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Toward Understanding Enterprise Architecture Management's Role in Strategic Change: Antecedents, Processes, Outcomes

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ABSTRACT

As organizations face accelerated economic dynamics, it is increasingly important to improve the capability of reacting agile to changes in the marketplace. This requires implementing and adapting internal structures in a timely manner and ensuring business-IT coordination throughout the process. Enterprise architecture management (EAM) is frequently proposed as a mean to arrive at organizational forms that allow for timely reconfiguration and to guide strategy-aligned change. This explorative study seeks to contribute to an overall understanding of EAM's application in strategic change processes. It is based on an in-depth content analysis of existing research in the field. Specifically, it identifies common EAM practices that have been suggested for application throughout the planning and implementation of strategic change. Furthermore, it reveals antecedents and outcomes of this application. The article discusses these findings in detail and summarizes the results in a preliminary process model of applying EAM for agile strategic change.

Keywords

Enterprise architecture, enterprise architecture management, strategic change, strategic agility, process theory

1. INTRODUCTION

“The discontinuous market and business environments where many private and public sector organizations now operate are changing rapidly, and in different ways” [6:155]. These increased dynamics are caused by accelerated competition, technology evolution, shorter product life-cycles, and customer needs individualization [6,64]. As a consequence strategy has become a moving target. This requires rethinking traditional strategy planning and implementation techniques in order to strengthen an organization's competency of responding to such strategic changes in an agile manner [65,78]. This comprises:

Achieving and maintaining flexible organizational forms: Instead of designing organizational structures that will be fixed for several years while the strategy is executed, these dynamics require “creating, re-creating, and sustaining organizational forms that will enable a process of strategic response” [64:148]. Prahalad and Krishnan add that a “[...] manager's ability to respond rapidly to those challenges [of organizational dynamics] is predicated upon having a *sophisticated and facile* organizational and technical infrastructure, and a degree of information technology *flexibility* that traditional approaches cannot provide” [56:24, emphasis added].

Effective adaptation of internal structures to a strategic positioning: Organizations need to increase their effectiveness in rearranging internal structures and processes so as to achieve a close match with the ever-changing strategic positioning of the organization in the marketplace [25,67]. Past strategic information technology (IT) planning techniques that merely focused on evaluating the contribution of IT initiatives in organizations in terms of their efficiency such as service availability and cost factors have been found rather inappropriate to provide such a strategic agility. Nowadays, it is considered more appropriate to judge the *strategic value* provided by the investments, in order to attain an IT infrastructure aligned with the changing strategic needs of the business and competitive industry [50].

The continuous coordination of the business and IT domain: Previous research has emphasized that a lack of coordination among the business and the IT domains may hinder the effective implementation of strategic change. Successful implementation requires managers from both domains to cooperate during the entire planning and implementation cycle [25,64,65]. IT's increased strategic relevance and its role as digital options generator and enabler of digital business strategies make this need even more critical [25,63].

Recent surveys show that the timely implementation of strategic change in terms of business agility and time to market as well as close coordination between the business and IT domains in the process are ongoing key concerns of IT managers [41,67]. Facing these challenges requires a holistic planning and steering approach that considers the entire organization and enables close and ongoing business-IT coordination. Enterprise architecture management (EAM) has been suggested as such an approach. Matthee et al. note: “Changes and transformation on all levels of the organisation are becoming imperative because of the growing uncertainty in the global business environment. EA is therefore growing in importance since it is seen as a tool to manage these

changes” [45:15]. EAM is put forward as strategic change tool for several reasons; these include:

Guiding purposeful organizational evolution: Enterprise architectures (EAs) are used to describe the current state of an organization in terms of a as-is architecture and the intended strategic state, in terms of a target architecture. It is proposed that an EAM core concept is to guide the focused evolution toward the target state by providing systematic support for organizational changes [2,10], directing organizational transformation [3,5], and offering directions for the deployment and integration of future technological and managerial developments [20,74].

Enabling flexible organizational forms: EAM is proposed as a way to manage organizational complexity and to foster agile organizational forms that allow for more flexibly addressing strategic change than it would be possible with rigid organizational structures [34,58,60].

Ensuring continuous alignment between the business and the IT domain: EAM is also put forward as mean for fostering business IT coordination and for synchronizing the strategic development paths of business and IT structures [23,33,36,60]. Ross motivates: “The objective is to get to the point where IT capabilities shape business strategy while business strategy shapes IT capabilities in response to changing market conditions and organizational realities. To do this the firm must develop an IT architecture competency to dynamically adjust strategies and technologies” [60:33].

These discussions suggest that EAM can provide the means to support improved handling of strategic change. However, this role of EAM is largely uninvestigated in past EAM research. It has not yet offered a holistic understanding of *how* EAM can be employed in the process of managing strategic change and how this in turn helps to address the above-mentioned challenges. Instead, EAM research is considered fragmented as well as dominated by a multiplicity of prescriptive artifacts, such as EAM frameworks, methodologies, and tools [36,52]. Although EAM literature highlights potential benefits associated with EAM’s strategic application, such as strategic agility, improved strategic goal attainment, or alignment of business and IT objectives [33,62], this relationship has been rarely explained. Moreover, it is necessary to examine contextual factors that may influence such relationships [7,33,35,57]. Aier et al. (2008) as well as Bucher et al. (2006) emphasize that no overall understanding of EAM applications such as its employment in strategic governance processes has emerged. Moreover, situational factors’ impact on these applications is unclear. Asfaw et al. (2009) argue that fundamental questions remain on how organizations use EAM concepts to manage strategic change and transformation in organizations. They further add that there is limited understanding of the enablers and challenges of using EAM for this purpose.

This explorative study seeks to help closing this gap. By taking a process theory perspective [44,49,73], it aims to gain a deeper understanding of how EAM can be employed in the process of managing strategic change. It further inquires about how such application contributes to the strategic change process’s outcomes and seeks to identify antecedents to the EAM application. In short, this article addresses the following overall research question: *How can enterprise architecture management support organizations in the management of strategic change?*

Section 2 lays the foundation for the remainder of this paper by clarifying basic terms. The article then describes the employed research design. This paper’s result section first discusses the identified EAM practices related to the strategic change process. It further illustrates the contribution of these practices to the process outcomes and outlines identified antecedents to effective application. Finally, the article summarizes the results in a preliminary process model and discusses future research avenues.

2. FOUNDATIONS

2.1 Enterprise Architecture Management

The EAM field lacks accepted definitions of basic terms such as *enterprise architecture* and *enterprise architecture management* [26,33,84]. A further source of confusion is that both terms are often used interchangeably. To avoid such confusion, this research assigns distinct meanings to both terms. Based on the ANSI/IEEE Std 1471-2000 definition of architecture as “[t]he fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution” ([43:6]), it takes *enterprise architecture* (EA) to mean an entire organization’s basic structure, which might be captured in terms of descriptive models reflecting the *current* and designated *target* state of the organization. It takes *enterprise architecture management* (EAM) to mean the overall *process* of maintaining and developing these enterprise architectures in a holistic and purposeful manner [39,45]. Enterprise architectures are thus the subject-matters of enterprise architecture management.

2.2 The Strategic Change Process

The often emphasized role of EAM as tool for guiding organizational change and transformation toward a strategic target state [2,3,5,10,20,74] inevitably situates this discussion in the domain of strategic change. This field concerns itself with the study of planning and implementing organizational changes brought about by changes in an organization’s strategy in response to changing environmental and organizational contingencies [16,59,83]. A shared underlying assumption in strategic change studies is that organizations must fit their environmental niches if they are to survive by aiming for congruence of organizational structures with their environment [4,28,72].

Studies on strategic change can be classified into two schools: a *content* school and a *process* school [59,77,83]. The content school views strategic change as system of distinct factors that must be fitted together. Scholars in this school focus on fitting certain strategy contents to certain environmental conditions in terms of desired configurations [77] and explain the antecedents and consequences of this fit and misfit. However, these studies have neglected the role of managerial actions [59]. The strategy process is most often reduced to a variable (e.g., the extent of use of formal planning) [37]. The *process* school in turn puts an emphasis on managerial actions by viewing strategic change as a stream of activities that are taken to achieve the most favorable match or alignment between the environment and the organization’s structure as a result of a change process [77]. Such a process perspective is not limited to micro-level activities and practices, but can be applied to different temporarily evolving phenomena at a variety of different levels (individual,

organizational, sector, field) [37]. This study subscribes to a process perspective on strategic change by focusing on the general patterns of applying EAM in the strategic change process. It abstracts from concrete strategies (i.e. strategy contents) and how they are used to face certain environmental or organizational contingencies.

Scholars have discussed different representations of the strategic change process; these differ primarily in terms of number and granularity of phases and activities [e.g., 4,14,15,32,48,80]. In line with these suggestions, this investigation assumes a two-phase strategic change process for the following discussion. A (1) *strategy planning phase* comprises the elaboration, discussion and evaluation of different strategic options, based on identified external threats and opportunities, internal strengths and weaknesses, and the translation of the chosen strategic options into a set of concrete strategic initiatives. The (2) *strategy implementation phase* assigns the implementation of the strategic initiatives by carrying out the underlying programs and projects. It thus seeks to adapt and install corresponding business and IT structures and processes in line with the strategic targets. This phase also comprises monitoring and evaluating strategy implementation and goal achievement.

Traditional views of strategic change have emphasized a fairly *static* perspective of strategic change by implying a match at a certain point in time, whereas subsequent researchers have argued for a more dynamic perspective in the face of changing environmental and organizational circumstances [83]. Such a perspective sees strategic alignment as a *dynamic* and never-ending task. This means that no organization is ever in a state of perfect alignment with its competitive environment [76]. This research also subscribes to this dynamic perspective of fit. In conjunction with the taken process perspective this means that the process of arriving at fit takes place on an ongoing basis [77].

3. RESEARCH DESIGN

3.1 A Process Theory Perspective

This research employs a *process theory* approach for understanding the application of EAM in the process of strategic change. Process theories [44,49,73] highlight the dynamic aspect of the phenomena under investigation by focusing on a process (i.e. sequences of causal events) as core of the explanation. Process theories provide a rich understanding of *how and why* an outcome is achieved in a process, when certain antecedent conditions are given.

Process theories are conceptualized in terms of process models. Process researchers highlight three primary components for this conceptualization (see Figure 1): (1) The *process* in the form of a sequence of events. Theorizing the typical sequences of causal events or activities are at the core of process theories [1,55]. This article employs Van de Ven's definition of a process as "a sequence of events or activities that describes how things change over time" [71:170]. (2) A second component of process models are *antecedent conditions*, which impact the occurrence of events, thus shaping the evolution of the process. Lyytinen and Newman define antecedents as elements "that preceded the event and could be viewed instrumental (i.e. necessary) in producing it" [42:599]. (3) A third process model component is the *outcome*. Outcomes are seen as results of the preceding event sequence, and every

event is regarded to provide a necessary contribution for the overall outcome [49,51]. This conceptualization of process theories underlay the investigations conducted in this research.

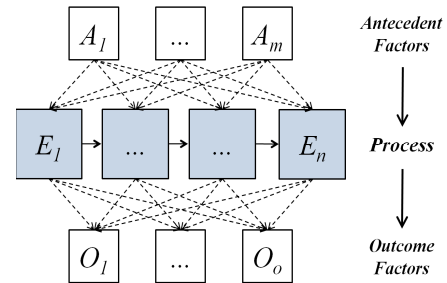


Figure 1: Conceptualization of process theories

3.2 Research Methodology

This research employed an inductive approach based on a systematic content analysis [46,79] of selected contributions in the EAM field.

(1) *Literature selection*: It first identified journal and conference articles addressing the domain of EAM in general by scanning scientific databases (ACM Digital Library, AIS electronic library, DBPL, EBSCOhost, IEEE Xplore Digital Library, ScienceDirect, and SpringerLink) as well as specific EAM conferences and journals (JEA, EMISA Journal, TEAR workshop, and EMISA workshop) using the search term *enterprise architecture*. The initial list of identified articles was reviewed in order to identify contributions that helped to understand the application of EAM for strategic change, for example, by generalizing EAM application scenarios [e.g., 3], investigating factors affecting EAM application [e.g., 8] and examining outcomes of EAM application [e.g., 36]. In order to increase the validity and reliability of the conclusions, the analysis focused on publications that rely on some form of empirical observation – such as interviews, surveys, or case study data – to found or validate the conclusions. Table 1 lists the final set of analyzed contributions.

Table 1: List of analyzed contributions

[3,5,7,8,9,13,17,18,21,23,24,26,27,30,31,33,34,35,36,40,45,52,53,54,58,60,61,64,65,66,68,69,75,81,82]

(2) *Content analysis*: Motivated by the general components of process models (see Figure 1), the analysis coded *process events* throughout the articles in terms of EAM practices that have been associated with phases of the strategic change process. It coded factors that were considered necessary for the emergence of these EAM practices (*antecedent factors*) and these practices' contributions to *outcomes*. It also coded *relationships* among these elements when addressed in the examined articles, so as to increase the explanatory power of the results [70]. All codes were iteratively revised in a bottom-up comparative process [22]. The analysis relied on the *ATLAS.ti* (version 6) qualitative data analysis tool, which allowed for the visual arrangement of the codes and for swift jumps between the data and the emerging codes. It also enabled to maintain a permanent link between the data and the codes, which increases the findings' reliability. Visual data analysis has been put forward as analysis technique in process research as well as in general qualitative research [38,42,47]. The content analysis sought to compare and integrate the findings with

extant literature in order to increase internal validity and generalizability as well as to reach a higher conceptual level in the face of supporting findings. Conflicting findings helped to indicate the limits of the emerging theory [19,70].

4. THE APPLICATION OF EAM IN STRATEGIC CHANGE PROCESS

4.1 The Strategy Planning Phase

The analysis highlights the application of ten EAM practices along the strategic change process. Five of these practices relate to the strategy planning phase and five relate to the strategy implementation phase.

Table 2 summarizes EAM support during *strategy planning*. Two EAM practices (1, 2) can be linked to a *strategy formulation* step, whereas two practices (4, 5) relate to the derivation and planning of initiatives from a chosen strategic option (*strategic planning*). An update practice (3) links both steps.

Table 2. EAM support in the strategy planning phase

Strategic phase		EAM support
Strategy planning	Strategy formulation	(1) Assessment of strategic business and IT options through architects
		(2) Development of strategic architecture initiatives
	Strategic planning	(3) Update of target architecture
		(4) Derivation of roadmaps
		(5) Assessment and prioritization of the project portfolio

From a general strategic management perspective, the *strategy formulation* step comprises elaborating and evaluating potential strategic options and finally selecting an alternative based on a comparison with the organization’s external threats and opportunities as well as internal strengths and weaknesses [e.g., 14,48].

(1) *Assessment of strategic business and IT options through architects*: EAM research highlights the active participation of enterprise architects in evaluating and selecting strategic business and IT options. It has been emphasized that the role of the enterprise architect is unique by combining business and technology knowledge [65,68]. This knowledge enables the architect to comment on various strategic options from different perspectives (such as integration requirements or time constraints) and, during the discussion of strategic alternatives, to promote those alternatives that would best solve the challenges of moving the enterprise towards its target vision. Strano and Rehmani note: “A successful architect proposes business solutions that reflect the most natural and comfortable way of organizing the business of the enterprise” [68:393]. The enterprise architect also helps to put forward such strategic IT initiatives that provide the technical capabilities necessary for the organizational vision and facilitates recognizing the potential of strategic IT initiatives that help enable new business opportunities [36,65,68].

(2) *Development of strategic architecture initiatives*: EAM itself contributes to setting up certain strategic options. These strategic architecture initiatives specifically seek to improve the overall

enterprise architecture maturity. They comprise all architectural levels by addressing technology, application, process, and data standardization [60,61], increasing service orientation and modularization [34,58,68], and reducing redundancies and gaps in the IT business support [3,9]. This results in concrete initiatives, for example, the replacement of legacy systems or the development of central data repositories. This is essential for the active improvement and development of an organization’s enterprise architecture, instead of – at best – maintaining the current architectural state. Ross [60] identified four such architectural maturity levels. She found that organizations first standardize their technology platform in order to overcome grown complexity and the incompatibility of locally optimized solutions. At a later stage, organizations extend standardization to data and processes. These standards allow for modularization in a final stage by introducing loosely coupled IT components.

(3) *Updating of the target architecture*: Once strategic business, IT, and architecture initiatives have been developed (1, 2), these strategic directions must be updated in the target architecture. This makes the inherent changes of all strategic initiatives explicit. Transparency about the target vision in terms of a formally stated target architecture is thus necessary for seeing satisfactory planning results in the subsequent steps [35] by facilitating ideas on how to approach the future state [3].

After strategic options have been developed and selected, these must be translated into concrete strategic tasks in the context of a *strategy planning* step [e.g., 15,32]. Two EAM practices (4, 5) relate to this step.

(4) *The derivation of roadmaps*: EAM has been suggested to support the translation of strategic options into tactical plans by comparing the documented current architecture and the target architecture state and deriving roadmap alternatives that address the differences between these architectures [3,35,52]. The discussion of different roadmap variants among affected stakeholders finally leads to the selection of one option [36].

(5) *Assessment and prioritization of the project portfolio*: The selection of a roadmap option (4) leads to certain (strategic) project ideas that evolve from such a roadmap. Additional project requests emerge from operational demands in the business and technology areas. Having a complete picture of all projects that cause changes in the enterprise architecture is necessary in order to manage these in a holistic and strategy-aligned manner [24,65]. EAM is considered integral to the assessment and prioritization of this project portfolio. On the one hand, this comprises the assessment of an initiative’s strategic consequences by understanding the interdependencies to the strategic goals. Kim and Everest highlight the meaning of transparency provided by an EA in this context: “[It] does provide the basis for planning and prioritization of the development of databases and applications by indicating how well information needs are currently satisfied and which needs are more critical to the organization” [35:8]. On the other hand, EAM helps identify implementation interdependencies among projects, which allows for the alignment of projects in a way that ensures seamless implementation and reduces the risk of conflicts in later stages [13]. Furthermore, EAM facilitates the identification of shared services and infrastructure components, which may help avoid redundant developments by realizing these in common efforts among projects [35,60,68].

4.2 The Strategy Implementation Phase

The analysis suggests five EAM practices belonging in the strategy implementation phase (see Table 3). Two practices (6, 7) relate to the *operative planning* step of the phase. Two practices can be assigned to the *monitoring and evaluation* of strategy execution (9, 10). The research again gave rise to a linking update practice (8) between these two general steps.

Table 3. EAM support in the strategy implementation phase

Strategic phase		EAM support
Strategy implementation	Operative planning	(6) Impact assessment and identification of reusable components
		(7) Standard compliance assessment
	Monitoring and evaluation	(8) Update of current architecture
		(9) Architecture guidance and implementation review
		(10) Architecture measurement and review

Strategy implementation comprises the adaptation and installation of organizational structures and processes by means of projects [e.g., 15,32]. EAM contributes to the *operative planning* prior to the actual implementation. It helps to set the projects' scopes more appropriately and identifying reusable components for the implementation (6), and ensuring compliance with architectural standards (7).

(6) Impact assessment and the identification of reusable components: EAM has been suggested as a means to more consciously identify a project's impact on other parts of the architecture, such as business processes, data structures, related applications, and technical components. EAM analysis techniques [9], such as impact analyses, allow for the identification of relevant stakeholders and parties that must be considered prior to the start of a project. This helps avoiding unintended impacts during implementation. It also facilitates the identification of redundancies and gaps and thus ensures the project's fit into the overall architecture [35]. EAM also aids organizations to identify where a development can rely on existing reusable services and infrastructure components and where it can contribute to developing such components [23,35].

(7) Standards compliance assessment: Based on a project's identified impacts (6), EAM is frequently suggested as a means to assess the compliance of the inherent changes to an organization's standards. Architectural standards refer to technology, process, data, and application elements and thus comprise all architectural levels [7,60,61]. It has been argued that the standard compliance assessment must include mechanisms for escalating and sanctioning non-compliance. Standards compliance assessment should also provide for exceptions to standards, when a well substantiated business need justify an exception. This builds short-term flexibility, which is to some extent restricted by compliance mechanisms [7,36,60,61]. Impact and standard compliance assessment are often conducted jointly in the context of an overall architectural assessment within a project's business case review [60,61].

(8) Update of the current architecture: Implementing projects inevitably causes the modification of existing organizational

structures as well the installation of new structures. Consequently, it is necessary to update the corresponding architecture information in the current architecture documentation in order to retain architectural transparency and to ensure up-to-date information in subsequent cycles of the strategic change process [8,21,52].

Strategy monitoring and evaluation in general comprises the monitoring of the implementation of strategic initiatives as well as the evaluation of these measures according to certain variables. This may lead to the adaptation of current plans and provide feedback for future strategic change cycles [e.g., 14,32,48,80]. EAM contributes to this step by guiding and reviewing the implementation of projects (9) as well as measuring and reviewing the overall architectural evolution (10) as a result of this implementation.

(9) Architecture guidance and implementation review: Besides participation in the review of business cases (6, 7), architectural guidance has been suggested throughout project implementation in order to allow for consultation and the review of the current implementation status [24,36,52]. Furthermore, a post-implementation review [36,60,61] has been recommended to collect architectural knowledge that may be employed in future initiatives and to identify reasons for discrepancies from the original design. Ongoing dialogue between architects and the project team ensures the retention of the right project scope and sticking to agreed standards [18,21,82].

(10) Architecture measurement and review: An EAM team task that accompanies the implementation of strategic change is the regular measurement and review of the enterprise architecture evolution, for example, by applying EA analysis techniques [3,9]. This seeks to ensure overall architectural consistency by identifying emerging gaps and redundancies in the IT business support [3,9,23] or conflicts to EA standards [75,82]. Furthermore, it helps monitor the progress of strategic initiatives along the agreed roadmaps [45] (e.g., by measuring the achieved standardization or homogeneity level), but also supports managerial decision-making by providing them appropriate measures [5,52,75].

5. CONTRIBUTION TO THE STRATEGIC CHANGE PROCESS'S OUTCOMES

The analysis results suggest that the application of EAM throughout the strategic change process – as discussed above – contributes to an organization's strategic change capability. The results put forward that EAM affects the ability to *effectively implement strategic change* and influences an organization's *preparedness for change*.

5.1 Contribution to the Implementation of Change

The synthesis of previous research indicates that the EAM application throughout the strategic change process affects an organization's *change implementation capability* by facilitating the adaptation of internal structures towards the strategic positioning in the marketplace (i.e. *strategic fit*) and by aiding the synchronization of the business and IT development paths (i.e. *business-IT alignment*).

5.1.1 Strategic Fit

The role of EAM for guiding strategic change is frequently discussed [e.g., 2,3,5,10,20,74]. A central strategic change goal or outcome is to achieve close alignment or fit between an organization's desired positioning in the marketplace and its internal structures and processes [4,25,28,72]. The results suggest that the application of EAM in the strategic change process can support attaining close strategic fit.

During *strategy planning*, the assessment of strategic business and IT options through architects (1) supports selecting such external strategic alternatives that most closely corresponds to the organization's internal capabilities in terms of a supporting technology platforms and thus allows for a more effective implementation in subsequent phases [65,68]. The derivation of roadmaps (4), based on a conscious comparison of the current architecture (i.e. current organizational structures and processes) to the target architecture (i.e. internal structures and processes that fit the desired external positioning in the marketplace) provides clear directions regarding what is required to execute a strategy [68] and thus to arrive at closer alignment with the external strategic positioning. The application of EAM for assessing and prioritizing the project portfolio (5) contributes to strategic fit by better understanding the projects' interdependencies to strategic goals and prioritizing those initiatives that are more likely to have a strategic impact [9,35,36,60,68]. EAM application thus helps an organization focus its resources on initiatives that are more effective in achieving the desired strategic targets. By identifying and resolving interdependencies among initiatives, this phase also helps reduce the likelihood of conflicts in later phases [9,13]. During *strategy implementation*, the conscious identification of a project's impacts and stakeholders (6) allows revealing conflicts of use, ownership, and resources before the actual implementation begins [35] and thus ensures a more effective adaptation of internal structures and processes towards strategic fit. Finally, the architectural monitoring and review (10) facilitates a more effective steering of the implementation of strategic initiatives along the agreed roadmaps [3].

Proposition 1 summarizes EAM's impact on strategic fit: *(Proposition 1) Organizations that apply EAM in the entire strategic change process will see more effective strategy planning and implementation in terms of better strategic fit.*

5.1.2 Business IT Alignment

Besides seeking to align the external and internal domains, it is considered similarly important to ensure close coordination between the business and IT domains during strategy planning and implementation [e.g., 11,25,67]. In contrast, poor alignment may hinder or slow the implementation of strategic changes and, thus, seeing satisfactory results from investments [12,25,60]. Business-IT alignment is often noted as a benefit of EAM [e.g., 9,13,23,33,40]. The analysis results provide more detailed explanations of how this is achieved through EAM application along the strategic change process.

The assessment of strategic business and IT options through architects (1) adds to business-IT alignment by translating strategic business initiatives for IT, but also by promoting strategic IT initiatives that are necessary to provide the technical capabilities to achieve the strategic option or that help enable new business opportunities [65,68]. Redundancies and gaps between

business and IT structures are expressions of poor alignment. Strategic architecture planning and development (2) supports business-IT alignment by setting up strategic architecture initiatives that seek to dissolve redundancies and gaps in the IT-business support [3,9,23]. During the derivation of roadmaps (4), the discussion of roadmap alternatives contributes to business-IT alignment by selecting those alternatives that best fit business and IT needs [3]. Furthermore, the improved identification of redundant developments and of potentials for developing shared infrastructure and services that is enabled through EAM's application in the portfolio management (5) helps to circumvent redundancies in the business IT support [13,29]. The assessment of an initiative's impacts (6) and the consideration of stakeholders allow for setting an initiative's scope more appropriately and thus avoiding emerging redundancies or gaps in the business and IT structures [9,35]. The architectural guidance and the implementation review (8) and the ongoing dialogue between architects and the project team allows for retaining this scope in the following implementation phases [21,60,82]. Finally, regular architectural measurement and review (10) contributes to business-IT alignment by identifying emerging business IT redundancies and gaps early on and enables the initiation of appropriate countermeasures [3,23].

Proposition 2 summarizes EAM's impact on business IT alignment: *(Proposition 2) Organizations that apply EAM in the entire strategic change process will see more effective strategy planning and implementation in terms of better business IT alignment.*

5.2 Contribution to Preparedness for Change

The results suggest that EAM application in the strategic change process can facilitate an organization's preparedness for change by fostering the *standardization* and *modularization* of the architecture throughout the process.

Improving standardization at all architectural levels is a prerequisite for strategic agility. Interoperable data structures and common technology components reduce the time of delivering and supporting business solutions. Standardizing core processes allows for the rapid implementation of these processes in new markets, the building of new products and services based on these processes, and ease of cooperation with external partners [34,60,61]. Modular architectures enable strategic agility through customized or reusable modules with standardized interfaces that can be used to rapidly respond to changing market conditions [58,60,61]. As Rai et al. note: "Once implemented, a modular enterprise architecture will provide growing opportunities to deliver new connections to partners and customers or to add new products and services to core customer offerings" [58:93].

Within the development of strategic architecture initiatives (2), an EAM contributes to the identification of standardization and modularization potentials, by providing a comprehensive picture and appropriate analysis techniques [3,9,35]. The separate and overarching coordinating role that is provided by EAM, enables setting up strategic architecture initiatives with affected stakeholders better than it was possible with traditional approaches that had limited foci [65]. The EAM literature provides several case analyses of EAM as successful driver of standardization and modularization initiatives (e.g., [75] in the health sector or [26,31] in public administration). Modularization

initiatives over time lead to a set of readily available and proven components. During strategy implementation, architecture reviews (6) assist identifying where these components can help to develop systems quicker and where projects can contribute to the development of new modules [31,34]. By standard compliance assessments (7) and architectural guidance and review (8), EAM ensures that an architectural standardization is maintained in the face of ongoing organizational developments [7,9,18,60]. Boh and Yellin's study [7], for example, confirmed that institutionalized processes for monitoring of EA standard conformance reduce infrastructure heterogeneity and increase application integration. Dreyfus and Iyer [18] showed that guidelines provided by EAM can avoid deterioration of an architecture when it grows. EAM further improves the measurement and evaluation (10) of the implementation of standardization and modularization initiatives according to agreed roadmaps by providing advanced analysis measures such as heterogeneity indices [3,9].

Proposition 3 summarizes EAM's impact on standardization and modularization as prerequisite for timely strategic change: *(Proposition 3) The application of EAM in the entire strategic change process improves an organization's preparedness for timely strategic change through standardization and modularization of the architecture.*

6. ANTECEDENTS TO EAM'S APPLICATION

The analysis further highlighted certain antecedents to an effective application of the identified EAM practices during the strategic change process.

6.1 Transparency

In order to effectively apply EAM throughout the process, it is necessary to achieve and maintain *architecture transparency* about the current organizational state and the intended strategic organizational state. It is also necessary to achieve and maintain *transparency about architecture standards* at all architectural levels.

Achieving transparency about the current and future organizational state in terms of documenting and maintaining current and target architecture descriptions is a core task of an organization's EA team. The documentation must ensure completeness by describing all relevant elements with the right scope. It must meet business *and* IT needs by capturing both perspectives [35,82]. Strano and Rehmani summarize the importance of EAM for gaining transparency: "The role of the enterprise architect is one of making order out of chaos by taking the overwhelming amount of information available and presenting it in a manner that enables effective decision-making" [68:392].

Transparency about the current architecture enables the application of EAM analysis techniques in order to identify architectural improvement needs and thus enables setting up corresponding strategic architecture initiatives (2) [5,35,60]. Having gained transparency about the current organizational state and about the intended future state is a prerequisite of consciously deriving roadmaps (4) of how to proceed to the strategic state [3,35]. During the assessment and prioritization of the project portfolio through EAM (5), transparency about the current and

future architecture is necessary in order to evaluate projects' strategic impacts and to identify interdependencies among projects. It also allows for improved identification of possibilities for developing and using shared infrastructure and services among projects [35,36,68]. During strategy implementation, architecture transparency is necessary to identify a project's impacts and stakeholders as well as reusable components (6) as thoroughly as possible [35,36]. Finally, architecture measurement and review (10) is based on information provided by regularly updated architectural descriptions [23].

These results strengthen the importance of the two update activities (3, 8) in the strategic change process. Updating the selected strategic business and IT options and the agreed strategic EA initiatives in the target architecture (3) increases transparency about the desired strategic state and allows for a purposeful evolution toward this state in the subsequent steps [3,35]. Updating changes that are caused by implementing projects in the as-is architecture (8) ensures the retention of transparency about the current state of the organization [8,52].

EAM research also highlights the EAM team's responsibility for developing, updating, and communicating EA standards at all architectural levels [7,60,61,65]. In order to increase awareness and acceptance of these standards, it is necessary to include the stakeholders in this process. The task also includes the monitoring of external standards and the incorporation of (reasonable) changes to internal standards. The thus achieved *standard transparency* is a prerequisite for effectively employing EAM to achieve and maintain standardization in the strategic change process. Transparency about architectural standards allows for the identification of architectural discrepancies from these standards and the setting up of strategic architecture initiatives (2) accordingly [5,35,60]. Documented and regularly updated standards allow for the assessment of standard compliance (7) prior to an initiative's implementation [7,36,60,61]. Finally, standard transparency enables the measurement and review of the architecture (10) evolution according to these standards [23,52].

Proposition 4 summarizes the need of transparency for the effective application of EAM in the strategic change process: *(Proposition 4) Transparency about the current and future organizational state as well about organizational standards at all levels is necessary in order to effectively apply EAM in the strategic change process.*

6.2 Management Support

Management support is frequently considered a key EAM success factor. This derives from EAM's long-term character, with few immediately visible commercial effects [65]. EAM also requires changing established working procedures and, to some extent, constraining the decision authority of local managers in order to foster globally optimized solutions [7,21,60]. Management support for the EAM function must ensure sufficient resources for the EAM team to conduct core tasks such as EA documentation and maintenance, the development and updating of EA standards, and the assessment and guidance of projects [8,35,53]. Such support must also ensure the appropriate organizational positioning of the EAM function in such a way that it can effectively conduct its tasks – for example, impacting strategy formulation or assessing the project portfolio [36,68].

The assessment of strategic business and IT options through architects (1) requires a corresponding organizational positioning of the EAM function, where it can affect business and IT strategy planning [45,68]. Strategic architecture initiatives (2) (e.g., creating standardized technology platforms or replacing complex legacy systems) usually involve fundamental organizational changes that require sufficient resources to be implemented [60,69] as well as top management support to overcome resistances and to facilitate change management [58,60,75]. The EAM team needs sufficient resources to maintain target and current architectures (3, 9) and the management needs to mandate the production of architectural descriptions by projects, since this task usually does not directly benefit local units [8,35,52]. During assessment and prioritization of the project portfolio (5), management support must enable the EAM team's participation in the respective corporate committees in order to effectively incorporate architectural input [36]. The careful consideration of an project's impacts and the identification of reusable components (6) as well as the enforcement of standards compliance (7) require top management support since these practices often mean additional efforts to projects and restrict local stakeholders' choices [7,82]. In the context of architecture management and review (10), management must mandate the use of the performance measures provided by the EAM team [52,75].

Proposition 5 summarizes the need of management support for the effective application of EAM in the strategic change process: *(Proposition 5) In order to effectively apply EAM in the process it is necessary to have management support for EAM in terms of sufficient resources, an appropriate organizational assignment, and enforcement of EAM practices.*

6.3 Centralized and Standardized Governance Structures

EAM involves a holistic perspective as well as globally optimized solutions, rather than locally optimized ones [21,60,61]. The analysis results underline that this requires a central EAM function as well as centralized and standardized governance structures, as prerequisites for effective EAM application throughout the strategic change process.

Researchers note the importance of a *central EAM function* that combines requisite skills and provides greater accountability for coordinating architecture tasks across organizations, than it could be offered by local units [7]. The central EAM function interfaces with other enterprise architects at different levels of the enterprise in order to ensure concordance of the architectures and to oversee the quality of the EA [68]. A central EAM function is especially important for the coordination of EA repository updates (3, 9) during strategy planning and implementation [52,75]. It also ensures a comprehensive perspective in the planning (2) and monitoring (10) of architecture initiatives [33,52].

It is also necessary to have some *central governance* in order to oversee and steer strategic changes during the process. This comprises central planning and prioritization processes (1, 4, 5) [7,23,60] for developing the strategic vision and aligning corporate initiatives as well as central governance bodies (e.g., a central portfolio management and a central architecture board) in which the enterprise architects interact and by which architecture-

related decision are made [36,68]. A lack of central control could tempt local managers to undermine global architecture goals by local developments [65]. Centralized governance structures are often installed in the context of implementing EAM programs [17,60].

The EAM tasks of project review and standard compliance assessment (6, 7, 8) benefit from *standardized processes* for project management and system development [7,34] in order to ensure effective architectural guidance during the implementation of strategic change at predefined control points [18,82].

Kettinger et al. note: "To achieve both business standardization and business flexibility requires more than just a global IT architecture; it also requires an information-oriented top-down management philosophy that promotes corporate-wide information management practices and information behaviors and values" [34:105].

Proposition 6 summarizes the need of centralized and standardized governance structures for the effective application of EAM in the strategic change process: *(Proposition 6) In order to effectively apply EAM in the strategic change process it is necessary to install a central EAM function that coordinates EA documentation and evolution, central planning and prioritization processes, as well as standardized processes for project management and system development.*

7. CONCLUSION

This explorative study examined the application of EAM in the strategic change process on the basis of a systematic content analysis of contributions in the field. By taking a process theory perspective [44,49,73], it identified *ten EAM practices* that have been suggested for application throughout the strategic change process. It further revealed the contribution of EAM to four outcomes and the impact of three antecedents for the effective EAM application in the process. Figure 2 summarizes the results in a preliminary process model. The research results give rise to four central implications:

(1) Necessity of EAM integration: The results underline the need of tight integration of EAM in existing strategic planning and implementation processes, such as roadmap planning and project portfolio management as a prerequisite for seeing benefits from EAM implementations. This complements the view of common EAM frameworks and methodologies that often regard EAM as a rather standalone activity.

(2) EAM as business and IT approach: The evolved process model supports a holistic perspective on EAM as an approach for the IT *and* the business domains (i.e. strategic business and IT planning and implementation). Winter and Schelp note: "Without tight integration into business units and without business architecture being addressed explicitly together with business units, EA management will not work" [82:571]. EAM was historically often implemented and driven by the IT department [82]. However, higher maturity EAM implementations place equal emphasis on the business domain and are characterized by a strong involvement in business strategy planning [3,52,60,68]. Organizations can build on their experience of applying EAM in the IT domain when making it an organization-wide effort.

(3) *EAM as driver of agile strategic change*: The results highlight that the careful integration of EAM in the strategic change process enhances an organization's strategic planning and implementation capability. This manifests in contributions to certain *outcomes* through EAM. The bottom up comparison of previous research suggests that the application can enhance an organization's *capability to implement strategic change* by fostering *strategic fit* and *business-IT alignment* during the process. Such change implementation capability is in line with Henderson and Venkatraman's [25] notion of strategic alignment, which emphasizes the fit between the external and internal domains (strategic fit) as well as the fit between the business and IT domains (functional integration) during strategy formulation and implementation. Henderson and Venkatraman further note that "[...] this strategic fit is inherently dynamic. The choices made by one business enterprise, or firm (if fundamentally strategic), will over time evoke imitative actions, which necessitate subsequent responses" [25:473]. Besides a change implementation capability, these dynamics require the ability to keep the organization permanently *prepared* for future strategic changes by achieving and maintaining agile organizational forms. The results propose that EAM can help strengthen an organization's *preparedness for change* by achieving and maintaining standardized and modular organizational forms. This enables faster strategic response as it would be with possible with heterogeneous and rigid architectures. Such a capability is related to the concept of strategic agility [6,50,63], which is an organization's ability "[...] to exploit uncertainty by facilitating timely competitive actions through fundamental reconfiguration. It enables a competitive strategy by *having the organization consistently ready for reconfiguration*. Thus, agility refers to the system capability to rapidly reconfigure in the face of unpredictable changes [...]" [6:43, emphasis added]. The complicity of both EAM-facilitated capabilities contributes to an organization's overall *agile strategic change* capability.

(4) *Necessity of certain antecedents*: The analysis revealed certain organizational antecedents to the effectively EAM application in the strategy process. Organizations that seek to apply EAM for

strategic change need to maintain *transparency* about the current and strategic organizational states in terms of up-to-date EA documentation as well as standard transparency in terms of documented and regularly updated standards. Furthermore, *management* must *support* EAM application throughout the process by providing an appropriate organizational assignment, sufficient decision rights, and adequate resources for the EAM team's tasks. Finally, previous research emphasized the importance of *centralized and standardized governance structures* in terms of a central EAM function that coordinates EAM efforts, central strategic planning and prioritization processes as well as standardized project management and system development processes for strategy implementation.

Although this research sought to found the model on sound extant research, the explanations offered are tentative. Backing with empirical data would further increase conviction in the findings. Future research could examine whether organizations that have carefully implemented the discussed practices are able to more effectively address strategic change (in terms of contributions to the identified outcomes), or whether problems in observing these outcomes can be traced to insufficient coverage of these practices or to a lack of the identified antecedents. The derived propositions can provide starting points for such investigations.

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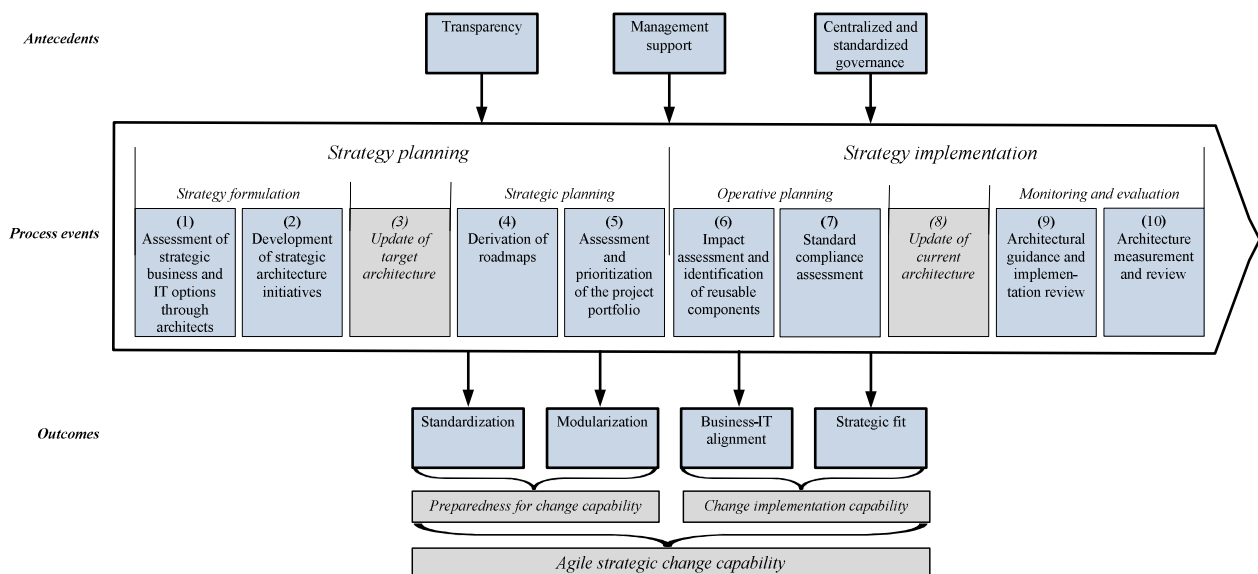


Figure 2: Derived process model of enabling agile strategic change through EAM

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