

INSTITUTIONALIZATION AND THE EFFECTIVENESS OF ENTERPRISE ARCHITECTURE MANAGEMENT

Completed Research Paper

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Abstract

Enterprise Architecture Management (EAM) has become a prominent discipline for managing increasingly complex Business/IT relationships in organizations. The more tangible aspects of EAM like modeling, planning, principles or governance structures are widely discussed and understood. However, institutionalizing EAM in an organization remains a challenging issue. Therefore, actually realized EAM benefits can be observed to vary widely across organizations. To address these issues, we take an institutional theory perspective and propose nine hypotheses which are tested based on quantitative empirical data. Our findings confirm seven institutional factors as antecedents for institutionalizing EAM in terms of positive stakeholder response, EA consistency and a realization of EAM benefits for the organization. Our research supports the understanding of the relevant phenomenon of institutionalization of EAM as a rather practice-driven discipline, where theoretical foundations as well as research into non-technical issues are limited so far.

Keywords: Enterprise architecture management (EAM), structural equation modeling (SEM), institutional theory

Introduction

In the ISO/IEC/IEEE Standard 42010 architecture is defined as “the 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” (ISO/IEC/IEEE 2011). The Open Group adopts this definition for their definition of enterprise architecture (EA) and substantiates ‘system’ as an enterprise that is “any collection of organizations that has a common set of goals” e.g. a company or government agency (The Open Group 2009). Ross et al. (2006) refer to EA as “the organizing logic for business processes and IT infrastructure, reflecting the integration and standardization requirements of the company”. The notion of enterprise architecture management (EAM) goes beyond EA and includes the tasks of establishing, maintaining and purposefully developing an organization’s EA (Aier et al. 2011b).

EAM is often discussed as an effective means for managing the considerable degree of complexity corporate information systems (IS) have reached today. Among others, EAM’s goals of achieving and maintaining IS efficiency and effectiveness as well as its contribution to an organization’s business value are often highlighted and confirmed by empirical data (Boucharas et al. 2010; Foorthuis et al. 2010; Ross 2006b; Schmidt and Buxmann 2011; Tamm et al. 2011).

On the one hand, the EAM toolbox is well developed and comprises (1) artifacts such as meta models for representing current and future states of an EA (Aier and Gleichauf 2010; The Open 2012; Winter and Fischer 2006), principles for governing its design and evolution (Aier 2012; Greefhorst and Proper 2011), frameworks for overarching reference (Bernus et al. 2003; The Open Group 2009), good practices (Ross et al. 2006), and software tools to support architects’ work (Matthes et al. 2008).

On the other hand and despite all these achievements, it remains challenging for practitioners to effectively anchor, i.e. institutionalize, EAM in an organization (Tamm et al. 2011). Analyst company Gartner only recently found that most organizations assessed are still at an “initial” or “developing” level of EAM rather than on a “defined”, “managed” or “optimized” level (Gartner 2012). But why is that? Ross and Quaadgras (2012) found that “business value accrues through management practices that propagate architectural thinking throughout the enterprise”. In other words, in order to make EAM effective it is necessary to institutionalize EAM in an organization. One of the reasons for the observed difficulties with institutionalizing EAM might be found in the fact that EAM ultimately aims at utilizing potential synergies in an organization by *restricting the design freedom* of affected stakeholders (Dietz 2007; Hoogervorst 2009). Despite reasonable arguments to do so, that is to pursue a global optimization (e.g. reducing functional redundancies on the overall application landscape) based on an enterprise wide perspective instead of several only local optima found in the individual goals of projects or organizational units etc., affected stakeholders are often reluctant to follow EAM’s norms and guidelines.

We approach this issue by taking an institutional theory perspective as a theoretical lens to advance EAM practice and research. Institutional theory is, among other aspects, concerned with questions of how organizations and individuals respond to pressures—in our case the restriction of design freedom—and what factors influence their conformance to or rejection of the pressuring entity (Oliver 1991; Scott 2008; Zucker 1987). Institutionalization can be defined as the process of establishing a practice as a norm thus giving it a “rulelike status in social thought and action” (Meyer and Rowan 1977). Along this line of thought, the aim of this research is to confirm factors fostering an institutionalization of EAM. Drawing on respective institutional theory literature and previous case study work (Aier and Weiss 2012; Oliver 1991; Scott 2008), we have developed a research model that conceptualizes institutional factors for EAM. These factors are hypothesized to foster positive stakeholder responses (RES) and EA consistency (CON), which represent the constructs where EAM’s institutionalization should manifest. RES and CON are significant prerequisites for realizing the benefits (BEN) attainable by the organization through EAM. In this paper, we test these relations employing a partial least squares (PLS) approach to structural equation modeling (SEM). Our research question can be formulated in two steps accordingly: 1) *What are the factors that influence an institutionalization of EAM?* and 2) *How does the institutionalization of EAM contribute to EAM’s benefit realization?*

Our findings show that institutional factors contribute significantly to the realization of EAM benefits. Our research confirms seven factors supporting the institutionalization of EAM and, subsequently, its benefit realization. Overall, our tested relations and the herein employed institutional perspective

contribute in understanding EAM phenomena and provide a novel perspective for informing EAM research and design. For practitioners, our findings suggest that trust building activities should be at the fore for institutionalizing EAM among affected stakeholders. Given these findings we generally expect more EAM research in the area of making existing EA artifacts and procedures more effective.

The remainder of this paper is structured as follows: Section two introduces this paper's line of thought by reviewing related work pertaining to the relevant conceptual foundations. Based on this, section three delineates our research model and hypotheses. Section four outlines the PLS-SEM approach taken for model testing, followed by a model evaluation in section five. Section six discusses the findings and implications. The paper ends with a short conclusion and a research outlook.

Conceptual Foundations

Institutional Theory

Institutional theory deals with questions of how and why institutions get adopted, refused and changed over space and time. Institutional theory is contributed to by a wide field of research analyzing institutional effects and processes following various research methods in the disciplines of economics, political science, sociology and organizational studies on varying levels ranging from world-system and societal level to organizational subsystem and individual level (for an overview, see for instance Hall and Taylor 1996; Scott 2008). In the paper at hand, we build upon the new institutionalism in organizational analysis that developed from the foundational works of Meyer and Rowan (1977), DiMaggio and Powell (1983) and Zucker (1977). In this section we review the basic concepts from this stream prior to discussing our adoption of this theoretical lens at the micro (i.e. intra-organizational) level.

According to Jepperson (1991), an *institution* “represents a social order or pattern that has attained a certain state or property”, which Meyer and Rowan (1977), in other words, refer to as “a rulelike status in social thought and action.” *Institutionalization* “denotes the process of such attainment” (Jepperson 1991). Institutions coordinate interactions, distribute tasks and roles, and define relationships among the actors (Walgenbach and Meyer 2008). As such, institutions provide stability and meaning to social life (Scott 2008), and they enable ordered thought, expectations and behavior. But they may also hinder critical reflection and the detection of more efficient ways of organizing (Zucker 1987). Consequently, institutions influence division of labor, specialization and productivity, and determine how efficient commercial activity may take place. The configuration and efficacy of institutions are therefore decisive factors for hampering or facilitating economic performance, prosperity and social development (Zucker 1987). Classic examples of institutions are traffic rules, the handshake, systematic bookkeeping or contracting. These examples represent institutions that have attained rulelike status and a high degree of resilience.

Institutions can be analyzed through what Scott (2008) termed the *three pillars of institutions*. The most prominent—the *regulative pillar*—underscores how institutions constrain and regularize behavior through coercive mechanisms and regulative rules. The *normative pillar*, focusing on social obligation and binding expectations, calls attention to norms and values, which prescribe and evaluate how and to which desirable ends things should be done. Finally, the *cultural-cognitive pillar* stresses underlying, taken for granted, shared conceptions and beliefs embraced by the mechanism of mimics, i.e. imitation. The presence of the mechanisms of a certain pillar may vary strongly among institutions, though. Considering the handshake as a form of mutual agreement, the regulative mechanisms are essentially not present. Traffic rules in turn are usually imposed through the mechanisms of all three pillars.

The decisive underlying proposition of institutional theory is that organizations are deeply imbedded in social and cultural contexts as part of which organizational structures and management practices are strongly influenced by institutional demands. According to this view, the ‘mode of operation’ can be summed up as follows: (1) An institution exerts pressures on actors to comply with the institution's demands (DiMaggio and Powell 1983). (2) Actors' compliance to institutional pressures is primarily motivated by an attainment of legitimacy and consequent survival in the institutional environment (Meyer and Rowan 1977). (3) Actors do not act solely rationally and autonomously—they are inherently influenced and constrained by their institutional environment (Scott and Meyer 1991).

To that end, the so called macro level has been the primary level of institutional analysis so far: The aforementioned ‘actors’ in this case are organizations or groups of organizations that adapt to

expectations and demands of the institutional environment, i.e. demands from outside the organizational boundaries. However, this view has also been criticized: some argue that people were situated in an “iron cage” (DiMaggio and Powell 1983), others that the behavior of organizations and individuals in organizations appear as “oversocialized” (Powell 1991). As a consequence, Oliver (1991) for instance has drawn attention to the fact that organizations may indeed respond differently, i.e. more actively and interest-driven, to institutional pressures aside from compliance. Furthermore, Zucker spearheaded research at the micro level where the organization may be regarded as institution and individuals or groups of individuals inside the organization as responding actors (cf. Zucker 1991). As a matter of fact, this micro level has been called increased attention to recently. In their profound review, Greenwood et al. (2008) see this level as one direction for future research, stating that other levels of analysis aside from the organizational field or environment level “have been rarely considered. For example, few studies treat the organization as the level of analysis [...] or examine how the organization might be treated as an institutional context for understanding *intra*organizational behaviour.” Our work adopts this micro level of analysis. In doing so, our research connects to the recent work by Pache and Santos (2013) who, on a micro level and likewise building upon Oliver’s (1991) work, conceptualize how individuals in organizations respond to competing institutional logics.

In an information systems (IS) context, institutional theory has been considered in many facets. Be it the interplay between IT and organizational research (Orlikowski and Barley 2001), the influence of institutional pressures on IS adoption (King et al. 1994; Teo et al. 2003), institutionalization and de-institutionalization processes of IT (Baptista 2009), or a more general argumentation that and how theories from other disciplines can and should be used to contribute to IS research (Boudreau and Robey 1996; Markus and Robey 1988), to give just a few prominent examples. However, the vast majority of studies are rather generic and take place at the inter-organizational level of analysis, as is also shown in the meta review by Mignerat and Rivard (2009). Similar to Greenwood et al. (2008), they conclude that there is room in particular for an institutional perspective to be applied to the intra-organizational level of sub-systems such as groups, departments and processes (Mignerat and Rivard 2009). Regarding the question of what constitutes the process of institutionalization, Mignerat and Rivard (2009) illustrate a general process covering the phases of innovation, theorization, diffusion, full institutionalization and beginning of deinstitutionalization. However, out of 53 analyzed IS papers that adopted an institutional perspective, ten studies dealt with institutionalization as a process, out of which only two took place at the micro level. From their analyzed studies, Mignerat and Rivard conclude that an organizing vision is of particular importance when intending to institutionalize new practices. However, we did not find more specific factors or guidelines among the papers analyzed by Mignerat and Rivard that appear more readily applicable, in particular for practitioners, when it comes to fueling the institutionalization of a particular practice inside organizations. We can only speculate as to whether the issue is either underrepresented in IS research so far and/or whether it is too context-specific, meaning that respective institutional factors and guidelines depend upon the element(s) to be institutionalized, which is why such studies did not show up in Mignerat and Rivard’s review.

An Institutional Perspective on EAM

With respect to EAM there seems to be only a limited amount of institutional research so far. To that end, Hjort-Madsen’s work stands out by investigating how EA implementation (2006) and adoption (2007) is dependent upon and shaped by institutional forces, noting that this issue is underrepresented in EA research so far. He shows that interoperability and IS planning, which can be facilitated through EAM, are not only technical issues, but that economic, political and contextual factors are just as important. However, his work stays on a descriptive-explorative level and focuses on pressures coming from outside of the focal organization. In contrast to this, we intend to test factors that relate to an intra-organizational institutionalization of EAM. A second exception is represented by the work of Iyamu (2009). Based on two case studies looking at the intra-organizational level, he presents six barriers to the institutionalization of EAM and relates them to four elements of EA utility. Our work addresses the same practical problem and can thus be seen as complementary or extending to his study. However, we take a different approach by adding more detail with respect to antecedent institutional factors and by empirically testing our hypotheses.

We adopt an institutional theory perspective as its line of thought lies at the core of our research goal, namely to derive factors that support giving EAM a “rulelike status” and that “structure social interactions”

in an organization with respect to architectural concerns. In this sub-section we therefore review specific EAM challenges that appear addressable from an institutional theory perspective. The institutional perspective helps us to a) contribute to an explanation for the observable challenges of embedding EAM in an organization, and b) provide reference on how to approach this problem.

Although research and practice have delivered EA models, methods, frameworks (Mykhashchuk et al. 2011), and also have successfully tested EAM success factor models (Schmidt and Buxmann 2011), it is still challenging for practitioners to introduce and sustainably anchor an EAM function in their organization (Tamm et al. 2011). During the past ten years, two of the authors have been actively involved in what could best be described as action design research projects (Sein et al. 2011) aiming at the development and use of methods for EA modeling, EA meta modeling, EA planning, the definition of EA principles, and the development of EA software tools. Based on this research project experience it became obvious that, despite these achievements, EAM's line of thought is challenging to institutionalize.

We conclude that EAM approaches do not only have to be methodically sound, but, in order to become effective across large parts of an organization, they also need to respect an organization's system of social norms and values that structure interactions. We argue that the latter issues are particularly important for EAM for several reasons: First, while being an increasingly important function to manage proliferation and dependencies of IS, EAM is still a rather young function compared to functions like marketing, production or controlling. Consequently, the awareness of EAM issues, the necessity for a coordinated approach to enterprise architecting, as well as standard procedures are still lacking widely. Second, EAM is not only a technical issue, but to a large extent also a social and political one, because (a) EAM is about coordinating the architectural development across levels and departments in an organization, which, after all, is about coordinating and arbitrating between people; (b) EAM is concerned with overarching transparency, analysis and transformation, which is often depreciated by certain stakeholders; and (c) EAM affects and pressures a high quantity and diversity of stakeholders (Dijkman et al. 2004; Kurpjuweit and Winter 2007). Third and last, a wide-spread institutionalization of EAM practices is important as it is the nature of EAM to coordinate different, possibly heterogeneous stakeholder groups that need to comply in order to achieve the expected benefits.

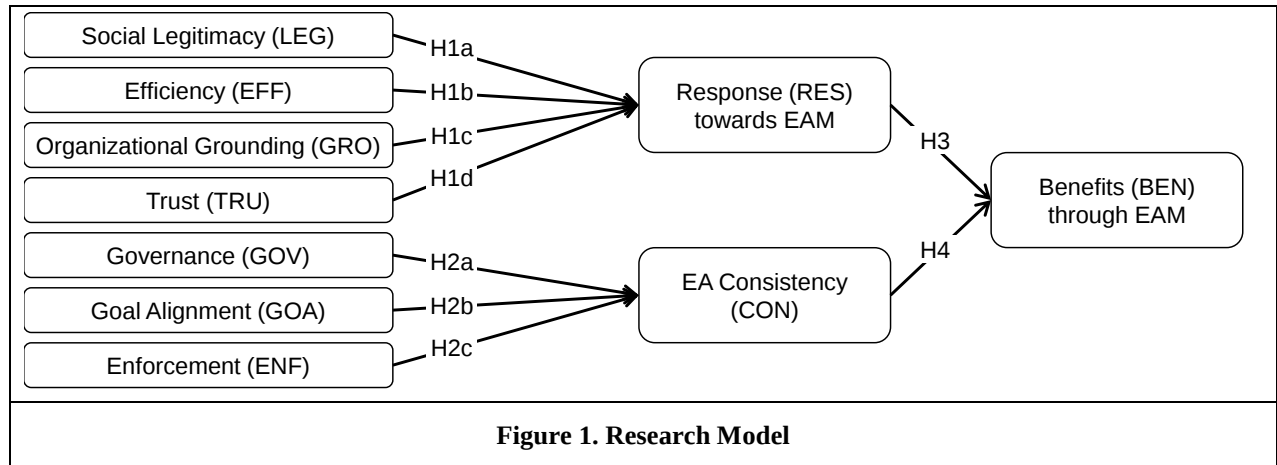
Concerning the use of institutional concepts, our research is particularly inspired by Oliver's (1991) institutional framework, as it mirrors the mechanisms of our EAM problem. On a generic level, she developed a typology of strategic responses to institutional pressures and presents institutional factors that affect the occurrence of certain response strategies. When setting up an EAM initiative, one can principally observe the same mechanisms: Affected stakeholders will certainly have different reactions towards the EAM approach. While some may follow almost blindly, others will perceive it as constraining (Dietz 2007) and unnecessary, and therefore try to defy and manipulate respective endeavors. Considering these similar mechanisms, we applied Oliver's concept to the EAM context at the intra-organizational level (see Pache and Santos 2013 for a related approach). We analyzed four EAM cases using polar sampling through this institutional lens in previous work, concluding that this perspective provides a fresh, applicable and useful view onto the abovementioned EAM challenges (Aier and Weiss 2012). In the paper at hand we advance this research stream and test derived hypotheses based on quantitative data. In doing so, we regard EAM as pre-institutionalized as in practice it often is. At the pre-institutionalized stage, new structures "appear in response to existing problems" (Mignerat and Rivard 2009). They provoke change, but are still far from being taken for granted. According to Mignerat and Rivard's model, they undergo, prospectively, the theorization and diffusion phases at this stage (see Zucker and Tolbert 1996 for a deeper explanation and alternative terminology). Our research model's endogenous and exogenous variables and respective hypotheses will be explained in the following section.

Research Model

Our model (Figure 1) is comprised of two major blocks hypothesized relevant for institutionalizing EAM. First, we conceptualize institutional factors aimed at convincing stakeholders of the EAM approach on an individual or group level. The stakeholder response variable (RES) reflects the resulting observable actor behavior. In other words, the response variable serves as manifestation of EAM's institutionalization among stakeholders, i.e. the actor aspect. If the antecedents social legitimacy (LEG), efficiency (EFF), organizational grounding (GRO) and trust (TRU) are marked well, stakeholders can be expected to respond more positively (hypotheses H1a-H1d).

Second, we take up the traditional, rather regulative EA governance approach targeted at EA consistency (CON) and enrich it with elements from a likewise institutional perspective (hypothesis H2a-H2c). Analogous to RES, CON is intended to reflect the institutionalization of EAM. As opposed to RES, however, CON represents the more visible, material or structural outcomes of an institutionalization of EAM practices, namely a higher EA consistency. Accordingly, the related antecedents governance (GOV), goal alignment (GOA) and enforcement (ENF) can be seen as more tangible, pertaining to the institutional setup of EAM in the organization.

Eventually, these two sub-streams (represented by stakeholder response (RES) and EA consistency (CON)) are expected to support the benefits (BEN) achievement provided by EAM to the organization (hypotheses H3 and H4). By combining these two facets, we intend to get a differentiated picture of the matter and to be able to contrast them in terms of impact onto our final dependent variable, EAM benefits. All relations, denoted by the respective nine hypotheses, will be motivated in the following sub-sections.



Social Legitimacy and Response

The factor of *social legitimacy (LEG)* represents the perceived social rationale for complying with EAM guidelines. It asks to which degree a stakeholder gains social fitness inside the organization when complying with EAM guidelines. If an actor can expect to personally gain a better social status, he will be more likely to respond positively to the matter. The importance of legitimacy and its relevance for decision making and support (in our case represented by a positive response towards EAM) has been acknowledge profoundly in literature (Jepperson 1991; Meyer and Rowan 1977; Oliver 1991; Suchman 1995). We can therefore propose our first hypothesis:

H1a: Higher levels of social legitimacy to be attainable from conformity to EAM will foster a positive stakeholder response.

Efficiency and Response

Efficiency (EFF) is the economic counterpart to legitimacy. It aims at the perceived economic rationale for following EAM guidelines. It asks to which degree a stakeholder becomes more efficient when following EAM guidelines. According to Oliver (1991), efficiency expectancy is besides legitimacy another causal antecedent of an affected entity's response. From an architect's perspective, efficiency gains through investing in a coordinated EAM function, establishing guiding principles and providing implementation support for instance, is a major argument. However, it is important that also affected stakeholders like project and middle management perceive EAM as helpful for achieving their personal economic goals. As a result, we propose the following hypothesis:

H1b: Higher levels of economic gain perceived to be attainable from conformity to EAM will foster a positive stakeholder response.

Organizational Grounding and Response

Organizational Grounding (GRO) describes to which degree EAM is anchored within the organization's values in terms of strategy definition, top management support or the position in the organizational hierarchy. Institutional studies have shown that values and norms, manifesting in top management championship and respective strategy formulations have an influence on individuals' beliefs and adoption of practices (Chatterjee et al. 2002; Lewis et al. 2003; Purvis et al. 2001). On this account we hypothesize these mechanisms to be important for EAM, too. Another argument for this structural relation can be derived from the previous EAM problem statement: EAM (a) is in particular a top management concern (pursuit of sustainable and synergy-leveraging EA) and (b) has oftentimes a rather young history and track record. Consequently, a propagation and mediation of EAM's values through adequate organizational grounding, that is through institutional symbols and artifacts (Scott 2008) like top management, position in hierarchy and strategy, appears to be important for fostering desirable stakeholder reactions. Our hypothesis reads as:

H1c: Higher levels of organizational grounding of EAM will foster a positive stakeholder response.

Trust and Response

The concept of trust is a complex and prominent research issue in many fields, including institutional, organizational and IS research (Benbasat et al. 2010; Mayer et al. 1995; Reed 2001). As part of this, trust has been related to many effects such as adoption, risk taking or willingness for coordination and collaboration. These elements are reflected in this relation and based on our project experience we argue that they are crucial: Only if stakeholders trust the EAM team, they will be willing to give up some autonomy, adopt certain architectural rules and collaborate towards a greater end. Thus, our construct of *trust* (TRU) asks to which degree stakeholders trust the EAM function to do the right things right. We formulate our hypothesis as follows:

H1d: Higher levels of trust in the EAM function will foster a positive stakeholder response.

Governance and EA Consistency

As the first of what could be termed traditional, tangible factors to foster consistency of the enterprise architecture, *Governance (GOV)* captures essential aspects of how to control (govern) design-restricting EA guidelines (Winter and Schelp 2008). In other words, our *Governance* factor asks on a general level *how* that game is played in terms of e.g. centrally signing off guidelines and having adequate processes in place for reviews of and exceptions to EA guidelines. From an institutional perspective, this factor embodies a mixture of the regulative and normative strand (Scott 2008). We propose the following hypothesis:

H2a: Higher levels of governance will foster EA consistency.

Goal Alignment and EA Consistency

Goal Alignment (GOA) refers to the degree EA goals are aligned with stakeholders' individual goals. In literature, this factor is also known under the terms of incentive-centered design (ICD) or incentive alignment (e.g. Ba et al. 2001). In institutional theory, compatibility of the institutional demands with the affected entity's goals is an acknowledged factor of actually achieving the demanded issues (Oliver 1991; Whetten 1978). With respect to EAM, the observable problem is that project managers for instance are oftentimes reluctant to go the extra mile for a sustainable and EA-conform solution, which may result in a slightly quicker solution at first, but may become very costly and risky in the long run. Thus, from an EAM perspective, this factor appears important, because it represents an incentive to not only optimize locally, but to consider EA consistency-related objectives like reusable and redundancy-reducing solutions. We therefore propose the following hypothesis:

H2b: Higher levels of goal alignment will foster EA consistency.

Enforcement and EA Consistency

Our last institutional factor, *Enforcement (ENF)*, is of solely regulative nature and is strongly related to what Oliver (1991) from an institutional viewpoint refers to as “the degree of legal coercion behind institutional norms and requirements”, which comprises enforcing and sanctioning mechanisms (Scott 2008). Transferred to EAM, we see enforcement as complement to the previous two factors by asking to which degree stakeholders are dependent upon EAM in terms of budget, knowledge and formal approval. The logic behind this is that certain stakeholders may only contribute to EA consistency reliably when they are ultimately dependent upon EAM. Otherwise, stakeholders may conduct their projects in an arbitrary fashion again. Consequently, we propose the following the hypothesis:

H2c: Higher levels of enforcement will foster EA consistency.

Response and EA Consistency and EAM Benefits

Neither the independent variables nor the intermediate dependent variables of response and EA consistency are an end unto themselves; they should eventually result in business benefits provided by EAM for the organization. Therefore, the last two relations are important as they depict this goal (Aier 2012; Foorthuis et al. 2010). The respective hypotheses read as follows:

H3: Higher levels of positive stakeholder response will contribute to the realization of benefits provided by EAM for the organization.

H4: Higher levels of EA consistency will contribute to the realization of benefits provided by EAM for the organization.

Research Methodology

Construct Operationalization

Following the recommendations of MacKenzie et al. (2011), we first defined the conceptual domains of the constructs including general properties, underlying themes and a brief construct definition. The necessary measurement items were then derived from literature, construct definitions, and expert suggestions (MacKenzie et al. 2011). In operationalizing our constructs, we strived for reuse and adaption of existing measurement items that are described as critical for success and are supported either by a broad literature review or by empirical data. If necessary, the items suggested by literature were reformulated and/or adapted to account for the specifics of EAM, thus following Ajzen & Fishbein's (1980) suggestions of tailoring measurement items to the research issue in question. However, few items were also directly derived from the construct conceptualizations as respective measurement items at the nexus of institutional theory and EAM were scarce in literature. We do not discuss each measurement item-related publication here but reference the literature that supports our construct operationalization (see Table 1) in the following.

Measurement items for the seven independent variables were primarily shaped by the institutional literature referenced above as part of the research hypotheses development section. In addition, we consulted prominent IS literature like Moore and Benbasat (1991), Thompson et al. (1991) and in particular Venkatesh et al. (2003) where measurement scales were consolidated and validated. These sources were used to inform us on item selection and item wording for the constructs of legitimacy, efficiency and grounding. For trust, we could draw on measurement scales from Weatherford (1992) and Serva et al. (2005), out of which we selected and adapted measurement items that are most relevant to our EAM research issue in question. With respect to the constructs of governance and enforcement, we could also draw from EAM literature as these aspects have already been taken into account in various nuances in previous research (Foorthuis et al. 2010; Schmidt and Buxmann 2011; Winter and Schelp 2008). At last, measurement items for goal alignment were essentially solely derived from broader literature and our construct definition, as we did not find scales fitting our particular EAM issue. Measurement items for the first dependent variable, response, were derived from Oliver's (1991) responses towards pressure exerting entities. The seven independent variables as well as the response variable were measured with mostly three indicator items (only grounding has two and governance four indicators). The measurement items for EA consistency and EAM benefits were adopted from pertinent

EAM literature (Aier 2012; Aier et al. 2011b). The therein tested measurement instruments are comprised of 16 items from mostly practice-driven publications (Niemann 2006; Ross 2006a; van den Berg and van Steenbergen 2006; Wagter et al. 2005). We adapted these items slightly and reduced them to overall 12 items in our final model (5 items for CON, 7 for BEN).

For all items, respondents were asked to evaluate their organization's current implementation level measured on a 5-point-Likert-scale ranging from 'not at all' (1) to 'completely' (5).

Sample and Procedure

In order to test our hypotheses we follow a quantitative empirical approach by means of a questionnaire used in a survey among enterprise architects. The questionnaire was distributed in German language at one major and three minor practitioner events in Switzerland, Germany and Austria between April and October 2012. The major event accounted for 76 of the overall 112 collected responses, out of which 7 (6%) had to be dropped due to missing or nonsensical data. The overall response rate was high at 90%. While, on the one hand, we cannot claim our sample to be representative, we can on the other hand expect data of high quality as respondents have a strong link to EAM because all of them were participants of events that specifically addressed EAM issues. Study participants came from Switzerland, Germany, Austria and Liechtenstein. Having analyzed the events' list of participants, we can state that the potential number of multiple questionnaires referring to the same organization is small (5% at maximum).

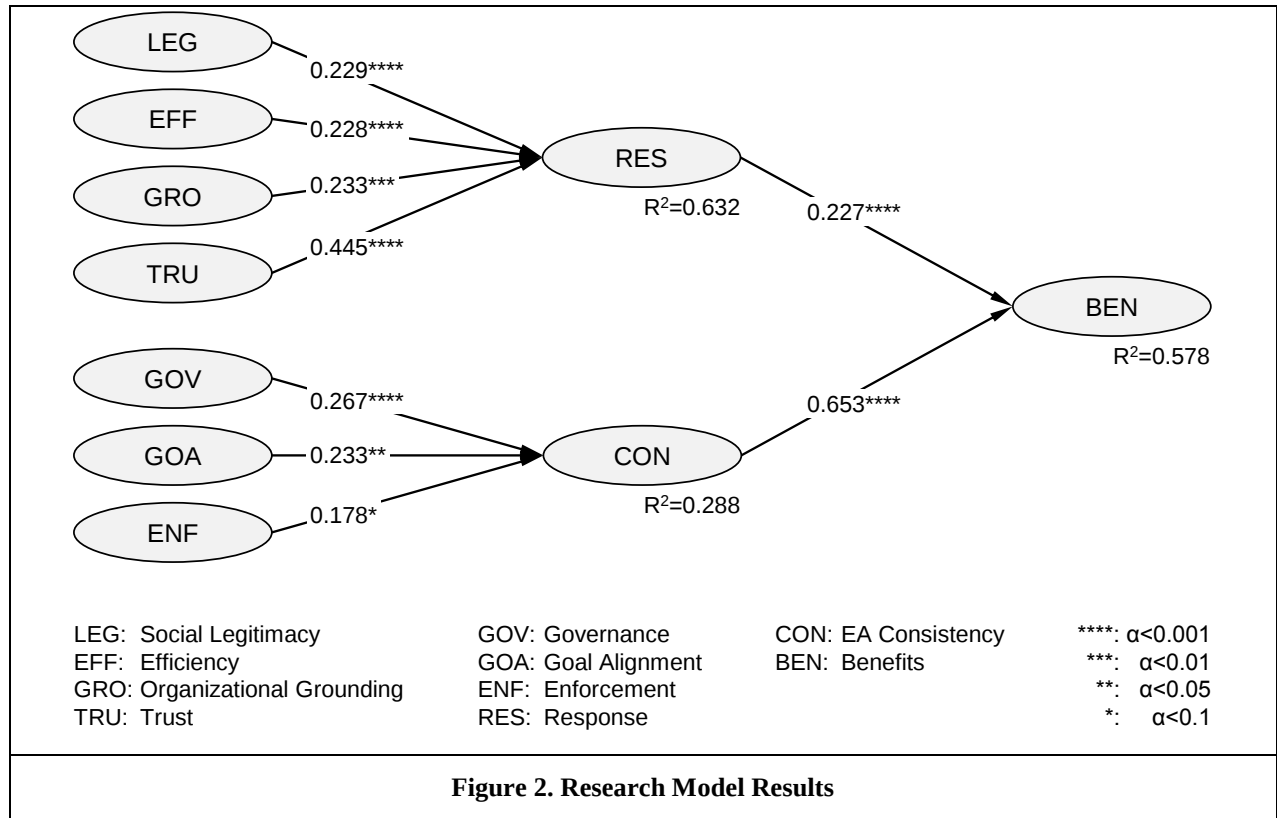
The questionnaire additionally included seven items on demographics and meta data. The majority of respondents (74%) worked for an IT unit rather than for a business unit. 90% of the respondents were actively involved in an EAM function in their organizations. The respondents were primarily representatives of large organizations. 47% of the respondents came from very large companies (5,000 employees and more), 24% from large companies (1,000–4,999 employees), 12% from medium large companies (250–999 employees), and 7% from medium sized or small companies (249 employees or less). The majority of survey participants were well experienced in the field of EAM. 33% of the respondents reported a long EA experience (more than 5 years), 25% 3–5 years, 15% 2 years and 17% 1 year or less. Survey participants were broadly distributed among industries. The most frequently reported industries in the survey are financial industry (27%), public services (14%), followed by insurances (13%), telecommunications (9%), and others (8%).

The research model was transformed into a structural equation model which was tested using a partial least squares (PLS) approach.¹ The PLS approach was favored over other (esp. covariance-based) SEM approaches, as PLS overall fits our research purpose better for several reasons: First, PLS naturally avoids the problems of inadmissible solutions and factor indeterminacy. Second, PLS has less strict distributional assumptions and is more suitable for exploration of relationships. Third, PLS has lower sample size requirements. According to the discussion in (Chin et al. 2003), the sample size for PLS should be at least ten times the maximum number of predictor variables for a construct (in our case 4). The resulting sample size requirement of $10 \times 4 = 40$ is easily met. The stability of the estimates was assessed using the bootstrapping resampling procedure with 500 resamples. Based on this, significances were determined by means of two-tailed *t*-tests.

Model Evaluation

The evaluation of the measurement model and the structural model follows commonly accepted procedures according to Chin (2010) and Götz et al (2010).

¹ We used the PLS implementation in SmartPLS, version 2.0.M3 (Ringle et al. 2005).



All constructs were measured in reflective mode. The *measurement model* needs to be evaluated in terms of (1) content validity, (2) indicator reliability, (3) construct reliability, (4) convergent validity, and (5) discriminant validity. *Content validity* has to be ensured upfront through theoretical considerations, namely that the measurement model (qualitatively) represents the conceptual domain of the construct in question. This was done as part of our model and construct development described in the previous sections of the paper. *Indicator reliability* specifies which part of an indicator's variance can be explained by the underlying latent variable. This implies that factor loadings λ should be larger than 0.7. Indicators with loadings smaller than 0.4 should be deleted. In our model all loadings are larger than 0.6 and only 5 out of the overall 36 indicators are not larger than 0.7 (see Table 1). All loadings are highly significant at a 0.001 significance level (two-tailed t-test) at least. *Construct reliability* indicates whether all the construct's indicators jointly measure the construct adequately. It can be assessed with the composite reliability (CR) criterion or the Cronbach's alpha (CA) criterion (assuming equal weightings). In either case, values should be larger than 0.6. In our case, both criteria are always above the threshold, with the lowest CR being 0.83 and the lowest CA being 0.65 (see Table 2). However, the composite reliability criterion is more adequate in our case since we do not necessarily assume equal weightings among the facets that a construct's indicators capture. *Convergent validity* is assessed with the average variance extracted (AVE) measure, which should be larger than 0.5, meaning that more than 50% of a construct's variance is explained by its indicators and not by the error term. In our model, AVE is always larger than 0.5. *Discriminant validity* deals with the dissimilarity of a measurement model's constructs. According to the Fornell-Larcker-criterion, discriminant validity is proven if the square root of a latent variable's AVE is larger than the common variances (correlations) of this latent variable with any other of the model's constructs. This holds true for all our measurement constructs (Table 2).

Table 1. Measurement model (survey items including mean value, standard deviation and factor loading)

Indicator	Description	μ	σ	λ
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LEG1	Minding EA increases the chance of obtaining a promotion	1.85	0.84	0.67
LEG2	People minding EA have more prestige than those who do not	2.34	0.86	0.87
LEG3	Minding EA increases the chance of project acceptance	3.26	1.05	0.82
EFF1	Non-architects believe to accomplish tasks faster because of EA	2.59	0.98	0.68
EFF2	Non-architects believe to increase the quality of their work with EA	2.98	0.90	0.92
EFF3	Non-architects believe to make better use of available infrastructure knowledge due to EA	3.11	0.99	0.92
GRO1	EA guidelines are grounded in the organization's strategy	3.68	1.02	0.79
GRO2	EAM is anchored in the organizational hierarchy and receives top management support	3.42	1.18	0.92
TRU1	Non-architects regard EAM to be a reasonable instrument for the organization	2.88	0.80	0.72
TRU2	Non-architects regard the EAM team to be professionally well qualified	3.39	0.91	0.88
TRU3	Non-architects feel their concerns to be taken seriously by the EAM team	3.23	0.88	0.82
GOV1	EA guidelines are signed off centrally	3.65	1.19	0.82
GOV2	It is defined how and which EA contents are communicated	3.01	1.19	0.70
GOV3	For the review of EA guidelines exist defined processes	3.13	1.36	0.83
GOV4	Exceptions to EA guidelines are discussed through defined channels/processes	3.25	1.31	0.84
GOA1	Leading non-architects know about other units' transformations	2.84	0.80	0.82
GOA2	Leading non-architects' goal systems take account of EA goals	2.61	1.00	0.88
GOA3	Non-architects have incentives to pursue cross-project/-departmental goals	2.50	1.07	0.66
ENF1	Non-architects depend upon EAM for project approval	3.09	1.37	0.87
ENF2	Project budgets depend to some extent on a consideration of EA guidelines	2.22	1.14	0.85
ENF3	Non-architects depend on EA knowledge/technology to conduct projects	2.80	1.07	0.75
RES1	EA content is eagerly accepted in the organization	2.54	0.82	0.82
RES2	There is an active demand for EAM services in the organization	2.66	1.04	0.82
RES3	EA guidelines and services are constructively discussed	3.10	0.96	0.86
CON1	Information silos are dissolved	3.04	1.06	0.61
CON2	Heterogeneity of technologies is reduced	3.67	1.00	0.80
CON3	Inconsistency and redundancy in EA is reduced	3.23	1.15	0.82
CON4	Reuse of platforms, information, and functions is increased	3.56	1.00	0.82
CON5	Standardization of applications is increased	3.31	0.97	0.81
BEN1	Better management of complexity	3.40	1.10	0.82
BEN2	Coordination of change projects is enhanced	3.33	0.99	0.80
BEN3	Costs for change the business are reduced	2.73	0.97	0.88
BEN4	Costs for run the business are reduced	2.91	1.02	0.71
BEN5	Lowered risk by being prepared for unplanned change	3.05	0.94	0.77
BEN6	Standardization of processes is increased	2.98	1.02	0.62
BEN7	Better realization of the corporate strategy	3.18	0.97	0.85

Table 2. Descriptive statistics and inter-construct correlations with square root of AVE on the main diagonal

	AVE	CR	CA	GOA	ENF	CON	BEN	EFF	GRO	LEG	GOV	RES	TRU
GOA	0.63	0.83	0.72	0.79									
ENF	0.68	0.86	0.77	0.45	0.82								
CON	0.60	0.88	0.83	0.42	0.40	0.78							
BEN	0.57	0.90	0.87	0.45	0.50	0.73	0.75						
EFF	0.72	0.88	0.82	0.41	0.26	0.31	0.30	0.85					
GRO	0.73	0.84	0.65	0.44	0.43	0.30	0.42	0.17	0.86				
LEG	0.62	0.83	0.70	0.40	0.40	0.29	0.36	0.37	0.25	0.79			
GOV	0.64	0.88	0.81	0.41	0.45	0.44	0.51	0.23	0.53	0.19	0.80		
RES	0.69	0.87	0.78	0.56	0.35	0.34	0.45	0.50	0.53	0.43	0.47	0.83	
TRU	0.65	0.85	0.73	0.47	0.37	0.29	0.42	0.34	0.46	0.14	0.48	0.66	0.81

One important metric for judging the *structural model* (Figure 2) is the *determination coefficient* (R^2) which reflects the share of an endogenous variable's variance that is explained by its exogenous variables. However, there are no general recommendations on acceptable values of R^2 . What is acceptable or not depends on the individual study. In our model 63.2% of RES can be explained by its four institutional antecedents, which is encouraging. With respect to CON, the explained variance is 28.8%. Eventually, RES and CON jointly explain 57.8% of realized EAM benefits (BEN).

As can also be seen, all *path coefficients* are in conformance with the hypothesized direction and have an absolute value above the recommended 0.1 threshold. Despite one exception, all path coefficients are in fact above 0.2, indicating worthwhile relations. Furthermore, all hypothesized relations are significant with the majority of relations being highly significant at a 0.001 level.

Finally we tested our model's *predictive validity* by means of the non-parametric Stone-Geisser test applying the blindfolding procedure in SmartPLS. The test shows how well the empirical data can be reconstructed using the model and the PLS parameters (Götz et al. 2010). If the test criterion is larger than 0 the model is considered to have predictive validity which holds true for our model.

Discussion

The objective of this study was to develop and empirically validate a theoretical model that helps to understand institutionalization and benefit realization challenges of EAM. To do so, we conceptualized seven institutional factors and two intermediate constructs affecting organizational benefits attainable through EAM. The study is original because it integrates three major aspects: First, we based our conceptualizations on institutional theory. In the IT and practice-driven discipline of EAM, the application of kernel theories from related disciplines is still rare, albeit promising for understanding EAM phenomena (Winter et al. 2013). Second, as intermediate variables, we combined the traditional construct of EA consistency (CON) and the construct of stakeholder response (RES) in our model. The rationale is that successful institutionalization and leverage of EAM benefits also require a constructive response of affected stakeholders next to more visible and material effects of EA consistency. Both RES and CON are therefore conceptualized as materializing constructs for EAM's institutionalization. Third, we related these constructs to a final variable that conceptualizes attainable benefits for an organization through EAM. This was important to us as we do not regard any of the antecedent factors as having value by themselves, but they become important when contributing to relevant business matters. The resulting model was successfully tested with a partial least squares approach to structural equation modeling using data collected from 105 survey respondents. The model evaluation yields a number of interesting findings which will be discussed in the following sub-sections.

Implications for Theory and Research

The model evaluation provides evidence that all our research hypotheses hold (Table 3). Looking at first at the high R^2 ($R^2=0.632$) of our response variable (RES), we can conclude that the four antecedent factors predict stakeholder response well and are indeed therefore of importance to get stakeholders on board. All path coefficients have a reasonable impact and are statistically highly significant. Among the four antecedents, TRU (H1d) stands out having a substantial effect on RES with a path coefficient of 0.445. In line with our experience, this value in particular underscores that institutionalizing EAM among stakeholders in an organization is not only a technical issue, but entails a social process that builds upon mutual trust. A more detailed consultation of trust building literature and assessment of respectively successful EAM practices may hence represent a particularly fruitful chapter for EAM.

With respect to CON, the explained variance by the three antecedent variables is lower, but still at a respectable 28.8%. However, as elucidated before we only dealt with factors from an institutional perspective in our study. We would expect a higher explained variance if further elements from the EAM toolbox like EA planning (Aier et al. 2011a) or principle management (Aier 2012) were related to CON in addition. The fact that GOV is the strongest antecedent of CON (H2a) may support this interpretation, as GOV can be seen to represent at most traditional EAM toolbox elements. That being said, we regard our study as complementary and compatible with other findings related to successful practices pertaining to the EAM toolbox and its proven utility, respectively (Schmidt and Buxmann 2011). Concerning GOA and ENF, we can still confirm these factors having a significant impact onto EA consistency (H2b, H2c). To that end, we could imagine the strongly regulative enforcement factor (ENF) to be a controversial one, though—although confirmed in our study to generally have a positive effect on EA consistency, further research may assess whether this is actually true in all cases or whether such mechanisms depend upon EAM maturity or organizational culture, for instance.

Finally, evaluating the relations of RES and CON with BEN, we see that both factors explain a notable 57.8% of the variance of realized EAM benefits ($R^2=0.578$). In conjunction with the highly significant relations from RES (path coefficient = 0.227) and CON (path coefficient = 0.653), we can conclude that both factors should be considered in practice and research when intending to generate higher EAM benefits for the organization. However, while RES provides an additional contribution, CON remains the primary issue for realizing EAM benefits. This does not come as a surprise, though, since mastering the more tangible structures and techniques of the EAM toolbox certainly is the core issue that needs to be addressed. Given the general maturity thereof, we may nonetheless propose that the herein confirmed institutional relations, in particular the ones geared towards stakeholder response (RES), are pivotal to bringing EAM to the next level in organizations. To that end, this work addresses a current topic as it is closely related to other recent EAM publications addressing the question of how to make EAM practices more effective in different situations based on a growing consensus of what the key concepts of EAM are (Winter et al. 2013).

Table 3. Results of PLS path analysis

Hypothesis	Path description	Path coefficient and significance	t-score	Result
H1a	LEG → RES	0.229****	3.924	Supported
H1b	EFF → RES	0.228****	3.795	Supported
H1c	GRO → RES	0.233***	3.108	Supported
H1d	TRU → RES	0.445****	6.228	Supported
H2a	GOV → CON	0.267****	3.398	Supported
H2b	GOA → CON	0.233**	2.465	Supported
H2c	ENF → CON	0.178*	1.851	Supported
H3	RES → BEN	0.227****	3.623	Supported
H4	CON → BEN	0.653****	13.421	Supported

From an institutional theory perspective, we asked how EAM's institutionalization manifests in terms of stakeholder response and structural EA consistency. Our work contributes in applying institutional concepts at an intra-organizational level, which aids both in enriching institutional theory as well as respective management practices like EAM.

What we did not explicitly discuss in this paper but consider a complementing and compatible concept to our study is the concept of institutional logics (Greenwood et al. 2011). Future research may for example discuss whether EAM thinking and values of transparent, coordinated and to some extent design restricting enterprise architecting represents a new institutional logic that penetrates large organizations. It may be interesting to use, for instance, Pache and Santos' (2013) model to analyze existing logics with respect to architectural concerns and to assess individuals' responses in light of the herein proposed factors.

Implications for EAM Practice

With these theoretical considerations in mind, several practical recommendations can be deduced from this research.

As EAM practitioners oftentimes have an IT background, we are confident that the presented perspective and the institutional factors provide valuable inspiration and vantage points to advance EAM in their organization. For organizations with a rather low EAM maturity, the professionalization of factors fostering EA consistency should be the primary concern. This comprises in particular the introduction of transparent and stakeholder-oriented governance and management processes for EAM. In a second step, we expect an adequate amount of top management support to be necessary in order to institutionalize these practices further in terms of e.g. goal alignment and enforcement measures. A practical, albeit detailed and research-based guide on how to implement and leverage EA endeavors can for instance be found in Ross et al. (2006).

However, drawing on findings from institutional theory, EAM practitioners should also start early on making EAM services appealing to stakeholders, because such processes usually take much longer than setting up the more formal structures and processes. As shown in this study, a positive stakeholder response eventually has a significant impact on wider EAM benefits. Concerning the respective factors of this study targeted at positive stakeholder responses, we may consequently propose the following recommendations for action: (1) Ideally backed up by senior management, run "marketing campaigns" for EAM and position it as desirable and rewarding for both the organization and affected stakeholders in order to raise social legitimacy. (2) Raise perceived efficiency gains of stakeholders by showing that EAM actually helps conducting analyses and projects more efficiently. This implies in particular that EAM should also find a mode that allows for quick help instead of in-depth and elaborate architecture assessment. Also, architects should gather case studies of success stories, if possible from their own organization. (3) Rationalize EAM procedures by anchoring them in or at least deriving them from the organization's strategy. Secondly, EAM norms and values should find a senior advocate or sponsor that raises the awareness of architectural issues personally. Again, this aspect of institutionalization has a lot to do with (stakeholder-specific) communication, which according to our experience is oftentimes lacking among architects that are more focused on technical matters. (4) Finally, trust building is crucial according to our study. To this end, being perceived as restrictor of design freedom or as 'police' is rarely helpful, even if this is eventually part of the job. Accordingly architects should be positioned as enablers and supporters, be skilled in their domain and be able to transport a clear and vivid vision and explanation of why EAM is necessary at all in the focal organization. Also, we observed internal architecture education and training to be a rewarding practice, as part of which architecture roles were built up that are anchored *outside* the EAM department and then contributed strongly to raising awareness of each other's problems and needs. However, given the wide field of organizational trust research (Schoorman et al. 2007), we would expect many more points to address this important factor in a dedicated and EAM-tailored fashion.

Limitations and Future Work

As with any empirical study, this work has limitations which need to be considered when interpreting the results, but which may also represent opportunities for future research. First, our data

collection—although it took place in a controlled environment—did not yield a representative sample. It might be interesting to repeat this study with respondents having different roles in their organizations. With respect to our study, we may expect a biased answer with respect to the positive effects of EAM (in particular the BEN variable) similar to Foorthuis et al. (2010). Foorthuis et al. contrasted the ratings of “EA creators” and “EA users” with respect to “EA benefits for the organization” and “EA benefits for projects”, finding that EA creators rated both benefits significantly more positive. However, Foorthuis et al. also contest that “EA users may be no less subjective [...] as they can not view the overall picture due to their local focus.” That being said, we see two implications for our study. On the one hand, we would expect a less enthusiastic rating of any business benefits if we had asked other people, i.e. EA stakeholders. On the other hand, we see our choice of respondents—enterprise architects—as an asset to the study. They may represent the minority that has an overarching view and who is therefore able to evaluate which EAM structures are established and whether this actually results in a more consolidated EA. With respect to stakeholder responses, we argue that asking enterprise architects is likewise reasonable. Due to rather short feedback loops in organizations and architects’ project work, architects are often directly confronted with stakeholder opinions and can be observed to have a realistic appreciation of the actual degree of EAM’s acceptance across stakeholders. In conclusion of these considerations, we see potential for refinement and differentiation of our results by surveying further audiences, but we have no reason to believe that our results would be strongly impeded, as we can attest a fit between our respondents’ knowledgeability and the research issue in question.

Second, while representing a relatively novel perspective on EAM with a balanced set of institutional factors, our model may allow for refinement and in particular further in-depth probing. The factors presented in this study may represent starting points for the latter. Indeed, we are currently engaged in more in-depth inquiries pertaining to how exactly architects and organizational leaders tried to address herein discussed factors in order to foster EAM’s institutionalization.

Third, we are aware of the fact that many more (contextual) factors exist, which may ultimately have an influence (e.g. on EAM benefit realization). This is not surprising though, as we are after all dealing with a wicked problem, i.e. “poorly formulated, confusing, and permeated with conflicting values of many decision makers or other stakeholders” (Pries-Heje and Baskerville 2008) and are thus naturally limited in our scope of analysis.

Finally, with our findings we hope to have sensitized both researchers and practitioners that EAM is not only a technical issue where stakeholders act rationally, but that an institutional perspective may well inform EAM phenomena. Regarding this perspective as indeed promising, we envision two major elements as future EAM research. For one thing a deeper analysis and solution development for individual institutional factors, and for another an analysis of when and how these factors should best be addressed as part of an EAM institutionalization process in organizations.

Conclusion

Starting out from the problem of institutionalizing enterprise architecture management in organizations, we formulated our research questions of 1) *What are the factors that influence an institutionalization of EAM?* and 2) *How does the institutionalization of EAM contribute to EAM’s benefit realization?* To answer these questions, we elaborated nine research hypotheses based on a triangulation of institutional theory and EAM literature, previous case study analysis and long-term EA action design research experience. The resulting research model was tested based on 105 survey responses using a PLS approach to SEM.

Our findings confirm 1) seven institutional factors as important predictors for an institutionalization of EAM and 2) that this institutionalization contributes to the realization of EAM benefits for the organization. The findings were discussed from a theoretical and a practice perspective including a proposition of recommendations for action. Future work may particularly (a) advance and confirm the herein presented relations, and (b) develop guidelines to more effectively address the individual institutional factors. Overall, the institutional lens of this work can be regarded as an enriching perspective on the predominantly practice-driven discipline of EAM and our work contributes to understanding relevant EAM challenges.

For researchers concerned with EAM we provide an instrument to observe and analyze the organizational

empowerment of their artifacts. We concede that this article is just one step towards conceptualizing the parameters that influence EAM benefits. Nonetheless, from our practical experiences we consider this a valuable step, given the level of maturity of the core EAM artifacts like models, tools, or planning approaches, to make these artifacts more effective.

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