Dynamics of Control Mechanisms in Enterprise Architecture Management: A Sensemaking Perspective

Completed Research Paper

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Abstract

Enterprise architecture management (EAM) has long been considered a governance means to impose enterprise-wide objectives to local information systems development projects. This perspective on EAM inevitably brings about formal control mechanisms with the aim of enforcing enterprise-wide objectives in a top-down fashion. This study takes a complementary perspective by investigating the portfolio of control mechanisms with and beyond formal control mechanisms. We examine control portfolios and their dynamics over time. We employ control theory to capture the portfolio of control mechanisms, and an organizational sensemaking perspective, to capture its dynamics. The longitudinal analysis of a financial service company over a decade reveals that EAM's portfolio of control mechanisms emerges in an ongoing sensemaking process. In this process, various stakeholders continuously interpret cues in their environment and take actions in response to these cues. Further, we demonstrate that control portfolios are constantly (re)configured, through different combinations of formal and informal mechanisms.

Keywords: Enterprise Architecture Management, Organizational Sensemaking Process, Control Theory, Case Study

Introduction

Contemporary organizations comprise a plethora of information systems (IS) to support their business activities. Ever changing business requirements make continuous changes in existing or in the development of new IS inevitable, but also create conflicts among stakeholders with diverging perspectives on IS. While local business entities, such as local projects, strive for the best IS solutions for their very specific needs (i.e., local optimization), global business entities, such as headquarters, aim at improving the efficiency and effectiveness of the entire set of IS from an enterprise-wide perspective (i.e., global optimization) (Malaurent and Avison 2016).

One of the prevailing disciplines in IS literature to address this conflict, and to align local and global perspectives, is *enterprise architecture management (EAM)* (Boh and Yellin 2006; Richardson et al. 1990; Zachman 1987). Enterprise architecture (EA) refers to the actual and envisioned IS architecture as well as the interdependencies of the entire set of IS components in an organization (ISO/IEC/IEEE 2011). EAM, in turn, encompasses all processes, methods, and tools to design and purposefully guide the evolution of EA (Simon et al. 2013).

We postulate EAM as a control function since it aims to align local IS development endeavors with global objectives. *Control* refers to the dyadic process, in which a controller tries to regulate or adjust the behavior of the controlee (Choudhury and Sabherwal 2003). To this end, a *portfolio of control mechanisms*, i.e., an undefined number of means to align individual behavior with organizational objectives, is required. Extant EAM research predominantly focuses on formal control mechanisms such as standards and principles, through which global business entities (controller) impose design restrictions on local business entities (controlees) in a top-down fashion (Boh and Yellin 2006; Richardson et al. 1990). Such mechanisms are often enforced through global architecture roles and governance bodies (Boh and Yellin 2006).

Notwithstanding research advances and considerable efforts in organizations to adopt and implement EAM, many organizations witness failing EAM initiatives (Löhe and Legner 2014) as well as rising complexity levels in their EA (Beese et al. 2016; Mocker 2009). Arguably, some of the applied control mechanisms are not effective enough. According to control theory (Kirsch 1996; Kirsch 1997; Ouchi 1979; Ouchi 1980), the effectiveness of control mechanisms depends on the circumstances under which they are applied. Therefore, successful EAM will use various control mechanisms and adapt the portfolio in alignment with changing circumstances (Cram et al. 2016a). While in some situations formal control mechanisms will be appropriate, informal control mechanisms will be more suited in others. In most situations, however, the portfolio of control mechanisms comprises both formal and informal control mechanisms simultaneously.

To explore the dynamics of control, we conceptualize change in the portfolio of control mechanisms in EAM as an *organizational sensemaking process* (Gioia and Thomas 1996; Weick 1993; Weick 1995). Building on both control theory and sensemaking perspective, we carefully analyzed the case of EAM at a large financial service provider along three sensemaking episodes, taking place over ten years, and used established classifications from control theory to describe changes in the portfolio of control mechanisms. Therefore, we seek to answer the following research question RQ: *How does EAM's portfolio of control mechanisms emerge in organizations?*

We find the portfolio of control mechanisms in EAM to emerge in a process of creating interpretations on cues that contradict the expectations of organizational stakeholders. These changes reflect a social adaptation process stimulated by internal or external events in order to reach a common ground and to meet the expectations of various stakeholders within the organization. With this insight, we contribute to the current discussion in IS literature on control dynamics (Wiener et al. 2016) and provide enterprise architects with an insightful perspective on their control portfolio.

Following this introduction, we provide an overview of EAM literature and argue for the necessity for examining dynamics in the portfolio of control mechanisms. We then, in the theoretical foundation, introduce the control theory, and reflect on the organizational sensemaking perspective and its explanatory power. We subsequently present our research method and case company before discussing our findings.

Related Research

Over the past few decades, EAM has received considerable attention in both academia and in practice (Simon et al. 2013; Tamm et al. 2011). Early EAM publications focused on the adequate representation of EA (containing the entire set of IS components and their relationships) (Lankhorst et al. 2004), and on designing EA artifacts, such as architecture principles (Richardson et al. 1990) and modeling methods (Lankhorst 2005; Winter and Fischer 2007), to support the development of EA. Research efforts on EA representation and design were later extended by organizational topics such as strategic management and organizational transformation (Winter et al. 2014). Other studies made the practical contribution of EAM more transparent by clarifying expected EAM outcomes (such as increased IS efficiency and flexibility), but also showed that many EAM initiatives were struggling to achieve the desired outcomes. This was mostly due to the prescriptive governance processes and guiding principles being insufficiently respected in organizations (Lange et al. 2016; Schmidt and Buxmann 2011; Tamm et al. 2011). Researchers proposed to address this issue by paying more attention to the organizational contingencies and consequently proposed the concept of situational EAM (Aier 2014; Aier et al. 2011; Buckl et al. 2010; Haki et al. 2012; Leppänen et al. 2007).

Recently, some scholars have promoted control theory as an appropriate lens to further develop EAM's body of knowledge. Cram et al. (2015) discuss how IS managers can demonstrate appropriate oversight on EAM through the establishment of control processes (Cram et al. 2015). Based on a review of IS control literature, they conclude that the portfolio of control mechanisms in overarching IS processes, such as EAM, are not adequately discussed in existing IS literature, particularly given the relevance and challenges observed in practice (Cram et al. 2016b). Specifically, less attention has been given to the dynamic (re)configuration of control mechanism portfolios and the stimuli of such dynamics (Wiener et al. 2016). Such a dynamic perspective is of relevance as organizational practices are emergent in nature and heavily exposed to political and interpretative influences (Karpovsky and Galliers 2015). Therefore, the portfolio of control mechanisms will change over time (Cardinal et al. 2004), which is particularly true for overarching and emergent IS processes such as EAM (Cram et al. 2015).

There is a larger and promising stream of research on the dynamics in the portfolio of control mechanisms in IS development, IS project management, and outsourcing in particular (Wiener et al. 2016). In their recent and comprehensive review, Wiener et al. (2016) discuss three schools of thought concerning the dynamics in the portfolio of control mechanisms: The phase-based, the learning-based, and the encounter-based view. Proponents of the phase-based view argue, that the portfolio of control mechanisms is adjusted along different project phases, which are characterized by changing task structures (Kirsch 2004), increasing clarity on the envisioned project outcome (Susilo et al. 2007), or task complexity (Remus and Wiener 2012). According to the learning-based view, the control portfolio matures along with experiences made while using different forms of control (Chua et al. 2012). The encounter-based view finally finds events, forces, and values to be determinants for change. According to this view, dynamics in the portfolio of control mechanisms are related to performance problems and (un)fulfilled expectations (Choudhury and Sabherwal 2003; Gregory et al. 2013), changes in the compensation model (Heiskanen et al. 2008), or adapted contracts (Prifling et al. 2009). In sum, existing research offers rich explanations on the reasons why the portfolio of control mechanisms is inherently dynamic. However, less is known about the process through which organizations re(configure) and agree upon their portfolio of control mechanisms.

This research aims at further improving our understanding of the dynamics in the portfolio of control mechanisms by investigating the underlying adjustment processes. By investigating the dynamics in EAM's portfolio of control mechanisms, we also extend the scope of control research in IS literature towards overarching IS phenomena. Compared to already investigated phenomena such as project and outsourcing management, in overarching IS phenomena there is typically a bigger variety of organizational stakeholders (hierarchical and functional diversity), making the controller-controlee relationship more complex (Cram et al. 2016b). Our research also aims at contributing to EAM's body of knowledge in several ways. First, it extends the nascent discussions on control in EAM by identifying various control mechanisms beyond the predominantly discussed formal control mechanisms. Second, and arguably most importantly, it brings a dynamic perspective into the study of control portfolios in EAM.

Theoretical Foundation

To explain dynamics in EAM's portfolio of control mechanisms, we employ two complementary theoretical lenses. We employ *control theory* to identify various forms of control mechanisms, as well as an *organizational sensemaking perspective*, to analyze and explain dynamics in the portfolio of control mechanisms (Figure 1). We opt for a sensemaking perspective as control mechanisms will only be effective if all stakeholders perceive them to be both appropriate and in line with the organizational objectives. This perception results from an ongoing collective sensemaking process "facilitated and constrained by an organization's experiences, formal and informal structures, its current circumstances, and the language its members use" (Busby and Collins 2014, p. 1739). In the following, we introduce the concept of a portfolio of control mechanisms based on control theory and provide an overview of the organizational sensemaking perspective.

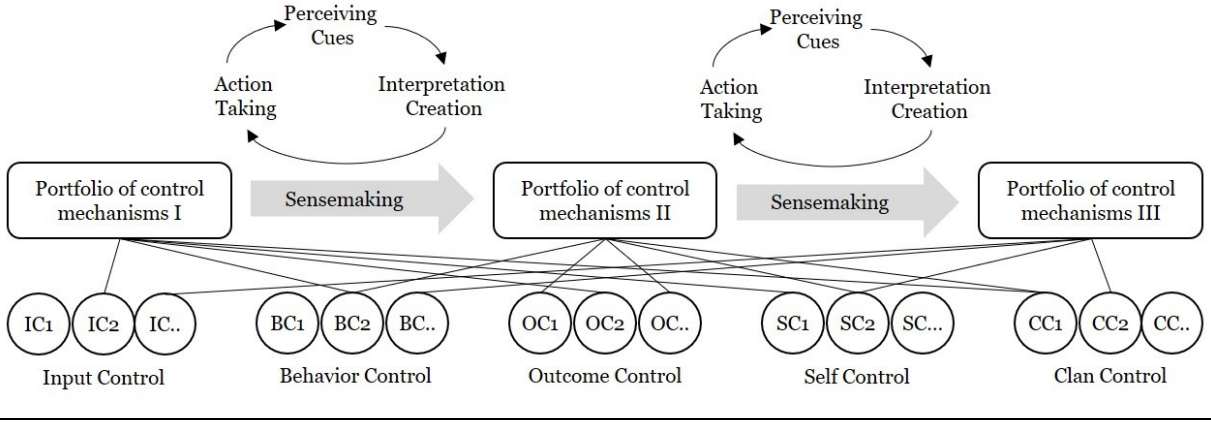


Figure 1. Theoretical foundation of the study

Portfolio of Control Mechanisms

According to control theory, a portfolio of control mechanisms consists of an undefined number of control mechanisms that are often categorized into five modes of control (Table 1): Input, Behavior, and Outcome Control (as formal modes of control), and Self and Clan Control (as informal modes of control) (Kirsch 1996; Kirsch 1997; Ouchi 1979; Ouchi 1980). The following discusses each mode in detail.

Input Control: The behavior of individuals is controlled through the allocation of human, financial, and material resources (Wiener et al. 2016). The controller typically monitors and manipulates the resources in a way that the controlee is forced to adjust her behavior.

Behavior Control: By prescribing processes, implementing and monitoring rules, and rewarding compliance the controller intends to guide the behavior of the controlee (Wiener et al. 2016). This control mode requires that appropriate behavior is known and can be observed (Kirsch 1997).

Outcome Control: While behavior control is focused on how something should be accomplished, mechanisms of outcome control focus solely on the result of an action and ignore the processes leading to the result. This is typically achieved through the means of goal definition, performance target definitions, and milestones (Kirsch 1997).

Self Control: The intrinsic motivation of an individual to set new standards is concerned here. In this case, the controlee defines their own goals and implements means to achieve them. For instance, self control is often practiced by senior IS professionals who have been active in an organization for a long time and redefine and improve existing processes and methods (Kirsch and Cummings 1996).

Clan Control: A clan is a group of individuals who are dependent on each other and share a set of common goals (Ouchi 1980). The values and norms present in these clans affect the behavior of the individuals and are thus described as clan control. They are manifested in ceremonies, rituals, and social sanctioning (Wiener et al. 2016).

Table 1. Portfolio of control mechanisms in control theory
(Kirsch 1996; Kirsch 1997; Ouchi 1979; Ouchi 1980)

Formal modes of control			Informal modes of control	
Input Control	**Behavior Control**	**Outcome Control**	**Self Control**	**Clan Control**
Control through the allocation of: - Human resources [IC_1] - Financial resources [IC_2] - Material resources [IC_3] - Organizational arrangements [IC_4]	Control through the definition of: - Processes to govern the actions of individuals [BC_1] - Mechanisms to observe the behavior of various stakeholders [BC_2] - Rules in guiding actions [BC_3] - Reward systems for compliance [BC_4]	Control through the definition of: - Specifications of desired outcomes [OC_1] - Processes to measure and promote outcomes [OC_2]	Control through the definition of goals by individuals: - Individual's voluntary improvement / learning activities [SC_1]	Control through values and norms: - Shared norms, values and beliefs [CC_1] - Reflection activities [CC_2]

According to control theory, organizations are in a constant process of adjusting their portfolio of control mechanisms (Cardinal et al. 2004; Choudhury and Sabherwal 2003; Cram et al. 2016a; Kirsch 2004). To explain the underlying process of how organizations' constituent individuals (stakeholders) agree on changes in the portfolio of control mechanisms, we employ an organizational sensemaking perspective as a complementary theoretical lens.

Sensemaking Process

Originating in organizational studies, sensemaking has been used as a lens, a framework, or theory to investigate how collective knowledge is structured and individual actions arise (Orlikowski and Gash 1994). Sensemaking in the context of organizational theory (Gioia and Thomas 1996; Weick 1993; Weick 1995) describes the process of how individuals, and in turn organizations, understand and act upon cues, i.e., unexpected or confusing events, issues, or situations that violate their expectations. Sensemaking is achieved through a recurring cycle of sensemaking activities: the gathering of information after noticing or perceiving cues, the creation and assimilation of the individual opinions, and, ultimately, the action taken on the drawn interpretations (Table 2) (Gioia et al. 1994; Rudolph et al. 2009). Accordingly, sensemaking is described as a social construction process through which individuals attempt to interpret and explain sets of cues from the environment, thereby forming the social dynamics of organizations (Maitlis 2005). In effect, "people develop some sort of sense regarding what they are up against, what their own position is relative to what they sense, and what they need to do" (Weick 1999, p. 42). The following describes constituent constructs of the sensemaking process in detail.

Perceiving cues: Sensemaking is triggered in situations where human agents experience a relevant discrepancy between what they are expecting and what they experience so that they wonder what they should do next (Maitlis and Christianson 2014). The triggers are events, issues, or situations, so-called stimuli or cues, that are surprising or confusing for human agents. Following Maitlis and Christianson (2014), we differentiate three major types of cues: environmental jolts, threats to identity, and planned change interventions (see Table 2 for details).

Creating interpretations: Once exposed to such cues, human agents may start to interpret the event. These interpretations are likely to vary among different agents given their various backgrounds and interests. To make organizational actions possible, these interpretations first need to be assimilated. Maitlis and

Christianson (2014) differentiate between two relevant aspects that affect this collective sense alignment process: activities of sensemaking, and shapers of sensemaking (see Table 2 for details).

Action taking: A crucial part of sensemaking is acting on the derived interpretations: Actions, on the one hand, support testing the newly created collective interpretations and, on the other, form new cues, which may trigger sensemaking. Existing research identified three core streams to which actions can be assigned to including actions in crises and unexpected events, actions forming temporary organizations, and actions beyond organizational boundary (see Table 2 for details).

Table 2. Process steps in organizational sensemaking
(Gioia and Thomas 1996; Weick 1993; Weick 1995)

Perceiving Cues	**Creating Interpretations**	**Action Taking**
Situations in which human agents experience a mismatch between their expectations and a given situation: - Environmental jolts: External changes that challenge organizational routines - Threats to identity: Events that challenge individual or organizational values and beliefs - Planned change interventions: Purposeful actions to change the organizational identity or culture	Human agents interpret the perceived cues through: - Activities of sensemaking: Practices to facilitate discourse in order to assimilate the individual interpretations to allow for collective action - Shapers of sensemaking: Relevant stakeholders influencing the sensemaking process	Acting on the derived interpretations: - Crises and unexpected events: Action taking as a trade-off between extensive analysis and fast feedback cycles - Temporary organizations: Establishing structures that are required for progressing on the agreed upon collective action - Beyond organizational boundary: Actions that not only lead to changes in the organization, but also in its environment

Research Method

To illustrate the process of sensemaking, scholars often draw on rich qualitative data (Maitlis and Christianson 2014). Qualitative methods are especially well suited to study the dynamic processes emerging from the individual interpretations (Gioia and Thomas 1996). In addition, they allow for considering the organizational context and account for activity sequences as they unfold (Pettigrew 1992).

We opted for a *single-case study approach* since we are interested in exploring the *how* of a phenomenon in a real-life context over which we have little control (Yin 2003) . The selection of a single case is grounded in the need to take a close look on the discourses on EAM and EAM control mechanisms in their context and to provide a rich case description (Darke et al. 1998).

Case Selection

While selecting the case organization we reflected on its criticalness and appropriateness to gain revelatory insights (Yin 2003). With respect to our research question, we had to select a case where (1) EAM had a long tradition, (2) the portfolio of control mechanisms changed over time, and (3) sufficient historical information was available, in particular where we had access to knowledgeable members of the organization.

Building on the abovementioned criteria, we opted for a large financial service provider[1]. Based on a long-lasting relationship with this organization (e.g., exchange of best practices, participation at conferences and training sessions) we were sufficiently aware that EAM had a long history in this organization and that the portfolio of control mechanisms has been adjusted several times. The organization is operating in an industry that, within the last decade, experienced fundamental changes in terms of market structure and

[1] *To be compliant with company policies, and in respect of intimate reasons (e.g., personal perceptions, feelings), the selected case is strongly anonymized.*

regulation. Being particularly affected by these changes the organization has gone through fundamental organizational restructurings and considerable changes in its business and technology strategy.

Data Collection

Data was collected between July and October 2017, and included empirical data from both *primary* and *secondary* sources. Primary sources refer to the interviews conducted in the organization. In total, we conducted ten semi-structured interviews that focused on the evolution of EAM and its portfolio of control mechanisms between 2008 and the date of the interview. Typical questions in these interviews, and our motivation for asking them, are presented in Table 3.

Table 3. Typical interview questions and our motivation for asking them

Interview Question	Motivation
What would you write down in a history book on EAM at your company?	Discovering major turning points that led to adjustments in the EAM approach and the portfolio of control mechanisms
Which conflicts led to changes in architecture management?	Discovering misalignments between the perspectives of EAM stakeholders that are likely to trigger sensemaking process
What was the contribution of architecture management in the past, and what is it today?	A measure of success, indicating the effectiveness of control mechanisms
What are the rules, laws, regulations, guidelines or sanctions that led to a balance of local/short-term goals with enterprise-wide/long-term ones?	Discovering formal modes of control
Which behaviors, norms, values, ideals, philosophies, or goals led to a balance of local/short-term with enterprise-wide/long-term goals?	Discovering informal modes of control

In the data collection step, we were interested in the perspectives of multiple stakeholders (representing both business and IT interests) and different hierarchical levels (top management and operational levels). Therefore, interviewees with extensive experience at the company were chosen from four distinct areas (Table 4): Business global (strategic perspective on the operations of the organization), business local (local operations), IT global (strategic perspective on the overall IT function), and IT local (IT support for local business). The interviews were conducted by two researchers and lasted between 60 to 90 minutes.

Table 4. Profiles of interviewees

Organizational Level		#	Role	Total Years Working at the Company	Duration of the Interview in Minutes
Business	Global	1	Divisional board member	5	60
		2	Division manager	12	60
	Local	3	Program manager	13	60
		4	Department head	18	60
IT	Global	5	Enterprise architect	23	90
		6	Enterprise architect	15	60
	Local	7	A representative of «agile community»	17	60
		8	Head of development resources	7	60
		9	Delivery manager	17	60
		10	Project lead	7	60

All interviews were recorded, transcribed, summarized, and sent back to the interviewees for review (in total 40 pages only containing the core statements of the interviews). We triangulated our data by *secondary sources*. Upon request, we received organigrams, selected job descriptions, and typical architectural artifacts such as blueprints, guidelines, and event descriptions. In addition, we collected publicly available data, such as annual reports, presentations, published strategy documents, as well as the content of web pages.

Data Analysis

Following the recommendations by Eisenhardt (1989), we first developed a coding scheme based on our two analytical lenses, i.e. control theory and the organizational sensemaking perspective. For control theory, our coding scheme comprises all the control mechanisms as shown in Table 1. For the organizational sensemaking perspective, our coding scheme encompasses all the sub-categories of the three sensemaking activities as shown in Table 2. We thus made use of the coding scheme for theory-informed data analysis as well as for rapid retrieval and clustering of relevant empirical data. To further facilitate the coding process, we also developed a coding guideline (based on the coding scheme), in which definitions and examples for each of the coding scheme's constituent items are provided. We included examples from literature as they can be found in Wiener et al. (2016) (for control mechanisms) and Maitlis and Christianson (2014) (for the sensemaking activities). Table 5 illustrates an exemplary item of the coding guideline.

Table 5. An Exemplary item of the coding guideline (environmental jolts as example)

Code item	Definition	Example from previous literature	Exemplary Quote from our empirical data
Environmental jolts	External changes that challenge organizational routines	- Change in Student Population (Milliken 1990)	"… on top were the crises in Greece, the shipping crises, commercial real estate crisis and so on, which put us into a fight against bankruptcy" (Interview #8)

We coded our empirical data in an iterative process: after an initial round of coding by one of the authors, we had in-depth discussions with the team of authors. It was the other authors' role to play the devil's advocate and propose alternative interpretations and counter-arguments. Once we had achieved a sufficiently high level of reliability of agreement on the categorization of the data, the coding of the data was completed.

The case was then analyzed in a chronological way. We identified the main cues and their respective time episodes. Second, for each of the episodes, we analyzed how the stakeholders interpreted the imposed cues and how these interpretations are reflected in the actions taken in the respective episode, therefore, affecting the portfolio of control mechanisms in EAM. The corresponding results are presented in the following section.

Case Analysis

By applying the sensemaking perspective, we can discuss how the portfolio of control mechanisms in EAM at a large financial service provider changed over a period of ten years, i.e., between 2008 and late 2017. Based on our coding scheme, we captured events as major turning points (cues), which trigger a reconsideration of prevalent values and beliefs on how EAM should be performed (interpretation creation). Further, we identify the individuals who guided and influenced the interpretation creation phase (shapers of sensemaking) and the means used in this process (activities of sensemaking). We also highlight the actions that emerged from the created interpretation to describe how EAM manifested itself in each period and how the portfolio of control mechanisms changed (action taking).

Our analysis spotlights three distinct sensemaking episodes and their portfolio of control mechanisms. Between 2008 and 2012, the case organization encountered the financial crisis, a merger with a competitor, and limited design freedom of IT development projects. In 2012 a new CIO was appointed that not only led

to some organizational restructuring (continued until 2016) but also brought new perspectives into the organization. In 2016 a new business strategy was introduced and marks the starting point of the latest, still ongoing sensemaking episode. Although sensemaking is an ongoing process, which most likely cannot be classified into isolated episodes (Sandberg and Tsoukas 2015), we still refer to these episodes to structure our analyses.

Episode I (2008-2012)

The case company was long operating in a rather stable environment, generating decent returns. Arguably, the local entities were rather free in the development of their IS, i.e., there was a low level of control. Consequently, many IT functionalities were built in parallel as the local entities were interested in making full use of their IT budgets. EAM, at this time, was perceived as something that only applied to the 'ivory tower'. While the architects perceived themselves to be "a central staff function defining the future of the company's IT architecture", non-architects described EAM to be a "cumbersome" governance function, whose impact was limited to the definition of the version of Java or kind of server that had to be used.

"Prior to 2009, architecture was treated as a central staff function, mostly focusing on IT architecture with a limited exchange with the business partners and even more far away from the actual implementation projects." (Interview #5)

Perceiving cues: In late 2008, the financial crisis affected the economic performance of the company with such severity that the risk of bankruptcy was publicly discussed. The crisis, an *environmental jolt*, suddenly challenged the design freedom of local IS development projects:

"Until 2008 when the financial crisis started, our industry had a lot of financial resources. The pipeline for IT projects was quite full and no one really cared what others were doing. Then the financial crisis came and, in our case, in addition the merger project. From then on, we just had to fight for survival" (Interview #8)

Almost at the same time, the board of the company agreed to acquire one of the competitors and decided to merge the IT landscapes of the two organizations into one. In terms of architecture management, the two companies had so far established two different approaches to EAM. While the architecture team at the case company already had a long tradition, there was no dedicated architecture team at the newly acquired company. We treated this cue as a *threat to identity*. Both cues, however, required a comprehensive perspective on EA and forced local entities to clarify their value contribution in the future landscape.

Interpretation creation: Non-architects in the local entities saw their *raison d'être* in danger; their IT solutions could either be perceived as too expensive or as becoming redundant during the merger project. They concluded that it would be best to deliver their projects in the fastest possible way and to be cautious of close collaborations with the architects that could affect achieving this goal due to both the efforts required and the risk of not getting the necessary approvals. For architects, the cues, financial crisis and the merger with the former competitor, were a strong argument for further streamlining the architecture function. Therefore, the architects mainly focused on defining long-term visions of the ideal IT landscape. However, the respective discourse was mostly held among architects with little interaction with non-architects (i.e., *activity of sensemaking*). We found that the activities of sensemaking took place within two groups (i.e., architects and non-architects) but not between them. This resulted in a continued deviation of the opinions of architects and non-architects on EAM's tasks and duties.

Being exposed to unexpectedly turbulent markets and increased financial pressure, IT management concluded that EAM should provide guidance on how the two IT landscapes could be merged in the fastest and most efficient way possible. In essence, IT managers (i.e., *shapers of sensemaking*) shaped the implementation of architecture management: EAM was expected to design a straightforward plan that would provide orientation in times of turbulence. Therefore, operational stability, and not necessarily technological advancement, was the highest priority.

"The idea was not to merge the best ideas from two worlds because one was aware that such an integrated approach would kill the company." (Interview #8)

Action taking: Based on this interpretation, IT management appointed an architectural task force with the main goal of defining the target architecture and the corresponding architectural principles. This

temporary organization had more formal decision making power than the previous architecture team. It was agreed that the acquired company should be integrated into the existing IT landscape and that further development activities were halted until the completion of the IT landscapes' merger.

To achieve this ambitious goal, the entire IT organization was working in a project mode as a form of temporary organization for 1.5 years. For the core modules (e.g., risk reporting), architects were assigned to the projects, which, for the first time, led to a closer collaboration between architects and non-architects.

When looking at the changes in the portfolio of control mechanisms (Table 6), we see that this sensemaking episode predominantly leads to *changes in the formal modes of control*. In response to the two cues, EAM function employed rigid control mechanisms to direct its stakeholders towards a top-down defined direction. In addition, a common agreement to mitigate risks and ensure stability of the IS supported the introduction of informal modes of control.

Table 6. Major changes in the portfolio of control mechanisms in episode I

Formal modes of control			Informal modes of control	
Input Control	**Behavior Control**	**Outcome Control**	**Self Control**	**Clan Control**
- Lowered financial resources for IT projects [IC_2] - Restricted budget allocation process [IC_2] - Established architectural task force [IC_4] - Allocated capacity of architects mainly to governance and internal alignment [IC_4]	- Defined architectural blueprints in a top-down manner illustrating how the landscape should be built [BC_3] - Defined implementation roadmaps [BC_3] - Involved architects in design decisions of the merger project's core modules [BC_2]	- Evaluated existing application landscapes of the two companies from an architectural perspective [OC_2]	*No changes observed in this episode*	- Spirit of risk avoidance due to the financial crisis [CC_1] - Acceptance of architecture management as an enabler of stability [CC_1]

Episode II (2012-2016)

The successful completion of the merger project was an opportunity for the former CIO to pursue his career at a different organization. His decision to leave the company marks the starting point of episode II.

Perceiving cues: The newly appointed CIO, who had already worked at the company for some time, declared his belief in the strategic value of EAM. In particular, he argued that the domain-agnostic perspective of EA would certainly be valuable, but would in addition require clear responsibilities to achieve a value contribution. To manifest his perception in the organization he appointed a new head of architecture, an action that we classify to be a *planned change activity*:

"This new CIO wanted one head of architecture, who was responsible for enterprise architecture management and who had to report directly to him. Consequently, every architect was assigned to the newly created organizational entity." (Interview #5)

The second cue of this episode is an environmental jolt, namely the technological advancement, and the resulting innovative offerings in other industries. The management experienced these offerings and expected the IT department to deliver sophisticated IT services as well. However, this was not possible due to a technological backlog resulting from the efforts spent on the merger project. At the same time, it became clear that an improved integration among the various systems was required:

"The higher demand for digital processes made issues in the technical backend more visible. A higher vertical integration was required and borders between departments needed to be removed" (Interview #5)

Interpretation creation: Enterprise architects had to interpret the significantly adjusted organizational structure (first cue) and identify methods to address the expectation of overcoming the technological and functional backlog (second cue). Having a background in consulting, the newly appointed chief architect, the shaper of sensemaking, emphasized the architect's role to build a connection between business and IT sides:

"The most relevant part is to generate connections among distributed teams because we as central architecture have the best overview on the application landscape. It thus was a good idea not to structure architecture along domains." (Interview #5)

Based on their initial experience during the implementation of projects (an action taken during the first episode), the architecture team interpreted that actions may not be easily enforced by designing blueprints of the future architecture and that relevant stakeholders need to be actively involved in architectural discussions.

"We do no longer only focus on rather abstract work, our aim is to actively contribute to the success of projects." (Interview #6)

For non-architects, the fact that management insisted on offering new technological services (i.e., second cue) was crucial. In order to better integrate their products, they required an overview on the architecture gained through discussions with architects, i.e., an *activity of sensemaking*. They interpreted the gathered information to identify that newer technological offerings required a state-of-the-art EA. Thus, the purpose of architecture was no longer only defined by the architects themselves, but also by non-architects.

Action taking: Enterprise architects concluded that they should establish connections among the project teams. The increased interest in EAM by non-architects resulted in discussions on architectural topics in meetings of communities of practices. The EAM implementation at the end of this episode can be classified by its more interactive conversation with non-architects to discuss the architectural roadmap. Since this allowed for fast feedback cycles, we consider this to be an action of stream *crises and unexpected events*, in which fast feedback cycles are crucial.

Table 7. Major changes in the portfolio of control mechanisms in episode II

Formal modes of control			Informal modes of control	
Input Control	**Behavior Control**	**Outcome Control**	**Self Control**	**Clan Control**
- Adjusted line of reporting and organizational allocation of the architects [IC_4]	- Anchored architectural discussions in committees [BC_1] - Involved architects in IT projects [BC_2] - Obliged projects to regularly consult architects [BC_1]	- Conducted quality checks on documentation, project structure, etc. [OC_2] - Started reporting in accordance to architectural guidelines to upper management [OC_2]	- Non-architects started to inform themselves on ongoing architectural activities [SC_1]	- Integration/architecture perceived as a prerequisite for new business offerings [CC_1] - Intensified networking and communication activities among project teams and architecs [CC_2]

Considering the changes in the portfolio of EAM control mechanisms, a shift in the time of intervention is observable (Table 7). Compared to episode I, more control mechanisms directing the behavior of local projects were in place. The direct involvement of architects in the IT project also allowed to intensify the means of clan control. Architects made use of storytelling to spread the idea that a better integration of the various IS components would allow for the creation of new business offerings.

Episode III (2016 onwards)

The intense discussions on architectural concerns in episode II led to a stronger consideration of architectural principles, yet leaving room for improvement:

"Today we play on a different level when it comes to quality and standards, but we still have not reached the level where we could be" (Interview #7)

Perceiving cues: During this period, the management of the case company is also convinced that the organization is not making full use of its technological capabilities. To address the ongoing low revenue margins, which may be considered a *threat to identity* for a company that often had high returns, the management planned to strengthen the technological capabilities of the organization. To this end, a new business strategy was announced, in our view a *planned change activity*, to transform the organization's culture and identity. Building on this new strategy, the financial service company plans to transform a financial service provider into a technology company and to automate all the relevant processes to eventually create new innovative offerings.

To emphasize the need for innovation through digital means, the IT management currently reflects on a proposal to further differentiate the role of architects, especially by strengthening the business perspective on EAM. This reflects another planned activity to change the prevalent EAM approach.

Interpretation creation: The strategic initiative to become a technology company forces non-architects to critically reflect on how this goal can be achieved. They interpret this as the responsibility of architecture to provide the required support:

"The architecture team needs to design a clear vision, depicting how IT should look like. It should be verified how projects not only solve particular problems but contribute to the overall goal." (Interview #1)

However, the architecture management team struggles in responding to this high demand for guidance due to a lack of resources. This is currently interpreted as responsibility avoidance from a non-architects' vantage point.

"I have the impression that recently businesses initiate architectural projects and that the architecture team then tries to avoid responsibility." (Interview #4)

Action taking: In line with this interpretation of EAM, the architecture team offers networking opportunities where representatives from several domains are brought together to discuss architectural concepts. At the same time, they try to be involved in major strategic design decisions during the early stages of IT projects. However, due to the higher demand for their contribution in projects, architects are now lacking time to hold discussions among themselves. This is something they plan to change in the future.

A closer look at the ongoing and announced changes in the portfolio of EAM control mechanisms (Table 8) reveals that the *amount of self-control mechanisms is remarkably increasing*. The general acknowledgment of EAM as a means to bring the organization forward results in architecture initiatives that are not driven by the architects, but initiated by business people.

Table 8. Major changes in the portfolio of control mechanisms in episode III				
Formal modes of control			Informal modes of control	
Input Control	**Behavior Control**	**Outcome Control**	**Self Control**	**Clan Control**
- Introducing a differentiation between architectural roles [IC_4] - Extending the capacity of architects [IC_1] - Allocating capacity of architects to project work and internal alignment [IC_4]	- Making solution architects responsible to ensure the fit of individual solutions with the enterprise architecture [BC_1]	*No changes observed in this episode*	- Business people actively asking for guidelines and a long-term view on architecture [SC_1] - Projects hiring people to close the "abstraction gap" [SC_1]	- Management convienced about the importance of architecture [CC_1] - The connotation of "architecture" as a hype [CC_1] - Opinion sharing in one-to-one conversations [CC_2]

Discussion and Conclusion

With the aim of explaining the dynamics in the portfolio of control mechanism in the context of EAM, we carefully analyzed EAM's adaptation process over a period of almost one decade at a large financial service company. On the one hand, our insights offer a broader understanding of control and its underlying mechanisms that go beyond the predominantly promoted formal, top-down driven mechanisms discussed in EAM literature. On the other hand, we offer a thorough explanation to the dynamics of control mechanisms as an ongoing organizational sensemaking process through which organizational stakeholders make sense of changes in their environment and adapt their EAM approach (reflected in the portfolio of control mechanisms) accordingly. For the latter, we spotlight three distinctive sensemaking episodes in our analyzed case, which not only differ in terms of cues triggering the respective change (e.g., financial crisis, functional backlog, new strategy) but also in the interpretation creation process (e.g., intensity of interaction, establishing networks) and resulting actions (e.g., enforcing architectural principles, push vs pull of architectural information). While the case analysis provides insights into the dynamics and adaptation of EAM and its control mechanisms, we now critically reflect on the findings, limitations, and implications of our study.

Main Findings

With this study, we contribute to the encounter-based view on the dynamics in the portfolio of control mechanisms (Wiener et al. 2016). This stream of research on control theory postulates events, forces and values as determinants for adjustments in the portfolio of control mechanisms (Choudhury and Sabherwal 2003; Gregory et al. 2013; Heiskanen et al. 2008; Prifling et al. 2009). In our study, we employ the organizational sensemaking perspective, as a complementary theoretical lens, that extends previous work as it allows us to capture the events triggering change as well as the underlying processes through which organizations re(configure) and agree upon their portfolio of control mechanisms.

In line with existing research on the dynamics in the portfolio of control mechanisms such as in IS project management or outsourcing (Barker 1993; Choudhury and Sabherwal 2003; Wiener et al. 2016), we observe the same dynamics in continuously adapting EAM approach. In the analyzed case of episode I, change in the control portfolio was mostly reflected in formal modes of control (input control in particular), whereas in the later episodes we observed that change was reflected in informal modes of control (i.e., self and clan control). Interestingly, these changes to the informal modes of control seem to bring an increased appreciation of EAM among non-architects.

In addition to describing the changes, we offer an explanation to the underlying organizational processes that lead to such changes. We find dynamics in the portfolio of control mechanisms in EAM to be a result

of an ongoing sensemaking process that is triggered by a variety of planned and unplanned cues. The EAM approach (reflected in the portfolio of control mechanisms) thus evolves as a result of aligned actions of individuals (such as developers, business partners, or software providers) making sense and taking advantage of cues in their environment (such as new technologies or changing market conditions, and new requirements). Therefore, actions taken by different organizations, even under the same environmental cues, may differ and change over time depending on their constituent individuals' interpretation of the environment. This makes the evolution of EAM complex and difficult to foresee. Accordingly, we argue that EAM may not be conceptualized as a linear process with clearly defined and constant goals, nor as a static set of control mechanisms. Instead, more attention should be devoted to the interpretation creation activities of EAM's various stakeholders. Thus, architects need to find the balance between actively enforcing architectural goals and principles (i.e., sensegiving) and purposefully allowing the exchange of ideas, values, and beliefs (i.e., sense exchanging). Most importantly, architects need to be aware that they only have limited control over the events triggering sensemaking activities. Nevertheless, they can actively engage in the sensemaking process and, to some extent, guide the evolution of EAM in their organizations.

Limitations

Due to the single-case design of our study, there are some limitations that need to be considered when interpreting our results. We required longitudinal data to elaborate on the dynamics of control mechanisms in EAM. However, most of this data is based on retrospective narratives collected at one point in time, i.e., at the end of ten years. We tried to avoid the risk of missing crucial events and actions by not only interviewing people who have been part of the company for many years, but also by considering historical secondary data such as old organigrams or presentations on the EAM approach. Thanks to our long-lasting relationship with the EAM team of the company, we could make additional use of our cooperatively generated secondary data with the case company, such as workshop documentations.

Adding to the above, the single-case design of our study does not allow us to compare portfolios of control mechanisms of different organizational contexts. Lastly, one should be aware that the control mode is only one of the many possible dimensions of a control portfolio. Gregory et al. (2013), for example, have identified the control degree as well as the control style as further dimensions to examine control portfolios. Our findings may also be extended by a discussion on the multiple forms of controller-controlee relationships, which was not the focus of our analysis. Kirsch et al. (2002) for example differentiate vertical (i.e., hierarchical) and lateral (i.e., peer-to-peer) control relationships that can be used as a basis for prospective research.

Implications and Future Research

Our study has several implications for EAM research. We illustrate that explaining a complex phenomenon, like EAM, in its socio-technical context benefits from a dynamic perspective to account for the emergent character of the underlying complex sets of interactions. By taking a static perspective, which is often limited to isolated cause-effect relations, researchers may only explain a snapshot of the respective emergent phenomenon, thus missing the phenomenon's deep structure (Haki and Legner 2013; Haki et al. 2016).

At the same time, a dynamic perspective may augment the extant contingency approaches to EAM (Aier 2014; Aier et al. 2011; Buckl et al. 2010; Haki et al. 2012; Leppänen et al. 2007). These approaches' basic assumptions are that EAM in an organization is not just the result of a linear maturity process, but that effective EAM approaches are contingent on their specific environment and, as we would add, they are a result of internal and external cues, as well as actions taken to respond to these cues. However, the sensemaking perspective on EAM clearly goes beyond the somewhat deterministic contingency approach in EAM literature. It highlights the roles of cues, discourses, and actions, which can be taken or not, and which can be shaped and partially controlled within the boundaries of complex socio-technical systems. Thus, the sensemaking perspective provides a thorough and potentially revealing look at the dynamics of EAM. Future research may elaborate on and design activities to purposefully influence sensemaking in the context of EAM (architectural sensegiving). Organizational research shows that through sensegiving, leaders can better motivate individuals to change their own practices and even transfer the intended interpretation to other individuals (Denis et al. 1996).

Additionally, our study illustrates that we may need to extend the methodological perspective on the EAM "body of knowledge" (such as in The Open Group 2018) given the new insights the control perspective offers. Until recently, EAM and IS control was discussed in two separate streams of literature, although addressing similar issues, i.e., aligning individual actors' actions with enterprise-wide objectives. We have shown how architects can make use of different forms of control, a perspective that has so far only been drafted on a conceptual level (Cram et al. 2015; Cram et al. 2016b).

Based on the gained insights, we propagate the use of the sensemaking perspective and control theory as complementary theoretical lenses. For researchers on IS control mechanisms, we motivate the sensemaking perspective to be a revealing perspective to study the dynamics of control portfolios for various IS phenomena. The organizational sensemaking perspective's explanatory power provides a promising means to address a recent call to improve our understanding on control balancing (Wiener et al. 2016).

In practice, enterprise architects may consider to purposefully employ a broader portfolio of control mechanisms to guide the evolution of EA. The case analysis has shown that different circumstances call for different forms of control, and that appropriate forms of control are delineated by the underpinning organizational sensemaking processes and their dynamics. Architects are advised to constantly maintain a balance of various forms of control mechanisms in their control portfolio. Our case description may also be a source of inspiration for architects looking for additional control mechanisms. By comparing their own situation with the one described in the case, they may find an indication of how they could design their portfolio of control mechanisms. To this end, architects may purposefully consider close collaboration with non-architects as sense-shapers to manifest architect's interests in the organization.

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