal modelling support, and the most importantly, a strong emphasis on the Business and IT alignment, and not on strategic alignment as a whole. Furthermore, most of these solutions are not cross-domain, which is a strong limitation from the perspective of strategic alignment.

Therefore, in order to fill this research gap, we propose a strategic alignment method, named the Enterprise Strategic Alignment Method (ESAM), which incorporates cross-domain knowledge from Strategic Management (SM), Capability-based planning (CBP) and Enterprise Architecture (EA), and which facilitates cross-domain relationships. Furthermore, our proposed method incorporates

support for formulating strategies with the help of a flexible and objective process which includes linked strategy techniques. Moreover, the ESAM provides support for strategy implementation by including several capability-based techniques which can be used for communicating strategic intent within an organisation, and also can be used as intermediaries between strategy and execution. Additionally, the ESAM includes support for translating the strategic intent of an organisation into their EA by means of the ArchiMate modelling language, which can facilitate impact analyses, planning and monitoring of change, and the links between strategy techniques and EA. Finally, the method includes support for improving strategic alignment by focusing on communication, facilitating better partnerships, supporting improved governance, promoting an integrated architecture, and insuring an alignment between the different types of measurements an organisation can have.

We have validated and evaluated the method presented above with the help of three very distinct case studies, in terms of organisation type and scope of the case study. In the first case study, we focused on helping the Insurance organisation with translating their high-level strategic intent into more actionable information, which can be modelled and related to their EA. In the second case study, we focused on helping the Public university improve the alignment between their high-level strategic plans, and their Information strategy (called i-Strategy), their application landscape, and their Project Portfolio. Finally, in the third case study, we facilitated the Investment fund with formulating their strategy in three different instances, namely with elaborating their strategy, exploring a new business idea, and analysing the impact of a strategic decision.

By having such a diverse application of the ESAM, we can identify which aspects of our method can be used by all three types of organisations, and which can be considered more situational. As a result, within all three cases, capabilities have played a central part, while aspects such as strategy formulation, modelling with ArchiMate, and relationships to projects can be considered situational. Furthermore, based on a cross-case analysis we can conclude that the ESAM has had a positive influence on different aspects relating to Communication, which are identified in literature as very important enablers of strategic alignment.

Besides the ESAM, within our research, we have also designed further support for the method in the form of a software tool. This includes a management dashboard tool, named Strategy on a Page, with several custom templates, multiple computer-aided canvases, a spreadsheet-based strategy design tool. The software tool was demonstrated with the help of two case studies also used for the method validation, namely the Public university and Investment fund case studies.

Additionally, we have also developed two serious games which can also be used to support the ESAM and disseminate it. The scope of the first serious game is to allow players to experience the benefits of using interlinked strategy techniques for the strategy process, in an easy manner. The second game is

focused on helping participants explore, in a simulated world, how the introduction of digitalisation in the strategies and business models of organisations operating on the horticultural industry would affect themselves and their whole supply chain. While these two games can be considered fairly distinct based on how they use aspects of the ESAM, we consider both of them to be very useful ways to demonstrate different aspects of the method.

We consider that the main contribution of this dissertation is proposing a cross-domain method for strategic alignment which can assist organisations with formulating and implementing strategies, and with translating strategic intent into their EA. Furthermore, this method addresses several challenges, identified from both theory and practice, as issues experienced by organisations in their pursuit of strategic alignment. Moreover, this method is also supported by two practical applications, namely the software tool and the two serious games, which can be used by practitioners to design and analyse their strategies, and also to experiment with different strategy techniques and decisions in a safe environment without real-life consequences.

Appendix C

Samenvatting

De omgeving van organisaties verandert almaar sneller in de afgelopen jaren, waardoor het steeds moeilijker wordt om concurrerend te blijven. Organisaties moeten ervoor zorgen dat zij zich bij het doormaken van transformaties richten op het handhaven of verbeteren van de alignment tussen de concurrentiepositie van de organisatie en het ontwerp van een passende strategie en structuur, ook wel bekend als strategic alignment. Dit streven naar strategic alignment kan echter zeer uitdagend zijn voor organisaties wat, zoals blijkt uit de literatuur, in veel gevallen ertoe kan leiden dat ze falen in het ontwerpen van een passende strategie en/of het succesvol uitvoeren hiervan. De meest voorkomende problemen met strategic alignment, zoals geïdentificeerd in de literatuur, zijn gerelateerd aan het formuleren van passende strategieën en de uitvoering ervan binnen de organisatie.

Een zeer belangrijke vraag met betrekking tot strategic alignment is waarom het van cruciaal belang wordt geacht voor organisaties om het na te streven. Een eenvoudig antwoord hierop, zoals geïdentificeerd in de literatuur, is dat het helpt bij het verbeteren van de bedrijfsprestaties, in de vorm van verhoogde omzet, verbeterde operationele efficiency, kostenbesparingen, en een toename in klantwaarde.

Door de jaren heen zijn een groot aantal modellen, methoden, raamwerken, enz. ontwikkeld om organisaties te helpen met het verbeteren van de strategic alignment. Echter, de meeste van deze voorgestelde oplossingen delen dezelfde beperkingen, zoals voornamelijk top-down oplossingen, gebrek aan afstemming tussen evaluatie- en correctietechnieken, informele modellering-sondersteuning en belangrijker nog, een te sterke nadruk op de Business- en IT-alignment, in plaats van strategic alignment als geheel. Verder zijn de meeste van deze oplossingen niet domeinoverstijgend, wat een ernstige beperking is vanuit het gezichtspunt van strategic alignment.

Om deze leemte in het onderzoek op te vullen stellen we een strategic alignment methode voor, genaamd de Enterprise Strategic Alignment Method

(ESAM), die cross-domain kennis bevat van Strategic Management (SM), Capability-Based Planning (CBP) en Enterprise Architecture (EA), en die domeinoverstijgende relaties vergemakkelijkt. Bovendien omvat onze voorgestelde werkwijze ondersteuning voor het formuleren van strategieën met behulp van een flexibele en objectieve werkwijze, met onderling gekoppelde strategietechnieken. Ook ondersteunt ESAM de strategie-implementatie door het gebruik van verschillende capability-gebaseerde technieken die gebruikt kunnen worden voor het communiceren van strategische intenties binnen een organisatie, en kan het worden gebruikt als intermediair tussen strategie en uitvoering. Daarnaast bevat de ESAM ondersteuning voor het vertalen van de strategische intentie van een organisatie naar hun EA door middel van de ArchiMate modelleertaal, die impact-analyses, planning en monitoring van de verandering, en de verbanden tussen strategische technieken en EA kan faciliteren. Tot slot bevat de methode ondersteuning voor het verbeteren van de strategic alignment door te focussen op de communicatie, het faciliteren van een betere samenwerking, ondersteuning van beter bestuur, bevordering van een geïntegreerde architectuur, en het borgen van een afstemming tussen de verschillende soorten metingen die een organisatie kan hebben.

We hebben de hierboven beschreven methode gevalideerd en geevalueerd met de hulp van drie zeer verschillende casestudy's, qua type en omvang van organisatie. In de eerste casestudy hebben we ons gericht op het helpen van de "Insurance Organisation", door het vertalen van hun hoog-niveau strategische intentie naar meer bruikbare informatie, die kan worden gemodelleerd en worden verbonden met hun EA. In de tweede casestudy hebben we ons gericht op het helpen van de "Public University" met het verbeteren van de afstemming tussen hun hoog-niveau strategische plannen en hun informatiestrategie (de zogenaamde i-strategie), hun applicatielandschap, en hun projectportfolio. Tot slot hebben we in de derde casestudy voor het "Investment Fund" het formuleren van hun strategie op drie verschillende manieren vergemakkelijkt: met het uitwerken van hun strategie, het verkennen van een nieuw business-idee, en het analyseren van de impact van een strategische beslissing.

Door de diversiteit aan toepassingen van ESAM kunnen we identificeren welke aspecten van onze werkwijze door alle drie typen organisaties kunnen worden gebruikt, en welke als situationeel kunnen worden beschouwd. Het resultaat hiervan is dat in alle drie de cases capability's een centrale rol hebben gespeeld, terwijl aspecten zoals strategieformulering, modelleren met ArchiMate, en relaties tot projecten als situationeel kunnen worden beschouwd. Op basis van een case-overstijgende analyse kunnen we bovendien concluderen dat de ESAM een positieve invloed heeft op de verschillende aspecten met betrekking tot communicatie, welke in de literatuur als zeer belangrijk enablers van strategic alignment worden beschouwd.

Naast de ESAM hebben we binnen ons onderzoek ook verdere ondersteuning voor de werkwijze in de vorm van een software-tool ontworpen. Deze omvat een dashboard-tool, genaamd "Strategy on a Page", met een aantal aangepaste

sjablonen, meerdere computer-ondersteunde canvassen, en een spreadsheet-gebaseerde strategieontwerptool. De software-tool is gedemonstreerd tijdens twee casestudy's die tevens gebruikt zijn voor de validering van de methode, namelijk de "Public University" en "Investment Fund" casestudy's.

Daarnaast hebben we ook twee serious games ontwikkeld die kunnen worden gebruikt om de ESAM te ondersteunen en te verspreiden. Het doel van de eerste serious game is om de deelnemers op een makkelijke manier de voordelen te laten ervaren van het strategieproces en de daarbij behorende onderling verbonden strategische technieken. De tweede serious game is bedoeld om deelnemers in een gesimuleerde wereld te laten ervaren hoe de invoering van digitalisering in de strategieën en businessmodellen van organisaties, werkzaam in de tuinbouw, zichzelf en hun hele supply-chain kunnen beïnvloeden. Hoewel deze twee games tamelijk verschillend van elkaar zijn wat betreft de aspecten van de ESAM die ze gebruiken, beschouwen we beide als zeer nuttige manieren om verschillende aspecten van de werkwijze te demonstreren.

Als belangrijkste bijdrage van dit proefschrift beschouwen we het voorstel van een domeinoverstijgende methode voor strategic alignment, die organisaties kan helpen bij het formuleren en uitvoeren van strategieën, en met het vertalen van de strategische intentie naar hun EA. Bovendien adresseert deze methode een aantal uitdagingen, geïdentificeerd uit zowel theorie als praktijk, zoals de problemen die door organisaties worden ervaren in hun streven naar strategic alignment. Daarnaast wordt deze werkwijze ook ondersteund door twee praktische applicaties, een software-tool en de twee serious games, die kunnen worden gebruikt voor het ontwerpen en analyseren van hun strategieën, en om te experimenteren met andere strategische technieken en besluiten in een veilige omgeving zonder real-life gevolgen.

Appendix D

Results of the SLR per selection phase

In order to simplify the following tables we use several notations for the groups of keywords used to search the databases:

KW1: "business strategy" AND ("strategic planning process" OR "strategy planning" OR "strategy process");

KW2: ("strategy formulation" OR "strategy development") AND ("strategy implementation" OR "strategy execution");

KW3: "strategy model" OR "strategy technique" OR "management model";

KW4: "strategy" AND "enterprise architecture";

KW5: "strategy implementation" AND "enterprise architecture";

KW6: "strategy planning" AND "enterprise architecture";

KW7: "enterprise architecture" OR "enterprise architecture frameworks";

KW8: "capability based planning" OR "capability theory";

KW9: "strategic alignment" OR "business IT alignment";

KW10: "strategic alignment" AND "enterprise architecture";

KW11: ("strategic alignment" OR "business IT alignment") AND "capability".

Table D.1: Studies retrieved from databases

		Databases						
		ACM	IEEE	JSTOR	SD	Scopus	WoS	Total
Keywords	KW1	5	60	211	17	82	191	566
	KW2	0	19	54	222	85	239	619
	KW3	0	0	34	82	192	54	362
	KW4	13	1	11	13	37	99	174
	KW5	0	1	0	0	4	1	6
	KW6	0	1	0	0	5	3	9
	KW7	7	22	10	44	334	252	669
	KW8	0	26	23	31	109	27	216
	KW9	30	143	87	104	411	303	1078
	KW10	1	5	2	3	0	27	38
	KW11	7	7	52	13	82	66	227
Total		63	284	484	529	1341	1262	3964

Table D.2: First elimination of studies retrieved from databases

		Databases						
		ACM	IEEE	JSTOR	SD	Scopus	WoS	Total
Keywords	KW1	0	2	19	4	5	16	46
	KW2	0	2	5	37	20	34	98
	KW3	0	0	2	9	21	4	36
	KW4	5	0	0	1	11	30	47
	KW5	0	0	0	0	2	0	2
	KW6	0	0	0	0	1	0	1
	KW7	4	3	0	12	37	16	72
	KW8	0	5	5	8	22	4	44
	KW9	3	36	12	31	43	52	177
	KW10	0	0	0	2	0	14	16
	KW11	0	0	0	0	20	19	39
Total		12	48	43	104	182	189	578

Table D.3: Final selection of studies retrieved from databases

		Studies		
		Found	Candidate	Selected
Keywords	KW1	566	46	10
	KW2	619	98	19
	KW3	362	36	9
	KW4	174	47	5
	KW5	6	2	0
	KW6	9	1	0
	KW7	669	72	14
	KW8	216	44	9
	KW9	1078	177	13
	KW10	38	16	1
	KW11	227	39	3
Total		3964	578	82

Appendix E

Strategic alignment survey

Thank you for participating in the Strategic Alignment Survey. This survey is intended to get a better understanding of the difficulties faced by organisations while developing and implementing a strategy. It will take approximately **15 minutes** to complete this survey.

Organisations develop and implement strategies to achieve (strategic) goals. The development of a strategy is about formulating what should be changed to evolve from the current situation to the desired future state. Implementation is about translating the strategic plans into clear actions to execute the strategy. **Strategic alignment** is the ability to create a fit or synergy between the position of the organisation within the environment (**business**) and the design of the appropriate resources and capabilities (**IT**) to support the execution. We would like to know your personal opinion regarding your organisation's strategic alignment efforts.

The responses on this survey are anonymous and your response will only be used in combination with other responses. The collection, storage and usage of responses are done while keeping your privacy in mind.

Instructions for completing the survey

The survey consists of four parts:

- General questions about you and your organisation;
- Questions about your organisation's strategic alignment efforts;
- Specific questions about your organisation's experiences regarding strategic alignment;
- And, questions about the role of return and risk in your organisation's strategic decision making process.

Please select "**Submit**" at the end of the survey to make sure that your answers will be sent.

Part I – General questions about you and your organisation

1.1. What is your function within your organisation?

- ☐ CEO/COO
- ☐ Managing Director/General Manager
- ☐ CTO/CIO/CSO/CFO
- ☐ VP
- ☐ Accounting, Finance & Procurement
- ☐ Consultancy
- ☐ Administration
- ☐ Human Resources
- ☐ Information Technology
- ☐ Legal
- ☐ Research & Development
- ☐ Sales & Marketing
- ☐ Strategy
- ☐ Other, please specify:

1.2. How large is your organisation?

- ☐ < 50 employees
- ☐ 50–100 employees
- ☐ 101–200 employees
- ☐ 201–300 employees
- ☐ 301–400 employees
- ☐ 401–500 employees
- ☐ > 500 employees

1.3. In which industry is your organisation active? (Please select the category that best represents your industry)

- ☐ Agriculture, forestry and fishing
- ☐ Mining and quarrying
- ☐ Manufacturing
- ☐ Electricity, gas, steam air conditioning supply
- ☐ Water supply; sewerage, waste management and re-mediation activities
- ☐ Construction
- ☐ Wholesale and retail trade
- ☐ Transportation and storage
- ☐ Accommodation and food service activities
- ☐ Information and communication
- ☐ Financial and insurance activities
- ☐ Real estate activities
- ☐ Professional, scientific and technical activities
- ☐ Administrative and support service activities
- ☐ Public administration and defence; compulsory social security

- ☐ Education
- ☐ Human health and social work activities
- ☐ Arts, entertainment and recreation
- ☐ Other service activities
- ☐ Activities of households as employers
- ☐ Activities of extraterritorial organisations and bodies
- ☐ Other, please specify:

1.4. What is your age?

- ☐ < 20
- ☐ 20–30
- ☐ 31–40
- ☐ 40–50
- ☐ 51–60
- ☐ > 60

Part II – Questions about your organisation's strategic alignment efforts

2.1. Are you involved during the development of your organisation's strategies?

- ☐ never ☐ sometimes ☐ most of the times ☐ always

2.2. Are you involved in the implementation of strategies (moving from strategic plan to execution)?

- ☐ never ☐ sometimes ☐ most of the times ☐ always

2.3. Do you use strategy techniques or methods to support the development and implementation of strategies?

- ☐ never ☐ sometimes ☐ most of the times ☐ always

If the answer is "never" go to question 2.5.

2.4. Which of the following techniques or methods are used during the development and implementation of strategies? (Multiple answers possible)

- ☐ ArchiMate
- ☐ Balanced scorecard
- ☐ Blue Ocean Strategy
- ☐ Boston Consulting Group (BCG) matrix
- ☐ Business case
- ☐ Business Model Canvas
- ☐ Confrontation matrix
- ☐ Critical success factors
- ☐ Dynamic capabilities
- ☐ Marketing mix
- ☐ McKinsey 7-S
- ☐ PEST analysis

- ☐ Porter's Five Forces analysis
- ☐ Porter's Value Chain
- ☐ Resource Based View
- ☐ Strategy map
- ☐ SWOT analysis
- ☐ The Strategy canvas
- ☐ TOWS matrix
- ☐ Quantitative planning matrix
- ☐ Other, please specify:

The following questions will be in the form of statements on which your opinion is asked regarding your organisation's experiences (select one of the given answers)

2.5. The strategies of your organisation are developed without any problems.

- ☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

2.6. The strategies of your organisation are implemented without any problems.

- ☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

2.7. The developed strategy fails to be implemented successfully.

- ☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

2.8. Strategy development and strategy implementation are seen as one process.

- ☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

2.9. During strategy development the entire organisation is involved.

- ☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

2.10. During strategy implementation the entire organisation is involved.

- ☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

2.11. During strategy development the supporting resources of the organisation are taken into consideration.

- ☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

2.12. During strategy development the supporting capabilities of the organisation are taken into consideration.

- ☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

2.13. During strategy implementation actions are defined according to strategic plans.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

2.14. An average formulated strategy with great execution is preferred.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

Part III—Specific questions regarding strategic alignment

Please give your personal opinion regarding your organisation's strategic alignment efforts.

3.1. Culture and shared beliefs

Culture and shared beliefs concern the fit between the organisation's culture and the strategy. Most of all, it is about the mind-set within the organisation regarding strategic alignment.

3.1.1. There is an overall strategic goal(s).

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.1.2. The organisation works towards reaching the strategic goal(s).

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.1.3. There is collaboration within the organisation to reach the strategic goal(s).

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.1.4. There are no conflicting priorities regarding reaching strategic goal(s) within the organisation.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.1.5. Individual contribution to strategy development is recognized.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.1.6. Individual contribution to strategy implementation is recognized.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.1.7. Within the organisation there is willingness to change.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.1.8. Strategic change is coordinated by management throughout the organisation.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.2. Organisational capabilities

Organisational capabilities refer to the importance of the fit between the organisation and the strategy. Among others, it considers how the organisation

manages strategy development and implementation.

3.2.1. The strategy is in line with the organisation's core capabilities.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.2.2. Long-term strategic goals are successfully translated into short-term objectives.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.2.3. Strategic objectives are sufficiently translated into clear actions.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.2.4. The strategy is supported by the existing information systems.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.2.5. The progress of strategy development and implementation is monitored.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.2.6. The impact of the strategy on the performance is measured.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.2.7. Strategic plans are refined and adapted during implementation.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.2.8. Management is involved in strategy implementation.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.2.9. Managers make high quality decisions related to strategic plans.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.2.10. Management takes enough time to make well-considered strategic decisions.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.2.11. The organisation has employees with the right competencies for reaching strategic goal(s).

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.2.12. Management is able to motivate their strategic choices.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.3. Communication

Communication is about the importance of clear defined purposes, values and behaviours to guide the implementation process. Communication is about cre-

ating understanding throughout the organisation about the strategy.

3.3.1. There is a formalised strategy (defined and official).

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.3.2. The entire organisation understands the strategy.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.3.3. The impact of the strategy on the employees is widely known.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.3.4. Individual responsibilities for reaching the strategic goal(s) are known.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.3.5. Employees have a clear understanding of the actions expected from them.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.3.6. There is frequent communication of the strategy within the organisation.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.3.7. Management provides sufficient information about strategic plans.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.3.8. Strategic plans are communicated in time to the employees by management.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.3.9. Management provides accurate information about strategic plans.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

3.3.10. Employees can easily access information about strategic plans.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

Part IV - Strategic decision making: expected return and risk of strategic alternatives

During strategic decision making a choice needs to be made about which strategy to pursue. Strategic alternatives can be assessed based on their expected return and risk. The financial benefits and possible risks from a strategy might influence the decision.

4.1. Do you evaluate the expected return of strategies when making strategic decisions?

☐ never ☐ sometimes ☐ most of the times ☐ always

If the answer is "never" go to question 4.3.

4.2. Which of the following methods are used for evaluating the return of strategic alternatives? (Multiple answers are possible)

- ☐ Accounting Rate of Return (ARR)/Return on Investment (ROI)
- ☐ Discounted payback period
- ☐ Earnings per share (EPS)
- ☐ Economic Value Added (EVA)
- ☐ Equivalent annuity
- ☐ Gross margin/operating margin/net profit margin
- ☐ Internal Rate of Return (IRR)
- ☐ Modified internal rate of return
- ☐ Net Present Value (NPV)
- ☐ Profitability index/benefit-cost ratio
- ☐ Return on assets (ROA)
- ☐ Return on equity (ROE)
- ☐ Other, please specify:

4.3. Do you evaluate the associated risk of strategies when making strategic decisions?

☐ never ☐ sometimes ☐ most of the times ☐ always

If the answer is "never" go to question 4.5.

4.4. Which of the following methods are used for evaluating the risk of strategic alternatives? (Multiple answers are possible)

- ☐ Adjusting discount rate
- ☐ Adjusting forecasted cash flows
- ☐ Beta analysis
- ☐ Certainty equivalents
- ☐ Fuzzy sets
- ☐ Monte-Carlo simulation
- ☐ Probability analysis: decision-trees
- ☐ Real options valuation
- ☐ Scenario analysis
- ☐ Sensitivity analysis
- ☐ Other, please specify:

The following questions will be in the form of statements (select one of the given answers)

4.5. Risk is evaluated when making strategic plans.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

4.6. Risks are sufficiently taken into consideration when making strategic decisions.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

4.7. New and emerging risks are sufficiently taken into account by the management team.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

4.8. Return is sufficiently taken into consideration when developing a strategy.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

4.9. Risk is sufficiently taken into consideration when developing a strategy.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

4.10. Strategic alternatives are compared sufficiently based on their financial return.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

4.11. Strategic alternatives are compared sufficiently based on their associated risk.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree ☐ n/a

Appendix F

The influencers of strategic alignment

Table F1: The enablers of strategic alignment, as mentioned in literature, mapped to the SAMM of Luftman & Kempaiah (2007)

No.	Authors	Enablers of alignment	Categories (Luftman & Kempaiah, 2007)
1	Preston & Karahanna (2009)	Shared language	Communication
		Shared understanding	Communication
		Shared domain knowledge	Communication
2	R. V. Bradley et al. (2012)	EA maturity	Architecture
3	Kearns & Sabherwal (2006)	Management knowledge of IT	Communication
		Business managers' participation in IT planning	Partnership
		IT managers' participation in business planning	Partnership
		Shared domain knowledge	Communication
4	Segars & Grover (1998)	Planning success	Measurements
5	Chan et al. (2006)	Shared domain knowledge	Communication
		Prior IS success	Measurements
		Planning sophistication	Governance
		Organisational size	–

Continued on the next page

No.	Authors	Enablers of alignment	Categories (Luftman & Kempaiah, 2007)
		Environmental uncertainty	–
6	Reich & Benbasat (2000)	Shared domain knowledge	Communication
		Communication	Communication
		IT implementation success	Measurements
		Connection between Business and IT planning	–
7	Charoensuk et al. (2014)	Communication	Communication
		Shared domain knowledge	Communication
		IT success	Measurements
		Planning/IT management sophistication	Governance
8	A. M. Johnson & Lederer (2010)	Mutual understanding about the role of IT	Partnership
9	Kearns & Lederer (2000)	Alignment of the IS and Business plans	Governance
		Participation in planning	Partnership
10	Sabherwal & Kirs (1994)	IT management sophistication	Governance
		Organisational integration	–
		Environmental uncertainty	–
11	Hussin et al. (2002)	IT management sophistication	Governance
12	Chung et al. (2003)	IT infrastructure flexibility	Architecture
13	Feeny et al. (1992)	Communication	Communication
		Relationship between CEO/CIO	Partnership
14	Teo & Ang (1999)	Top management commitment to use IT	Partnership
		IS management is knowledgeable about business	Communication
		Top management has confidence in IS department	Partnership
		IS provides efficient services	Measurements
		Frequent communication between IT and others	Communication
15	Kashanchi & Toland (2008)	Communication	Communication
		Knowledge sharing	Communication
16	Bassellier & Blaize Horner Reich (2001)	Business managers' knowledge	Communication

Continued on the next page

No.	Authors	Enablers of alignment	Categories (Luftman & Kempaiah, 2007)
		Business managers' skills	Skills
17	Jorfi & Jorfi (2011)	IT flexibility	Architecture
		IT capability	Architecture
		Communication effectiveness	Communication
18	Van Der Zee & De Jong (1999)	Communication management language	Communication
19	De Haes & Van Grembergen (2009)	IT governance	Governance
20	Hu & Huang (2006)	Relationship management	Partnership
21	Huang & Hu (2007)	CEO championship of alignment	Partnership
		Top management support of IT	Partnership
		Communication	Communication
		Integration with personnel/department evaluation	Measurements
22	Rakgoale & Mentz (2015)	Enterprise Architecture	Architecture
23	Wagner & Meshtaf (2016)	IT architect knowledge of business and strategy	Communication
		IT architect involvement in business process design	Partnership
		Communication	Communication
24	Hosseinbeig et al. (2011)	IT governance	Governance
25	Burn & Szeto (2000)	Business strategy	Governance

Figure F.1: The influencers of strategic alignment, as identified by Kusumaningrum (2016)

Table F2: The inhibitors of strategic alignment, as identified by Roelfsema (2014)

Variables constraining strategic alignment	Authors								Total score
	Hrebiniak (2006)	Alexander (1985)	Corboy & Corbui (2007)	Beer & Eisenstat (2000)	Steiner (1979)	LoRe (2012)	Thompson & Martin (2010)	Ali & Hadi (2012)	
Management does not get involved in execution	2	0	2	1	2	1	0	2	10
Development is seen as separate from execution	2	0	2	0	2	0	0	0	6
Failure translating long-term strategic goal(s) into short-term objectives or actions	1	2	2	0	2	2	0	2	11
No fit between strategy and organisational structure (resources and capabilities)	1	0	0	0	0	0	0	2	3
Management involves too little people	2	0	2	0	2	2	0	0	8
Inadequate management	2	1	0	2	0	0	2	2	9
Management does not clarify strategic decisions	2	0	1	1	1	2	2	2	11
Poor or vague strategy	2	0	2	2	0	2	2	2	12
conflicting priorities	0	2	0	2	2	0	2	0	8
Poor or inadequate communication	2	2	1	2	0	2	0	2	11
No understanding strategic plans	2	0	2	0	0	0	0	2	6
Unclear responsibility and accountability	2	2	2	0	0	0	0	0	6
The implications of strategy are not clear	1	0	0	0	0	0	0	0	1
Reluctance to change/resistance to strategic plans	2	2	2	0	2	0	2	2	12
Ineffective coordination within organisation	1	2	0	2	0	1	2	2	10
Competencies of employees are not sufficient	1	2	0	0	0	0	0	2	5
Monitoring and measuring strategic change is not adequate	1	2	2	0	2	0	2	2	11
Strategy is not supported by systems and processes	1	2	0	0	0	0	0	2	5
There is no understanding that a strategy requires resources	0	0	0	0	0	0	0	2	2
The contribution of each person is not recognised	0	0	0	0	0	0	0	0	0
Not all the activities/actions support strategy	1	0	0	0	0	1	0	0	2
Strategic plans are rigid	0	0	2	0	2	0	0	0	4
There is no collaboration to reach strategic goals	0	0	0	0	2	2	0	2	6

Table F.3: The enablers of strategic alignment, as identified by Roelfsema (2014)

Variables enabling strategic alignment	Authors						Total score
	Dobni (2003)	Li et al. (2010)	Higgins (2005)	Luftman (2004)	Vagadia (2013)	Neilson et al. (2008)	
Management is involved in execution	0	2	0	2	2	2	8
Development and implementation are seen as one process	0	1	0	2	1	0	4
Strategic plans are translated into long-term plans and short-term goals	0	1	0	0	2	0	3
Fit between strategy and organisational structure	2	2	2	2	1	0	9
All employees are engaged in the strategy process	1	0	0	0	2	0	3
Adequate management style	1	2	2	2	2	0	9
Management is able to motivate decisions	0	1	0	0	1	2	4
Clear defined strategy and strategic objectives	0	2	2	2	2	2	10
No conflicting priorities	0	2	0	2	2	0	6
Good (continuous) communication	2	2	0	2	2	2	10
There is understanding about the strategy	0	1	0	3	2	0	5
Clear defined responsibilities	0	2	0	0	2	2	6
Clear defined implications for strategy	0	2	0	0	2	2	6
An aligned culture, readiness for change	2	2	2	2	2	2	12
Effective coordination of strategy within the organisation	0	1	0	0	1	0	2
Employees have the right competencies	2	0	2	0	0	0	4
Monitoring and measuring the strategic process	0	1	2	2	0	2	7
Systems and processes support strategy	0	2	2	0	0	0	4
Understanding that a strategy requires resources	0	0	2	2	2	0	6
Understand the contribution of each person	2	1	0	0	2	2	7
All activities/actions support strategy	2	0	0	2	0	0	4
Plans are refined and adapted during implementation	0	0	0	0	0	0	0
There is collaboration to reach strategic goals	1	2	1	2	0	0	6

Appendix G

Strategy techniques used in the ESAM

Table G.1: Overview of the strategy techniques included in the ESAM

Model	Objective	Concepts	Input	Output
Marketing Mix Perreault et al. (2014)	Change the variables that an organization uses to satisfy the target market and to achieve its objectives	Product, Price, Promotion, Place (4P); People, Process, Physical environment (7P); Packaging or Profit (8P)	Target market and how and what the organization intends to offer to the target market	Unique selling point of a tangible or intangible Product tailored for its Target market
BMC Osterwalder & Pigneur (2010)	Develop a new business model or document and refine an existing one	Key partners, Key activities, Key resources, Value proposition, Customer relationships, Channels, Customer segments, Cost structure, Revenue streams	How a business is generating value or how it intends to generate value	Overview of the nine building blocks that can help an organization create, deliver and capture value

Continued on the next page

Model	Objective	Concepts	Input	Output
BoS Kim & Mauborgne (2005)	Help organizations to generate more value by creating new demand in an uncontested market	Blue Ocean, Red Ocean, Value Innovation, Strategy Canvas, Four Actions Framework, Eliminate-Raise-Reduce>Create grid, Six Paths Framework	Information about competitors, industry, alternative industries, buyers	New value curve that creates value for both customer and organization by pursuing both value and low cost
RBV Barney (1991)	Identify the resources that can help an organization to gain competitive advantage	Resources: Human, Physical, Organisational, and Financial; Criteria: Valuable, Rare, Inimitable, Non-substitutable (VRIN)	Information about the resource base of the organisation	Key resources (VRIN) that an organisation can use to gain competitive advantage
Dynamic Capabilities Teece & Pisano (1994)	Complement the RBV; Determine the ability of an organisation to maintain competitive advantage by looking at their capabilities	Capabilities: Sense and shape opportunities and threats, Seize opportunities, Maintain competitiveness through enhancing, combining, protecting, and reconfiguring tangible and intangible resources	The capability map and business model of the organisation, especially key activities	Analysis of an organisation's capability to integrate, build and reconfigure its capabilities in order to achieve sustained competitive advantage
PEST analysis Developed in practice	Detect potential opportunities and threats from the macro-environment of an organisation	Political, Economic, Socio-cultural, Technological; Ethical, Legal, Environmental, Demographic	Information about the macro-environment of the organisation	Analysis of the opportunities and threats from the macro-environment of an organisation
FFF Porter (1980)	Analyse all the competitive forces from an organisation's industry	Bargaining power of suppliers, Bargaining power of customers, Threat of new entrants, Threat of substitute products/services, Competitive rivalry in industry	Information about the competition within the industry of an organisation	Analysis of the most important five forces from the industry that can have an impact on an organisation

Continued on the next page

Model	Objective	Concepts	Input	Output
SWOT analysis Humphrey (1960's)	Evaluation of the internal and external factors that can influence an organisation	Strength, Weakness, Opportunity, Threat	Internal and external environment of an organisation	Analysis of the most influential factors from the internal and external environments
TOWS Wehrich (1982)	Matching internal and external factors that influence an organisation in order to build alternative strategies	SO strategy (maxi-maxi), WO strategy (mini-maxi), ST strategy (maxi-mini), WT strategy (mini-mini)	Internal (Strengths and Weaknesses) and external (Opportunities and Threats) factors	Alternative strategies that an organisation can choose to pursue in order to achieve their vision
QSPM David (1986)	Choose between alternative strategies that are built upon internal and external factors from an organisation's environment	Key factor statements, Alternative strategies, Weights, Attractiveness score, Total attractiveness score, Sum total attractiveness score	Internal and external factors, and the alternative strategies that can be chosen	Differentiation between the alternative strategies based on their attractiveness score
Scenario planning Schoemaker (1995)	Analyse the range of possibilities that can help organisations prepare and deal with uncertain external environments	Define the scope; Identify major stakeholders; Identify basic trends; Identify key uncertainties; Construct initial scenario themes; Check for consistency and plausibility; Develop learning scenarios; Identify research needs; Develop quantitative models; Evolve toward decision scenarios	Information from the external environment, more specifically from the macro-environment and industry	A set of alternative scenarios which depict the relevant combinations of changes that can occur in the next few years in the macro-environment and industry of an organisation

Appendix H

The TOGAF standard

The core of the TOGAF standard is represented by the Architecture Development Method (ADM) which recommends a sequence of various phases and steps to developing an EA. The ADM is intended as an iterative method, over the whole process, between phases, and within phases (The Open Group, 2011). The structure of ADM is cyclical and contains a preliminary phase, eight main phases (Phase A – Architecture Vision; Phase B – Business Architecture; Phase C – Information Systems Architecture; Phase D – Technology Architecture; Phase E – Opportunities and Solutions; Phase F – Migration Planning; Phase G – Implementation Governance; Phase H – Architecture Change Management) and the requirements management process. – **Preliminary Phase:** used to specify which architecture framework will be used, to define the principles that will be used, and determine the architecture capability;

- **Phase A – Architecture Vision:** development of the high level vision on the capabilities and business value to be delivered as a result of the proposed EA;

- **Phase B – Business Architecture:** development of the target business architecture that describes how the business needs to operate in order to achieve business goals, and respond to the strategic drivers identified in phase A;

- **Phase C – Information Systems Architectures:** development of the target IS (data and application) architecture which describes how it will support the business architecture and the architecture vision;

- **Phase D – Technology Architecture:** development of the target technology architecture that enables the logical and physical application and data components, and the architecture vision;

- **Phase E – Opportunities and Solutions:** development of the complete architecture roadmap based on a gap analysis and components from phases B, C, D;

- **Phase F – Migration Planning:** finalisation of the architecture and creation of an implementation and migration plan in co-operation with portfolio

and project managers;

- **Phase G – Implementation Governance:** governance of the implementation and creation of a link between the architecture and operations; the result of this phase should be the actual implementation of organisational change;

- **Phase H – Architecture Change Management:** management of the architectural life-cycle and of the alignment between the architectural capabilities and requirements;

- **Requirements Management:** management of architectural requirements during the ADM cycle; the central position of requirements management symbolises that the ADM is continuously driven by the requirements management process.

The other two main components of the TOGAF standard are the Enterprise Continuum and the Resource Base, which have a connection to the ADM. The Enterprise Continuum provides a framework and context that can aid a user to leverage key architecture resources when executing the ADM. The Resource Base contains the resources that support the ADM, such as guidelines, templates, check-lists, etc. Figure H.1 illustrates the components of the TOGAF standard.

Figure H.1: The components of the TOGAF standard

Appendix I

The ArchiMate language

The core language distinguishes between three layers: the business layer, the application layer, and the technology layer. Each of these layers contains structural, behavioural and informational aspects, and also defines relationships between and within the layers. The correspondence between the ArchiMate standard and the TOGAF standard, as suggested by The Open Group (2011), can be seen in Figure I.1

Figure I.1: The correspondence between the TOGAF ADM and the ArchiMate standards, according to The Open Group (2011)

The ArchiMate language also contains a set of relationships that can be used to relate the different types of concepts. These relationships are grouped into

three categories: structural, dynamic, and other relationships. Table I.1 gives an overview of the ArchiMate relationships with their definitions, presented in order of their strength, according to the The Open Group (2013).

Over the years, two extensions of the language have been added: the Motivation extension, and the Implementation and Migration extension. These extensions have been developed in an attempt to improve the alignment to complementary domains such as business strategy and project management.

The role of the motivation extension is to allow for the modelling of motivations or reasons that underlie the design or change of some EA (The Open Group, 2013). For this reason, the motivation extension is the main focus of this paper (Figure I.2). Within this extension the following concepts are defined (The Open Group, 2013):

- **Stakeholder** describes a person or a team that has interests or concerns regarding the outcome of the architecture;
- **Driver** represents an internal or external force that triggers and motivates change in an organisation;
- **Assessment** is used to describe the outcome of a specific analysis on a driver;
- **Goal** is used to describe an intended result that a stakeholder wants to achieve;
- **Requirement** is used to describe what is needed to be able to achieve a specific goal;
- **Constraint** represents restrictions to the way a goal can be achieved;
- **Principle** is used to design the means to realize a goal.

Figure I.2: ArchiMate standard Motivation extension metamodel, according to The Open Group (2013)

The implementation and migration extension describes concepts that sup-

Table I.1: Overview of the ArchiMate standard relationships (The Open Group, 2013)

Structural Relationships		Notation
Association	Association models a relationship between objects that is not covered by another, more specific relationship.
Access	The access relationship models the access of behavioral concepts to business or data objects.
Used by	The used by relationship models the use of services by processes, functions, or interactions and the access to interfaces by roles, components, or collaborations.
Realization	The realization relationship links a logical entity with a more concrete entity that realizes it.
Assignment	The assignment relationship links units of behavior with active elements (e.g., roles, components) that perform them, or roles with actors that fulfill them.
Aggregation	The aggregation relationship indicates that an object groups a number of other objects.
Composition	The composition relationship indicates that an object is composed of one or more other objects.
Dynamic Relationships		Notation
Flow	The flow relationship describes the exchange or transfer of, for example, information or value between processes, function, interactions, and events.
Triggering	The triggering relationship describes the temporal or causal relationships between processes, functions, interactions, and events.
Other Relationships		Notation
Grouping	The grouping relationship indicates that objects, of the same type or different types, belong together based on some common characteristic.
Junction	A junction is used to connect relationships of the same type.
Specialization	The specialization relationship indicates that an object is a specialization of another object.

port the modelling of the architectural change process and provides insight into these changes and into portfolio and project management decisions (Figure I.3). The extension introduces the following concepts (The Open Group, 2013):

- **Work package** is the central behavioural concept which defines a series of actions designed to accomplish a goal within a specific time. It can be used to model projects, sub-projects, programs, or project portfolios;
- **Deliverable** is used to model the precise outcome of a work package;
- **Plateau** is used to model the state of the architecture that exists for a limited period in time. Can be used to model baseline, transitional, and target architectures;
- **Gap** is used to model the differences between two plateaus.

Figure I.3: ArchiMate standard Implementation and Migration extension meta-model, according to The Open Group (2013)

Appendix J

Capability-based planning method

Figure J.1 illustrates the main activities of the CBP method we propose together with the expected outcomes from each of them.

Figure J.1: The activities of the CBP method with the expected outcomes

The four main activities that we propose in our CBP method can be further specified into sub-activities, as follows:

Map:

- Identify, describe, and relate the capabilities of the organisation. This may be done at different levels of aggregation/decomposition (capability map)
- Link capabilities to their motivation (strategic goals) and their implemen-

tation (resources, competences, information, processes, etc. as represented by EA models)

Assess:

- Identify relevant metrics/Key Performance Indicator (KPI)s (derived from strategic objectives) and score these metrics (e.g.: in terms of properties of the EA to which the capability is linked)
- Identify under/over-performing capabilities and missing capabilities (capability gap) based on performance targets derived from the strategy

Plan:

- Identify alternative scenarios for planning and implementation of the capabilities that require a change in performance
- Plan increments over time and allocate resources. This requires collaboration with SM (sponsor, decision maker), PPM (focus on definition of projects, portfolios, resources), and EA (focus on design, road-mapping, migration planning, feasibility)

Control:

- Monitor and control the planning of the capability development. Similar to the planning of capability increments, this activity also requires close collaboration with SM, EA, and PPM.
- Identify the performance levels of implemented capabilities and compare to the expected level required to meet the desired outcome. If differences are observed between planned levels and realised levels, adjustments can be recommended.

J.0.1 Mapping capabilities

One of the first steps of CBP is determining the capability map, which contains all the business capabilities of an organisation. The planning of the business improvements should be defined based on this capability map. This capability map can also be used as a basis for assessing the internal environment of an organisation.

Identifying capabilities

Typically, any ability of an organisation can be considered a capability. We define a capability as the ability of an organisation to employ resources to achieve some goal (Iacob, Quartel, & Jonkers, 2012). However these capabilities should be defined in a consistent manner. The following guidelines are proposed for defining capabilities, in the context of CBP.

- **Should be defined by using a language that is understandable by all relevant stakeholders.** One of the main benefits of using CBP as a link between Business and IT is that it provides a common language that all stakeholders can understand (Gils & van Dijk, 2014). In order to achieve this, capabilities should be expressed using general and high-level terms (The Open Group, 2011). This

will ensure that both business leaders and enterprise architects can understand what a capability means in terms of their business. Moreover, just because a capability is supported by technology it does not mean that the capability should be defined using technical terms (Ulrich & Rosen, 2011).

- **Should express what the organisation is able to do, not how it does it.** According to the The Open Group (2011), a capability is the ability that an organisation, person, or system possesses. Therefore it focuses on what an organisation is able to do and abstracts from how the capability is actually achieved (Gils & van Dijk, 2014). By defining a capability in this way, it can help to avoid the confusion between a capability and a value stream or process. By following this logic, a capability can be defined by using nouns, not verbs (Ulrich & Rosen, 2011). For example, the capability of Customer management uses two nouns, whereas the process that would support it could be called Manage customer, which uses a verb and a noun.

- **Should not be redundant.** A specific capability should appear only one time on a capability map, regardless of how many processes, applications, etc. realise it (Ulrich & Rosen, 2011). This can be considered as a consequence of the fact that capabilities should be defined independently of how they are realised. For example, the Product sales capability appears only once on a capability map, even though there are multiple processes, applications, etc. that help realise it.

- **Should be measurable.** Capabilities can be used to guide investment decisions, based on the business outcome(s) they help achieve. Therefore, if the value that is expected to be delivered by improving a capability is not objectively identified, an organisation might make investments that might not yield the expected returns. Therefore capabilities should be defined using the Specific, Measurable, Achievable, Relevant, Time-bound (SMART) guidelines in order to avoid ambiguity (The Open Group, 2011).

- **Can be defined vertically or horizontally.** Capabilities can be defined down any lines that an organisation wishes to improve, such as process, function, organisational, etc. Therefore capabilities can become lines of optimisation for an organisation. For example, an organisation that defines capabilities along the lines of processes will optimise their process performance. An organisation that defines capabilities down functional lines will be optimised based on business functions (The Open Group, 2011). Consequently it is advised for organisations, depending on their preference and situation, to choose vertical or horizontal optimisation and define their capabilities accordingly.

- **Can be decomposed into sub-capabilities.** It is usual that high-level capabilities are decomposed into more detailed capabilities. This decomposition of capabilities is particularly useful when making a capability map. For the purpose of a high-level planning and analysis, a capability map can contain the main capabilities (level 1) and another two levels of decomposition (level 2 and 3) of these capabilities (Ulrich & Rosen, 2011). It is important to keep the same level of detail for all the capabilities within the same level. For

example, the capability "Customer management", which is a main capability, should have on the same level capabilities such as "Product management" and "Financial management", and not "Customer data management" and "Financial reporting", which are sub-capabilities and describe a different level of detail.

The first step of constructing a capability map is defining the level 1 capabilities. Ulrich & Rosen (2011) propose the following level 1 capabilities, which they consider common for organisations: customer or equivalent external stakeholder management; product or service management; account, policy, contract, or similar management; additional external stakeholder relations management; investments, marketing, and other SM; industry-specific categories, such as claims, routing, or money management; support capabilities, including accounting, HR, IT, and legal management. These capabilities can be used as an initial blueprint for the capability map. They will however need further refinement in order to fit the particular situation of the organisation.

The level 1 capabilities can be further detailed into more specific level 2, 3, 4, etc. capabilities. Ulrich & Rosen (2011) recommend that an organisation should not go further than level 3 capabilities in order to not confuse them with business processes or functions. Furthermore, capabilities can also be stratified, based on the specific purpose they serve.

Linking capabilities to their motivation and implementation

As mentioned before, CBP focuses on the planning, engineering, and delivery of strategic business capabilities to the enterprise (The Open Group, 2011). There are two main aspects to this statement. First of all, it is stated that CBP deals only with the strategic business capabilities of an organization. What is meant by this is that there should be an emphasis on those capabilities that provide strategic value. This can be done by identifying which capabilities of an organisation contribute to realizing a specific strategy. Therefore linking capabilities to their motivation takes place in the later phases of the strategy process, after the strategic objectives, KPIs, targets and initiatives have been determined in the strategy elaboration phase. This strategic guidance is needed to begin CBP (TTCP, 2005).

The Strategy Map can be used as a valuable input for linking capabilities to motivation. It can be used as guidance to determine which capabilities are needed in order to realise each of these objectives which contribute to the realisation of the overall strategy. The first two perspectives of the Strategy map typically contain high-level objectives related to satisfying highest needs of the organisation in terms of financial stability or growth, and customer satisfaction. These two levels of the strategy map can be related to the level 1 and/or level 2 capabilities of the organisation which are on a relatively equal abstraction level to these objectives. The level 3 capabilities of the organisation can be related to the internal perspective, and the learning and growth perspective of the objectives from the Strategy map. These objectives are more specific to the internal

aspects of the organisation and closer to processes and resource development.

The final step of linking capabilities to their motivation is creating an excerpt of the total capability map of the organisation. This fragment of the capability map contains only those capabilities that will contribute to realising the specific objectives which are part of the chosen strategy. These capabilities can also be referred to as strategic capabilities.

Second of all, the initial statement about CBP prescribes what CBP should do, namely the planning engineering and delivery of these capabilities, or to put it differently the entire process of obtaining them. It can be further explained as a planning discipline, in which enterprise change is defined, sequenced, coordinated and managed in terms of capability increments, thus it has the power to affect and complement EA. This comes in addition to projects and deliverables within the frame of EA and can therefore support PPM as well. In other words, capabilities can be used as a higher level abstraction of EA, where elements of the architecture realise business capabilities. PPM can help manage those projects that implement enterprise transformation in steps and therefore the realisation of the respective capability increments (Papazoglou, 2014).

J.0.2 Assessing capabilities

While the capability map containing strategic capabilities is very useful, it does not contain any information regarding the performance of these capabilities. It is therefore necessary for CBP to define performance in a measurable way, so that capability developments can be defined objectively. Besides having an objective look at the outcomes of improving a capability, defining metrics can help with assessing the current and desired performance levels, with monitoring progress, and with evaluating the realised outcomes of the improvement (TTCP, 2005).

The assessment of capabilities can be done both before and after the organisation has clear objectives, or even a strategy defined. A high-level assessment of the performance of capabilities can inform the organisation where they are currently experiencing problems. For example the "Process performance" metric could be used to measure the level of the "Customer management" capability. An assessment of the "Customer management" capability based on the "Process performance" metric reveals that the capability needs improvement because there are multiple and inconsistent CRM databases. To address this assessment, the strategic objective to "Facilitate resource sharing" can be formulated. In case the organisation has already defined its strategy and a set of clear objectives, a more in-depth assessment of capabilities can provide insight into where the organisation needs to invest in order to be able to achieve its desired situation.

Identifying metrics

We propose measuring the performance of each business capability with one or more metrics. We define metric as the extent, quantity, amount, or degree of something, as determined by measurement or calculation. These capability metrics can be derived from the higher-level strategic metrics. In the ESAM these strategic metrics are defined in the Strategic measurements phase with the help of the BSC. Due to the overlap between the BSC and the Strategy map, any capabilities that are linked to the objectives specified in the Strategy map can also be related to their accompanying measurements determined by the BSC. By deriving the capability metrics from the strategy metrics an organisation can ensure that by improving the performance of a specific capability they can contribute to the achievement of a specific business outcome related to an objective. For example the "Reliability" metric could be used to measure the level of the "Customer management" capability. In this example, the "Reliability" metric is a decomposition of the higher-level strategic metric "Process performance".

As a guideline, the The Open Group (2011) propose to assess capabilities in terms of several dimensions, such as process, people, and material, while Greski (2009) considers assets instead of material. Grant (2016) divides assets into tangible (financial, physical) and intangible (technology, culture, reputation). Based on this we propose that in a generic manner, all capabilities can be assessed in terms of process, financial, physical, technology, organisational, and human.

Besides the specific metric(s) that can be defined for a capability, we also propose the specification of a target value, a minimum value, a tolerance value, the current value, the method by which the information related to the metric is gathered, the owner of the metric/capability, and possibly the total performance level for the generic dimension.

Analysing capability gaps

The purpose of this activity is to determine the current performance levels of each capability and compare to the desired levels which will help realise the strategic goals. The difference between these current and desired levels is called a capability gap. The different versions of a capability that represent a change in its performance are referred to as capability increments.

Once the capability increments have been identified for each business capability, their performance levels can be determined. This is achieved by assessing each capability increment against each metric, typically with a quantitative analysis. In case a quantitative analysis is not possible, or too difficult, a qualitative analysis with pseudo-performance levels can be used. For example, following the guidelines of the CMM by Paulk et al. (1993), the following performance levels can be used: One – Very low; Two – Low; Three – Medium;

Four – High; Five – Very high. This information can be illustrated with the help of a spider/radar chart, provided that there are at least three metrics defined for a capability.

The capability heat map can also be used as a high level method for representing capability gaps (TTCP, 2005). After assessing the relevant capabilities in the capability map and determining their desired future levels, a specific colour can be assigned to their performance levels (Papazoglou, 2014). For example, if a capability is scoring very low on its performance level and the desired level is medium, it can be coloured in red. If a capability is scoring medium and the desired level is high, then it can be coloured in yellow. If a capability is scoring medium and the desired level is medium, then it can be coloured in green.

Usually the capabilities of an organisation do not exist in isolation from each other, rather they share a dependency relationship. For example, a level 2 capabilities is part of a level 1 capability. Therefore the performance of the level 1 capability is dependent on the performance of its sub-capabilities. Capabilities can also complement each other by fulfilling goals, satisfying soft-goals, sharing resources, or performing tasks (Danesh & Yu, 2015). In these cases, it is advised to start by assessing the capabilities that have a direct contribution to the realisation of an objective, and at later stages investigate in more detail also their supporting capabilities.

Based on the CMM we propose the following capability performance assessment framework (Cheng, 2015).

Table J.1: The capability performance assessment framework

Capability performance level	Score range	Heat map colour	Definition
Level 0: None	[0, 0.5)		The performance level of the capability is too low to allow the organization to execute the capability.
Level 1: Initiate	[0.5, 1.5)		The processes of the capability are usually ad-hoc and chaotic. The organization usually does not provide a stable environment and sufficient resources to support the processes.
Level 2: Under development	[1.5, 2.5)		The processes are planned and executed in accordance with certain standards. It involves the skilled people and the required resources to produce controlled output. In this level, the capability is repeatable and is not specific to the organization's needs.
Level 3: Defined	[2.5, 3.5)		The processes are well characterized and understood, and are described in standards, procedures, tools, and methods. In this level. The process, resources of the capability are particular suiting for the organization's requirements and the related strategic objective.
Level 4: Managed	[3.5, 4.5)		The organization and projects establish quantitative objectives for quality and process performance and use them as criteria in managing processes. Quantitative objectives are based on the needs of the customer, end users, organization, and process implementers. Quality and process performance is understood in statistical terms and is managed throughout the life of the processes.
Level 5: Optimising	[4.5, 5)		The organization continually improves its processes based on a quantitative understanding of the common causes of variation inherent in processes. This means the concept of life cycle is involved in the capability. The capability will be continually improved and changed based on the feedback of the capability implementation result.

J.0.3 Capability development plan

The purpose of this section is to plan the improvements to a capability. Typically these types of improvements are not all made at once, but they are planned in capability increments, over time. This implies that the improvement of a capability is usually done in multiple capability increments, each providing a part of the expected added value of improving the capability (The Open Group, 2011).

In order to visualise the improvements that need to be made, a gap analysis can be created. A gap analysis usually combines the results of two heat map, more specifically the ones representing the current situation and the desired situation. Each capability is divided into two colours if it requires a change in performance, or has only one colour if the current performance level is appropriate for achieving the strategic objectives. Typically, in the case of two colours being present in a capability, the colour on the left represents the current performance, and the colour on the right represents the desired performance. The gap analysis can be very useful to illustrate in a simplistic manner the amount of improvement required for each capability. Once the capabilities which require a change in performance are identified, their development plan can be commenced. For each capability that requires change, a spider/radar chart can be constructed. This chart contains information about the performance of the capability, both current and desired, according to its selected metrics or dimensions. The spider/radar chart can be used as a simplistic but comprehensive visualisation of the capability performance gap.

One of the most important aspects of the development plan is the prioritisation of the capability increments. Typically, the development of each capability will require more than one capability increment, which need to be prioritised not only within the capability itself but also on the whole capability development roadmap.

A capability development roadmap can be used to sequence and plan these capability increments over time (Papazoglou, 2014). By using this method, it can become easier to have an overview of when each increment is supposed to be implemented. Furthermore it can help with planning the appropriate resources needed to realise each increment and avoid not having resources available because they are being used for other purposes.

The prioritisation of the capability increments can be done based on a few guidelines:

- Based on the strategic priorities established by management;
- Based on an optimal trade-off of resources;
- Based on the capability gaps;
- Based on the business leaders' choice.

In order to determine the most suitable roadmap several scenarios can be made with the help of the prioritisation guidelines. Each of these scenarios can portray the change in the performance of capabilities based on their increments,

the possible sequences of capability increments, the allocation of resources, the estimated costs, etc. The main purpose of these scenarios is to give an overview of possible alternatives in order to make an educated decision about the definitive capability development roadmap.

In terms of EA, capability development roadmaps can be a very useful starting point for planning the necessary architectural change. They can be used to plan the work packages that help realise capability increments. Furthermore they help link desired business value to architectural change and to work packages. Therefore investments in IT can be easier justified as necessary for achieving strategic goals. Moreover, it can guide the creation of project portfolios aimed at the changing the performance of a specific capability.

J.0.4 Controlling the capability development

Monitoring and controlling the development of capabilities is essential to the strategy process, but also to creating and maintaining well-managed and dynamic organisations. The purpose of this activity is to ensure that the capabilities are developing as originally intended. In order to ensure the success of this activity, close collaboration is needed between managers, enterprise architects, and program and portfolio managers.

Throughout this activity, the performance levels of capabilities are constantly measured and compared to their planned targets. In the case that discrepancies between those two values are detected, adjustments can be recommended.

Appendix K

ArchiMate 2.1 enhancements

Figure K.1: The proposed metamodel for the strategy process concepts

Figure K.2: The proposed metamodel for the value-related concepts

Figure K.3: The proposed metamodel for the capability-related concepts

Appendix L

The board game questionnaire

Thank you for participating in the Enterprise Strategic Alignment Method (ESAM) Survey. This survey is intended to get a better understanding of the acceptance of the method and its techniques. You are expected to answer the survey questions based on the way you experienced the ESAM during the game session. It will take approximately **10 minutes** to complete this survey.

The main objective of the ESAM is to help organizations improve their Business-IT alignment. What this implies is that an organization needs to have an alignment between strategy development (business side) and strategy implementation (IT side). The ESAM features multiple models, techniques, and frameworks from strategic management, EA, CBP, and portfolio management. The strategic planning game you have just participated in focuses on the strategic management models, techniques and frameworks.

The responses on this survey are anonymous and your response will only be used in combination with other responses. The collection, storage and usage of responses are done while keeping your privacy in mind.

The survey starts with a few general questions about you and your background. The rest of the survey consists of five parts, each with several statements about:

- The usefulness of the method
- The ease of use of the method
- Ability to use the method to achieve the given tasks
- The fit between the task and the techniques of the method
- Intention to use the method for a future assignment

Background information

I. What education are you currently following at the University of Twente? (e.g. Master of Business Administration)

II. How often have you used strategy techniques before the session of today?
☐ never ☐ sometimes ☐ most of the times ☐ always

III. Which of the following techniques were you familiar with before participating in the session of today? (Multiple answers are possible)

- ☐ Ansoff matrix
- ☐ Balanced scorecard
- ☐ Blue Ocean Strategy
- ☐ Boston Consulting Group (BCG) matrix
- ☐ Business case
- ☐ Business Model canvas
- ☐ Confrontation matrix
- ☐ Critical success factors
- ☐ Dynamic capabilities
- ☐ Marketing mix
- ☐ McKinsey 7-S
- ☐ PEST analysis
- ☐ Porter's Five Forces analysis
- ☐ Porter's Value Chain
- ☐ Resource Based View
- ☐ Strategy map
- ☐ SWOT analysis
- ☐ The Strategy canvas
- ☐ TOWS matrix
- ☐ Quantitative planning matrix
- ☐ Other, please specify:

Part 1 - The usefulness of the method

1.1. Using the method in my job* would enable me to accomplish tasks more quickly.

- ☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

1.2. Using the method would improve my job* performance.

- ☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

1.3. Using the method in my job* would increase my productivity.

- ☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

1.4. Using the method would increase my effectiveness on the job*.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

1.5. I would find the method useful in my job*.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

*with a job we mean any strategic alignment consulting job

Part 2 - The ease of use of the method

2.1. Learning to use the method would be easy for me.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

2.2. I would find it easy to get the method to do what I want it to do.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

2.3. My interaction with the method would be clear and understandable.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

2.4. It would be easy for me to become skilful at using the method.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

2.5. I would find the method easy to use.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

Part 3 - Ability to use the method to achieve the given tasks

I could complete a job* or task using the method ...

3.1. If there was no one around to tell me what to do as I go.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

3.2. If I could call someone for help if I got stuck.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

3.3. If I had a lot of time to complete the job* for which the method was provided.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

3.4. If I had just the built-in guide for assistance.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

*with a job we mean any strategic alignment consulting job

Part 4 - The fit between the task and the techniques of the method

4.1. The techniques incorporated in the method were appropriate.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

4.2. The techniques incorporated in the method were compatible with the task.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

4.3. The techniques incorporated in the method were helpful.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

4.4. The techniques incorporated in the method were sufficient.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

4.5. The techniques incorporated in the method made the task very easy.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

Part 5 - Intention to use the method for a future assignment

5.1. I intend to use the method for a future assignment in which strategic alignment would play a role.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

5.2. I predict I would use the method for a future assignment in which strategic alignment would play a role.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

5.3. I plan to use the method for a future assignment in which strategic alignment would play a role.

☐ strongly disagree ☐ disagree ☐ neutral ☐ agree ☐ strongly agree

Appendix M

Example process without and with HubWays

The following is an example of how a supply chain process in the horticultural industry could look like, from the perspective of the three roles. First we present how the process would look like in the current situation without the HubWays platform. Second, we present how the same process would look like if done with the help of HubWays. This example process has been developed with the assistance and guidance of a representative from HubWays.

Example process without HubWays

Trader

- Trader orders 10 buckets of flowers (rose avalanche - wit) from grower 1 at 8:05 to be delivered at 14:00;
- Trader orders 5 buckets of flowers (gerbera - rood) from grower 2 at 8:15 to be delivered at 14:00;
- Trader orders 10 buckets of flowers (rose avalanche - rose) from grower 1 at 8:36 to be delivered at 14:00;
- Trader orders 3 buckets of flowers (gerbera- geel) from grower 2 at 8:38 to be delivered at 14:00;
- Trader orders 2 buckets of flowers (rose avalanche - oranje) from grower 1 at 8:45 to be delivered at 14:00;
- Trader orders 7 buckets of flowers (gerbera) from grower 2 at 8:47 to be delivered at 14:00;
- Trader orders 8 buckets of flowers (rose avalanche - wit) from grower 1 at 8:49 to be delivered at 14:00;
- Trader orders 1 bucket of flowers (gerbera) from grower 2 at 13:15 to be delivered at 9:00 the next morning, etc.
- And so on ...

Grower 1

- Collects flower from the greenhouse and makes the goods ready to be picked up at the trolley (s);

- Calls the transport to collect 1 trolley(s) to transport to the trader in Naaldwijk and 2 trolleys to the auction in Naaldwijk;

Grower 2

- Collects flowers from the greenhouse and makes the goods ready to be picked up at the trolley(s);

- Calls the transport to collect 2 trolley(s) to transport to the trader in Naaldwijk;

Transporter

- Receives a phone call at 14:00 from grower 1 to collect 1 trolley to transport to the trader in Naaldwijk and 2 trolleys to the auction in Naaldwijk;

- Receives a phone call at 15:00 from the grower to collect 2 trolleys to transport to the trader in Naaldwijk;

- Transporter has capacity in a truck to Naaldwijk to be delivered at 17:00. He plans the 5 trolley in this truck;

- Transporter leaves at 16:00 to collect the trolleys.

Trader

- At 16:00 the goods are not in. At 16:15 he has to decide whether the truck to the boot in Hoek van Holland should leave, or should he wait for the goods of grower 1 and 2. The goods are not there yet. He calls grower 1, he calls grower 2;

Growers 1 and 2

- Growers 1 and 2 call the transporter. First grower 2 and then grower 1.

Transporter

- Transporter receives the call. He has to call the planner. The planner was not aware of the delivery time of the trader because the grower did not tell. The planner calls the driver to ask his position and the time needed to arrive. The driver gives his position and estimation. The planner calls the transporter and the transporter calls grower 1 and grower 2. The transporter, Grower 1 and grower 2 are not aware that the transport is for the same trader.

Growers 1 and 2

- Both growers call the trader.

Trader

- The trader receives the information at 16:30. He decides the truck to depart because otherwise the truck will miss the boot the England despite the goods of grower 1 (2 buckets) and grower 2 (1 bucket) are not received yet. These need to be transported by plane now instead in order to be in time in London tomorrow.

Example process with HubWays

Trader

- Trader orders 10 buckets of flowers (rose avalanche - wit) from grower 1 at 8:05 to be delivered at 14:00 at dock 2;

- Trader orders 5 buckets of flowers (gerbera - rood) from grower 2 at 8:15 to be delivered at 14:00 dock 2;
- Trader orders 10 buckets of flowers (rose avalanche - rose) from grower 1 at 8:36 to be delivered at 14:00 at dock 2;
- Trader orders 3 buckets of flowers (gerbera- geel) from grower 2 at 8:38 to be delivered at 14:00 at dock 2;
- Traders orders 2 buckets of flowers (rose avalanche - oranje) from grower 1 at 8:45 to be delivered at 14:00 at dock 2;
- Trader orders 7 buckets of flowers (gerbera) from grower 2 at 8:47 to be delivered at 14:00 at dock 2;
- Traders orders 8 buckets of flowers (rose avalanche - wit) from grower 1 at 8:49 to be delivered at 14:00 at dock 2;
- Trader orders 1 bucket of flowers (gerbera) from grower 2 at 13:15 to be delivered at 9:00 the next morning etc at dock 2;
- And so on ...

Grower 1

- After each accepted sales order the grower sends automatically from his grower system a transport order to the transporter. After each new order within the same time window and the same dispatch, delivery location and time window an update of the transport order is sent to the transporter;
- At 9:00 orders an extra transport of 2 trolleys to the auction in Naaldwijk;
- Collects flowers from the greenhouse and makes the goods ready to be picked up at the trolley(s);

Grower 2

- After each accepted sales order the grower sends automatically from his grower system a transport order to the transporter. After each new order within the same time window and the same dispatch, delivery location and time window an update of the transport order is sent to the transporter;
- Collects flowers from the greenhouse and makes the goods ready to be picked up at the trolley(s);
- Calls the transport to collect 2 trolley(s) to transport to the trader in Naaldwijk;

Transporter

- Just after 9:00 the transporter already knows he has to collect 3 trolley at grower one to transport to Naaldwijk and 2 trolley a grower 2 to transport to Naaldwijk;
- Transporter has capacity in a truck to Naaldwijk to be delivered at 16:00. He plans the 5 trolleys in this truck. The planning message is automatically sent to HubWays;

Grower 1, 2 and Trader

- All see the planning of the transport in the monitor-board of HubWays.

Grower 2

- The first trolley is ready. The grower scans the RFID of the trolley and the bar code on the package slip on the trolley. His systems sends out a message

now that the 1 trolley is ready for pick-up. In the message is exactly what purchase orders of the trader are on which trolley.

Transporter

- Receives the ready for pick-up message from the grower. He has capacity of one trolley left in the truck which is ready to leave for the milk run to Naaldwijk. The transporter decides to change the planning and already collects the first trolley from grower 2. Now he has extra capacity for the truck to deliver in Naaldwijk leave at 16:00;

- Transporter sends an update of the planning.

Grower 2 and Trader

- All see the update of the planning of the transport in the monitor-board of HubWays. Trader is happy he will already receive one trolley.

Trader

- At 15:00 the traders inquires the monitor board to see if all goods of the truck to Hoek van Holland will be received in time. He concludes it will. He is able to enquire per purchase order the status of the transport. One order is already arrived (by the earlier truck) and the other orders are in transit.

Grower 1 and 2

- Will not be disturbed.

Transporter

- Will not be disturbed;

- Delivers the goods of grower 1 and 2 at dock 2 of the trader. The driver uses the driver's phone application to send the delivery message to the HubWays system.

Trader

- Receives all goods in time. He exactly knows what orders are on which trolley. He is able to collect the orders for the boat to England very quick. The truck delivering the buckets to the boat to England leaves in time.

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PROPOSITIONS

accompanying the dissertation

ENTERPRISE STRATEGIC ALIGNMENT METHOD

A cross-disciplinary capability-driven approach

By Adina Ioana Aldea

6 April 2017

1. Practice-based research methodologies, such as Action Design Research, are essential to ensure that researchers focus on designing solutions which answer the questions that practitioners are concerned about. (Chapter 2)
2. Strategic alignment is one of the main ways organisations can improve their performance. (Chapter 3)
3. Cross-domain approaches are essential for improving strategic alignment. (Chapter 4)
4. Software tools and serious games are instruments that can be used by practitioners to apply and understand complex scientific methods. (Chapters 5 & 6)
5. Capability maps are an essential tool for improving communication between different stakeholders of an organization, and are one of the major contributors to improving strategic alignment. (Chapters 7 & 8)
6. An objective analysis of the strategy of a company can be facilitated with the help of models, such as the ones created with ArchiMate. (Chapter 9)
7. “Research is formalized curiosity. It is poking and prying with a purpose.” – Zora Neale Hurston
8. There is nothing quite as challenging as a practical problem.
9. Pursuing a Ph.D. is a very complex journey, which can be equally demanding and rewarding.
10. “Success is not the key to happiness. Happiness is the key to success. If you love what you are doing, you will be successful.” – Albert Schweitzer