The Impact of Enterprise Architecture Management on Design Decisions in IS Change Projects

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Abstract

Information systems (IS) change projects aim at developing consistent IS solutions for business needs. In order to avoid inconsistencies, redundancies, and misalignments among these projects, some form of cross-project guidance is needed. Enterprise architecture management (EAM) is a prominent discipline that aims to guide IS change projects not only for local business needs, but also for enterprise-wide and long-term goals. However, EAM's impact often remains limited due to the complexity of IS landscapes, conflicting goal systems, and design decisions that cater local/short-term rather than enterprise-wide/long-term solutions. Assuming that EAM does not necessarily guide all these potentially relevant design decisions in IS change projects, we explore dimensions and characteristics of design decisions based on empirical focus group data. To this end, we develop a classification scheme, based on which we identify two design decision types that embody hierarchical and lateral characteristics, respectively. Using this scheme, we discuss how to (re-)consider EAM for enterprise-wide/long-term solutions in IS change projects.

1 Introduction

An increasing number of information systems (IS) change projects in today's organizations create solutions focusing a short-term/local rather than a long-term/enterprise-wide perspective (Gardner et al. 2012; Aier et al. 2015). A frequently discussed reason is the complexity of the corporate IS landscape (Abraham and Aier 2012; Boh et al. 2003; Weiss et al. 2013): Large organizations often implement hundreds of IS landscape changes every year, affecting a large number of applications that support various depending and interrelated business processes. Design decisions on even small changes affect a potentially large number of business processes, workflows, applications, and more generally a larger group of stakeholders and their respective goals (Murer et al. 2010). Additionally, these IS changes occur not only sequentially, but also in parallel, which potentially leads to inconsistencies among applications, processes and infrastructure components on an enterprise-wide level (Winter and Fischer 2007; Lankhorst 2005; Abraham and Aier 2012). Credit Suisse, a global bank, may serve as an illustrative example: Between 1995 and 2005, individual solutions for regionally heterogeneous business processes were developed individually, having generated inconsistencies,

redundancies, and misalignment, and eventually fallen short in creating an enterprise-wide consistent IS landscape in the following years (Murer et al. 2010). In other words, design decisions for IS changes that target local optima do not necessarily generate a beneficial solution on the enterprise-wide/long-term level.

For several years, enterprise architecture management (EAM) has been researched and applied as a means for holistically guiding IS change projects toward consistent solutions on the enterprise-wide IS landscape (Aier et al. 2011; Winter and Fischer 2007; Buckl et al. 2009; The Open Group 2011). However, extant research found that EAM's impact remains limited in IS change projects and does supposably not reach all potentially relevant design decisions in these projects (Ross and Quaadgras 2012; Winter 2014; Gardner et al. 2012). While prior research has often valued the effects of EAM (Abrams et al. 2006), we assume, in line with Winter (2014), Aier et al. (2015) as well as Ross and Quaadgras (2012), that design decisions are generally a core object for achieving IS change solutions on an enterprise-wide and long-term basis.

The purpose of this study is to analyze design decisions in IS change projects. We aim to identify dimensions (e.g., acceptance of decision) and the respective characteristics (e.g., general acceptance, unequal acceptance) of design decisions in order to provide an instrument for scholars and practitioners for analyzing design decisions and their potential contribution to enterprise-wide and long-term IS solutions. Therefore, we proceed as follows: First, we review extant literature in order to position EAM as a means for achieving enterprise-wide IS solutions. Next, we collect and analyze focus group data for developing a classification scheme of design decision dimensions and characteristics in IS change projects. Based on this scheme, we identify design decisions types, and discuss how to (re-)consider EAM for achieving enterprise-wide and long-term goals through these design decisions. Implications and limitations are concluded in the final section.

2 Enterprise Architecture Management

Enterprise architecture (EA) is defined as the "organizing logic for business processes and the IT infrastructure, reflecting integration and standardization requirements" of an organization (Ross et al. 2006, p. 9). It has been largely developed by academic research and practitioners for descriptive usages, such as EA modeling (Buckl et al. 2009; The Open Group 2011). The traditional perspective of EAM goes beyond these descriptive approaches by aiming at prescriptively guiding IS change projects (Aier et al. 2015; Boh et al. 2003). These changes are often a necessary reaction to external influences on the organization (Teece et al. 1997), such as "opportunities, threats or unforeseen events" (Rouse 2006, p. 16).

EAM contributes to an organization's overall goal system by managing IS change endeavors (Winter and Fischer 2007; Lankhorst 2005) for increasing the corporate IS landscape effectiveness, manageability, and consistency (Schmidt and Buxmann 2011; Winter 2014) with a holistic perspective rather than focusing on local/short-term solutions (Aier et al. 2011). This holistic perspective reaches out in the organization for horizontal, vertical, and time dimensions (Winter and Fischer 2007; Lankhorst 2005). In these dimensions, (horizontally) all artifacts per artifact type (e.g., all applications) and (vertically) all layers of the business-to-IT stack (e.g., applications running on certain IT infrastructure and being used in certain business processes) are considered; furthermore, EAM considers these dimensions for several points in time. EAM typically approaches its holistic scope by artifacts like meta-models, models, plans and roadmaps, and coordination mechanisms, such as rules, norms, or guiding principles (Aier et al. 2015; Winter 2014). These artifacts and

coordination mechanisms are mainly driven from a centralized position in the hierarchy of an organization, following a top-down direction (Asfaw et al. 2009; Aier 2014; Gardner et al. 2012).

Despite activities for developing and institutionalizing EAM in the organization (Weiss et al. 2013; Tamm et al. 2011; Gardner et al. 2012), established EAM functions still fall short of their expected contribution in practice (Ross and Quaadgras 2012; Winter et al. 2012; 2014). Compared to its holistic perspective, there are several reasons for EAM's limited impact: One reason can be found in the scope of EAM, which often is IS-/IT-related and thus does not reach out for those parts of the organization that are not related to IS concerns or IT change projects (Ross and Quaadgras 2012; Gardner et al. 2012). Likewise, the decisions in EAM are traditionally made by a small group of enterprise architects, which limits local impacts of architectural guidance (Aier et al. 2015; Winter 2014). Other reasons may be found in the applied artifacts and coordination mechanisms of EAM: Top-down driven coordination in complex environments and sophisticated artifacts (e.g., metamodels, roadmaps) foster the centralized management of enterprise architectures, its drivers and affected stakeholders, while restricting the design freedom of individual decision-makers (Dietz 2008; Hoogervorst 2004). In all, these limitations of EAM often result in unaligned local and short-term considerations, which at the same time provide the foundation for design decisions in IS change projects. In consequence, EAM-guided change projects, while providing local (business) value, remain limited with regard to their enterprise-wide and long-term contribution.

Although concepts have been introduced that advance EAM by complementary, decentralized (also non-IS-related) perspectives in project guidance (e.g., Winter 2014), the question remains how scholars and practitioners need to consider the impact of EAM on design decisions for enterprise-wide/long-term IS solutions. Hence, the design decisions themselves become the object of analysis. This study is aimed at providing a classification scheme of these design decision for scholars and practitioners, illustrating their differentiating characteristics and dimensions (which we define as the respective classes of characteristics) for further analysis:

RQ: *What are the dimensions and characteristics of design decisions in IS change projects?*

Using the resulting classification scheme in the context of our research, we identify design decision types and discuss how to (re-)consider EAM for better guiding design decisions of the respective decision type for contributing to enterprise-wide/long-term goals.

3 Research Design

We used *focus groups* as an instrument for collecting empirical data from practitioners. For this reason, we adopted a structured *design* (section 3.1), balanced for guided interaction and data collection. Furthermore, we established a feasible *setting* (section 3.2), having a homogenous group of participants with similar backgrounds and long-time experiences (Krueger and Casey 2000) in order to facilitate the gathered data toward a classification scheme.

3.1 Design

The focus group data collection process started as group task with the collection of exemplars of design decisions in IS change projects. Based on their backgrounds and experiences (Krueger and Casey 2000) as well as for better managing discussions, two homogenous groups with four participants each were formed. Both groups had a moderator to guide interactions, to manage time, and to collect data; in this step, the overall objective was to identify and understand all relevant decision

dimensions and characteristics based on the previously collected exemplars. Our classification scheme development process was guided by the *method for taxonomy development in information systems* by Nickerson et al. (2013). Taxonomies are a form of classification that employ a *classification scheme* for grouping and categorizing objects (Doty and Glick 1994). The goal is to help both researchers and practitioners to better understand and analyze complex problem domains. Consequently, Nickerson et al.'s (2013) method aims at the schematic classification of objects; hence, we adapt their method for the development of our classification scheme.

In general, Nickerson et al.'s (2013) method starts with a definition of the meta-characteristics (purpose and scope of method application) and ending conditions (expected outcome of method application), followed by a *three-step dimension development process*, and ending up with a revision of the final construct against the earlier stated ending conditions. Regarding the three-step dimension development, Nickerson et al. (2013) propose two alternative approaches: The *empirical-to-conceptual* approach that starts with a collection of an object subset, on which characteristics will be inductively identified and finally grouped to dimensions. However, we chose to follow the *conceptual-to-empirical* approach and use conceptualization as deductive way of gathering dimensions and their characteristics based on the knowledge and experience (Nickerson et al. 2013) of our focus group members. The following examination of objects for these characteristics and dimensions founded a valid basis for the identification and discussion of design decision types.

3.2 Setting

Focus groups are supposed to provide enough time and participants for argumentative diversity on the one side, and not too many participants for ensuring a comfortable atmosphere in sharing thoughts, opinions, beliefs, and experiences on the other side (Onwuegbuzie et al. 2009). Following Kontio et al. (2004) as well as Tremblay et al. (2010), the ideal focus group is supposed to comprise three to twelve participants, requires between one to three hours, and provides guided discussions by the moderator (Kontio et al. 2004). The focus group was conducted on May 12th 2015 within an established practitioner community. Eight managing enterprise architects, representing six large organizations in the insurance, banking, and logistics industry in Germany and Switzerland, attended the workshop. Each of these managers had authority for decision-making in IS change and development projects; particularly, their project experience and decision responsibilities covered EA, the alignment of business and IT, budgeting, planning, controlling, and reporting.

The participants provided valuable information on decisions in IS change projects: The insurance and financial service industries were of particular interest as these have undergone large regulatory changes in the past years that affected organizations not only in business processes and workflows, but also in the underlying IT infrastructure. Basel III, BCBS 239 (banking) and Solvency II (insurance) are only a few examples that have challenged organizations in the use of IS in both business and IT. The logistics industry complemented our setting, however, by responding with IS change projects mainly to competitive opportunities rather than external forces in the market. Together, the motivations and backgrounds of the attending organizations for pursuing IS change projects diversely enriched our source of focus group data (Teece et al. 1997; Rouse 2006). Hence, we propose that the resulting decision characteristics and dimensions as well as the identifiable decision types are generalizable to also other than the attending organizations and their respective industries.

3.3 Procedure

The workshop was initiated by a detailed introduction, which announced the goals for each of the following steps as well as an explanation of the classification scheme development model by Nickerson et al. (2013). As outlined by the single steps of the classification development process (Nickerson et al. 2013), the procedure for the focus group was structured as follows:

Meta-characteristics. The first step was to introduce all participants to the ultimate purpose (meta-characteristics) of this study, including its objects of analysis (design decisions in IS change projects) as well as its construction method (Nickerson et al. 2013). The classification was grounded on the experience and knowledge of the participants solely (see also section 3.1). For this reason, we conducted an open, non-guided discussion among all participants, taking approximately 30 minutes. The participants were asked to name factual exemplars of design decisions in IS change projects with enterprise-wide and long-term impacts, regardless of the abstraction level. These examples were documented in the order they were named:

"Formulation of architectural principles, online solutions, using SAP HANA, SaaS solution versus own development, cloud usage strategy, definition of "client", IT platforms and infrastructure, RedHat versus Debian, SharePoint versus Confluence, planning of IT budget/investments, ad-hoc solutions in business segments, alignment in targeted architecture (business and IT), project approval business/IT, CUD requirements and applications, central versus decentralized architecture, product structure, sale channels, regulations, vertical range of manufacture, industrialization/digitalization, IT-contract and license management, cross-unit/departmental platforms, Java versus JEE, usage of boundary objects, usage of information and data models, procedure and structure of projects, business rules, key performance indicators, product portfolios, client- versus product-oriented perspectives, security dealings"

Ending conditions. We chose the ending conditions for the construction process on the following basis: All collected objects were supposed to be used for the process of refining the conceptualized results, to be classified, and there had to be at least two illustrative characteristics per final dimension. In order to avoid redundancies and to ensure mutual exclusiveness for each of the dimensions, the refinement process was supposed to end once reaching saturation by conceptualized dimensions that were not further extending/differentiating the classification scheme.

Conceptualize (new) characteristics and dimensions of objects. In this first development step, the participants of both groups directly conceptualized dimensions (without examining actual objects), to which differentiating features (i.e., characteristics) were illustrated in the following. The participants approached this step by first a rather abstract perspective, aligning highly abstract characteristics with each other in order to conceptualize dimensions, then lowering the level of abstraction in order to facilitate illustrative characteristics on a more detailed level. After 45 minutes, all dimensions were conceptualized and all characteristics illustratively enriched.

Examine objects for these characteristics and dimensions. In this step, the participants were asked to examine the conceptualized characteristics and dimensions along the previously collected set of exemplars. This step lasted about 20 minutes in total for both parallel groups. The examination of objects also started from a rather abstract perspective and became, guided by the moderator, more and more detailed over time. In all, only a few specified dimensions had to be refined, some characteristics renamed for a better understanding.

Create (revise) classification. Having conducted the last two steps in parallel, both groups' results were compared in a final discussion slot, which lasted about 20 minutes. In this discussion, the participants were asked to present their results to the other group. Both groups' results were complemented toward the final classification scheme. Using the character of the focus group method, the interaction among the participants facilitated not only the final dimensions, but also their respective characteristics. Similar to the preceding section, this step started from a rather abstract perspective and was developed by the moderator into a more detailed one over time. After approximately 20 minutes, the final ending conditions were met, having two to three characteristics grouped to one dimension, all dimensions being mutually exclusive.

4 Results

The final classification scheme (Table 1) responds to our research question with 18 dimensions. For each dimension, we identified two to three illustrative characteristics (Table 1). These characteristics serve as exploratory (however not fully exhaustive) basis for illustrating design decisions in IS change projects. The characteristics follow a certain *scale type*: There are nominal scales, characteristics that can be differentiated, although they cannot be ordered. Furthermore, there are ordinal scales, characteristics that can be ordered but their distance cannot be determined.

Group	Dimension	Illustrative Characteristics			Scale
Decision	Decision properties	Critical/political	Relevant	Not relevant	*Nominal*
	Decision nature	Attractive	Not attractive		*Nominal*
	Decision driver	Collective	Selective	Individual	*Ordinal*
	Decision object	Process	Software	Infrastructure	*Nominal*
	Decision quality	Fact-based	Personal Feeling		*Nominal*
	Level of documentation	Distinct	Partial	Unincisive	*Ordinal*
Decision Process	Decision process maturity	High	Low		*Ordinal*
	Decision-maker competency	Comprehensive	Generalized	Specialized	*Nominal*
	Decision-maker hierarchy	Executive-level	Middle-level	Low-level	*Ordinal*
	Decision-maker locality	Central	Unit-specific	Local	*Ordinal*
	Informality	Low	High		*Ordinal*
	Implementation	Instruction	Guideline	Recommendation	*Nominal*
	Reach of decision	Cross-departmental	Local		*Ordinal*
Decision Impact	Decision bindingness	Mandatory	Partially binding	Open	*Ordinal*
	Range of impact	Enterprise-wide	Organizational unit		*Ordinal*
	Decision-maker allocation	Global	Heterogeneous	Homogenous	*Nominal*
	Impact over time	Unlimited	Limited		*Nominal*
	Acceptance	General	Unequal		*Ordinal*

Table 1: Classification Scheme of Decision Dimensions and Characteristics

Decision. The participants perceived a varying degree of relevance among decision properties, which helped us to understand design decisions by characteristics like critical/political, relevant and not relevant. Similarly, practitioners offered a new perspective on the nature of a design decisions,

which was perceived as attractive (prestigious decision) and non-attractive (less relevant, routine decision). The drivers of decisions were seen as decision-executing stakeholders that can be represented by the collective organization, selected roles, or the individual. Contrary to drivers, the objects of decisions were seen as its targets, whether concerning the infrastructure, the software, or processes. The quality aspects helped us to explore IS change decisions by both subjective and objective associations: While the fact-based character appeared rather objectively evaluable, we learned that the quality is often also a subject to personal feelings and intrinsic motivations (subjectively) of the respective decision-maker. Finally, regarding the coordination character of IS change projects, we learned that not all decisions are supported by formalized mechanisms (distinct documentation), but also maintain less formal (to some degree documented) and informal (unincisive, no/very low level of documentation) ones.

Decision process. Among the reported process-grouped dimensions, which were rather generally discussed beyond specific IS change project associations, we gained insights into the maturity of decision processes. Also more generally discussed was the competency of the decision-maker: Although the focus group members reported several criteria of assessing competence, they admitted in the final in-class discussion that this dimension was perceived, to a major extent, subjectively. Competence was illustrated among comprehensive, an attribute that participants associated with high-level managers and their experience, generalized (associated with project-/line-managers), and specialized (associated with selected individuals). Informality was also discussed beyond specific IS change project associations. In this vein, participants explained localities as centralized (associated with higher influence and competence in decision-making), unit-specific and local (both associated with comparable low influences and competencies in decision-making). Likewise, they explained that hierarchy (of decision-makers) shows different characteristics, such as the executive-level, the middle-level, and the low-level. More project-dependent, we gathered insights into the mechanisms applied in IS change projects: The implementation of decisions may result by instructions (perceived as rather formal), guidelines, or recommendations (both rather informally perceived). Also project-dependent was the reach of the change decision within the firm, which varied between cross-departmental (enterprise-wide) and local (employee-/unit-specific), as stated from the perspective of our focus group participants.

Decision impact. We learned about the effects of IS change projects by the bindingness of decisions: Bindingness was discussed in a range of characteristics like mandatory (forcing effect), partially binding (guiding effect), and openness (facilitating effect). According to the participants, the impact of decisions can reach out for both IS-related and non IS-related stakeholders, ranging from enterprise-wide (strong, often long-term effects) to unit-specific (local, often specific effects). Regarding the project aspect of IS changes, the allocation of decision-makers helped us to consider decision impacts by the diversity of its concerned decision-makers, being characterized as high (global), partial (heterogeneous) and lowly diversified (homogenous). Additionally, we learned about the time-dimensional aspects of IS changes projects, considering unlimited and limited facets. Finally, we gained insights into the impacts of IS changes by the acceptance of decisions, illustrated by characteristics like general (enterprise-wide agreement) and unequal (mixed agreement).

5 Discussion

Based on the developed classification scheme, the next step is set out as identification of design decisions types, and discussion of how EAM needs to be (re-)considered for contributing to the

achievement of enterprise-wide and long-term IS solutions. Hence, we use characteristics as differentiating features in order to discuss on which decisions EAM can have an impact, those on which EAM most probably has no impact, and those not being meaningful for this particular differentiation. Using this differentiation, we defined two major types of design decisions: The *hierarchical* one, highly similar to the expected impacts of EAM (see section 2), and the *lateral* one, grounded on those decision characteristics that are complementary to the hierarchical type. Their key characteristics are briefly stated in Table 2 and illustrated in Table 3.

Hierarchical design decisions	Lateral design decisions
Top-down driven coordination mechanisms	Bottom-up consolidation, decentralized
Enterprise-wide/holistic scope	Local perspective, lateral relations
Sophisticated/formal artifacts	Less sophisticated/formalized method support

Table 2: Design Decisions and Key Characteristics

Hierarchical design decisions (see Table 3) resemble the mechanisms, scope, and artifacts of traditional EAM as stated by literature (see section 2). *Lateral design decisions* are not addressed by traditional forms of EAM: They focus on the middle and lower hierarchical levels, decentralized/local perspectives, and apply less sophisticated methods compared to the hierarchical type. In the following, we discuss the two design decision types and their implications on the use of EAM.

Group	Dimension	Illustrative Characteristics			Scale
Decision	Decision properties	Critical/political	Relevant	Not relevant	*Nominal*
	Decision nature	Attractive	Not attractive		*Nominal*
	Decision driver	Collective	Selective	Individual	*Ordinal*
	Decision object	Process	Software	Infrastructure	*Nominal*
	Decision quality	Fact-based	Personal Feeling		*Nominal*
	Level of documentation	Distinct	Partial	Unincisive	*Ordinal*
Decision Process	Decision process maturity	High	Low		*Ordinal*
	Decision-maker competency	Comprehensive	Generalized	Specialized	*Nominal*
	Decision-maker hierarchy	Executive-level	Middle-level	Low-level	*Ordinal*
	Decision-maker locality	Central	Unit-specific	Local	*Ordinal*
	Informality	Low	High		*Ordinal*
	Implementation	Instruction	Guideline	Recommendation	*Nominal*
	Reach of decision	Cross-departmental	Local		*Ordinal*
Decision Impact	Decision bindingness	Mandatory	Partially binding	Open	*Ordinal*
	Range of impact	Enterprise-wide	Organizational unit		*Ordinal*
	Decision-maker allocation	Global	Heterogeneous	Homogenous	*Nominal*
	Impact over time	Unlimited	Limited		*Nominal*
	Acceptance	General	Unequal		*Ordinal*
Explanation:		Hierarchical	Lateral	Not differentiating	

Table 3: Differentiated Design Decisions

5.1 Hierarchical Design Decisions

In all, we find the hierarchical design decisions as established targets of EAM. Using the classification scheme, we draw a parallel to the traditional EAM literature: On the one side, the *hierarchical* type maintains an enterprise-wide scope (collective drivers, cross-departmental impacts), which resembles the holistic EAM scope as expressed in horizontal and vertical dimensions (Winter and Fischer 2007; Lankhorst 2005). On the other side, this type fosters enterprise-wide perspectives by top-down driven means (e.g., centralized locality, hierarchical-/executive-level, diversified allocation) as associated with traditional EAM coordination mechanisms (Aier and Gleichauf 2010; Aier 2014). Furthermore, this design is similar to EAM in its underlying management methods, applying for instance instructions and guidelines, and supporting artifacts like characteristics of quality (fact-based), maturity (high), informality (low), bindingness (mandatory), as well as documentation (distinct), which are discussed by traditional EAM literature (Winter 2014; Aier et al. 2015; Asfaw et al. 2009; Gardner et al. 2012). Likewise, the decisions are processed by the organization as a collective rather than by selective or individual drivers.

5.2 Lateral Design Decisions

Having reviewed the remaining classification scheme characteristics, one decision type appears not to be targeted by traditional forms of EAM: The *lateral* type. Contrary to top-down driven flows of information, the lateral type appears to be grounded on local, decentralized levels of the organization, for instance among employees (e.g., selective/individual drivers) or specific organizational units (local reach). We found neither a centralized locality nor a global allocation of the decision-maker; contrary, we found low- and middle-level hierarchies as well as unit-specific and decentralized localities. Likewise, reach and impact of decisions remain rather on the local level. Contrary to the top-down structure of the hierarchical type, this decision type draws from less sophisticated support mechanisms (e.g., recommendations) and has no (formal) bindingness. Hence, also the decision methods have a less formalized/hierarchical character (e.g., high informality), expressed for instance by characteristics of decision quality (personal feelings), a low level of documentation (e.g., partial, unincisive) as well as a comparably low maturity.

The identified lateral decision type encouraged us to investigate EAM in decentralized perspectives for considerable impacts on design decisions, including coordination mechanisms and method support (Winter 2014; Proper 2014; Aier et al. 2015). Using the classification data, we explored recent advancements in literature that promote the thinking in enterprise-wide/long-term perspectives, favoring to internalize these perspectives in decisions across organizational hierarchy levels, not restricted to IS-/IT-related stakeholders (Ross and Quaadgras 2012). Considering the classification data through these concepts, the lateral type appears capable for being targeted by EAM, achieving enterprise-wide impacts on local, decentralized levels (Lattanze 2012; Aier et al. 2015; Winter 2014): For example, the proposed sophisticated character of methods can be complemented by a "lightweight" (e.g., principle catalogue, charts) method support (Winter 2014), which fits the lateral design decision as discovered in the classification scheme.

5.3 Implications on the Impact of EAM

Achieving enterprise-wide and long-term solutions in IS change projects was shown to be compromised by EAM's limited reach and impact on design decisions. In all, we can suggest two options for achieving these enterprise-wide/long-term considerations: The first one is to guide IS change

projects by targeting only those design decisions that follow a hierarchical, sophisticated character, which is expected to strengthen the impact of traditional EAM on IS change decisions.

The second option is to guide IS change projects by reconsidering traditional EAM through complementary coordination mechanisms. Similar to the *lateral* type, this option favors the inclusion of local, decentralized perspectives and the extension of EAM towards non-IS-related stakeholders (Aier et al. 2015; Abrams et al. 2006; Dietz 2008). Furthermore, enterprise-wide goals will have to be aligned with the local levels of the organization in order to bridge conflicting goal systems and to strengthen enterprise-wide, holistic considerations (Aier et al. 2015). While traditional EAM approaches focus rather sophisticated support artifacts (Aier et al. 2015; Winter 2014), the inclusion of decentralized perspectives will require decisions to follow non-hierarchical and less formalized methods (Ross and Quaadgras 2012; Winter 2014; Lattanze 2012). In sum, it will aim at educating individual decision-makers to internalize enterprise-wide/long-term considerations of the organizational IS landscape (Aier et al. 2015), thereby incorporating also non-IT-/IS-related stakeholders (Ross and Quaadgras 2012; Gardner et al. 2012) for guiding IS change projects.

To this end, the classification scheme illustrates several dimensions that remain not meaningful for differentiating design decisions into EAM-impacted and not-impacted ones, which propose an avenue for future research. For example, there are *properties* and the *nature* of decision: To the best of our knowledge, neither of these types has received an in-depth exploration by EAM literature yet. This also infers the assumption that some dimensions/characteristics are rather general attributes that are not specifically connected to the IS/IT change (project) context. Nevertheless, the participants of our focus groups discussed critical properties and attractive natures as highly relevant factors for motivating the participation in IS changes. Similar is the *object* of the decision as well as the *competency* of the decision-maker, which may shift the perspective of future research onto more environment-dependent design decision analyses; environments may change and thus will require a context-specific understanding of design decisions. Finally, the dimensions *time* and *acceptance* are important impact factors on EAM that may or may not differentiate EAM's effects from a longitudinal perspective. Based on the literature at hand, we were not able of drawing conclusions on EAM successfulness with regards to time series. However, we expect that the analysis of design decisions in IS change projects is and will receive ongoing attention as a central element for achieving consistent IS solutions with enterprise-wide and long-term considerations.

6 Conclusion

This study provides concrete insights into design decisions of IS change projects. We contribute to the understanding of guiding IS change projects by the means of EAM with illustrative exemplars of decision characteristics and dimensions that go beyond the theoretical discussions provided by literature so far. Drawing from the developed classification scheme, a large number of characteristics was meaningful for identifying types of design decisions and hence, for discussing how to achieve enterprise-wide and long-term considerations in IS change decisions by the means of EAM, following traditional and complementary perspectives, respectively. However, this study also maintains some limitations: Based on the homogeneity of the focus group, the developed classification scheme represents only a selective set out of a potentially large number of decision characteristics in IS change projects. A concrete use case would strengthen the findings to this point. Future research might also use our results as a basis for further generalizability and substantiate of the pool of identifiable design decision types.

7 References

Abraham R, Aier S (2012) Architectural Coordination of Transformation: Implications from Game Theory. In: Rahman H, Mesquita A, Ramos I, Pernici B (eds) 7th Mediterranean Conference on Information Systems (MCIS 2012), Guimaraes, Portugal

Abrams S, Bloom B, Keyser P, Kimelman D, Nelson E, Neuberger W, Roth T, Simmonds I, Tang S, Vlissides J (2006) Architectural thinking and modeling with the Architects' Workbench. IBM Systems Journal 45 (3):481-500

Aier S (2014) The Role of Organizational Culture for Grounding, Management, Guidance and Effectiveness of Enterprise Architecture Principles. Information Systems And E-Business Management 12 (1):43-70

Aier S, Gleichauf B (2010) Application of Enterprise Models for Engineering Enterprise Transformation. Enterprise Modelling And Information Systems Architectures 5 (1):58-75

Aier S, Gleichauf B, Winter R (2011) Understanding Enterprise Architecture Management Design – An Empirical Analysis. In: Bernstein A, Schwabe G (eds) Proceedings of the 10th International Conference on Wirtschaftsinformatik WI 2011, Zürich

Aier S, Labusch N, Pähler P (2015) Implementing Architectural Thinking: A Case Study at Commerzbank AG. In: Persson A, Stirna J (eds) Trends in Enterprise Architecture Research, Stockholm. CAiSE 2015 Workshops. Springer, pp 389-400

Asfaw T, Bada A, Allario F (2009) Enablers and Challenges in Using Enterprise Architecture Concepts to Drive Transformation: Perspectives from Private Organizations and Federal Government Agencies. Journal of Enterprise Architecture 5 (3):18-28

Boh WF, Yellin D, Dill B, Herbsleb JD (2003) Effectively managing information systems architecture standards: an intra-organization perspective. In: Proceedings of the MISQ Special Issue Workshop. Standard Making: A Critical Research Frontier for Information Systems, pp 171–187

Buckl S, Ernst AM, Lankes J, Matthes F, Schweda CM (2009) State of the Art in Enterprise Architecture Management. Technische Universität München Chair for Informatics 19 (sebis), Munich

Dietz JLG (2008) Architecture. Building strategy into design. Academic Service, The Hague

Doty HD, Glick WH (1994) Typologies as a Unique Form of Theory Building: Toward Improved Understanding and Modeling. Academy Of Management Review 19 (2):230-251

Gardner D, Fehskens L, Naidu M, Rouse WB, Ross JW (2012) Point-Counterpoint: Enterprise Architecture and Enterprise Transformation as Related but Distinct Concepts. Journal of Enterprise Transformation 2 (4):283-294

Hoogervorst JAP (2004) Enterprise Architecture: Enabling Integration, Agility and Change. International Journal of Cooperative Information Systems 13 (3):213-233

Kontio J, Lehtola L, Bragge J (2004) Using the Focus Group Method in Software Engineering: Obtaining Practitioner and User Experiences. In: Proceedings of the International Symposium on Empirical Software Engineering (ISESE), Redondo Beach

Krueger RA, Casey MA (2000) Focus Groups: A Practical Guide for Applied Research. 3 edn. Sage Publications, Thousand Oaks, CA

Lankhorst M (2005) Enterprise Architecture at Work: Modelling, Communication and Analysis. Springer, Berlin

Lattanze AJ (2012) Infusing Architectural Thinking into Organizations. IEEE Software 29 (1):19-22

Murer S, Bonati B, Furrer FJ (2010) Managed Evolution: A Strategy for Very Large Information Systems. Springer, Heidelberg

Nickerson RC, Varshney U, Muntermann J (2013) A method for taxonomy development and its application in information systems. European Journal of Information Systems 22 (3):336-359

Onwuegbuzie AJ, Dickinson WB, Leech NL, Zoran AG (2009) A qualitative framework for collecting and analyzing data in focus group research. International Journal of Qualitative Methods 8 (3):1-21

Proper HA (2004) Enterprise Architecture: Informed Steering of Enterprises in Motion. In: Hammoudi S, Cordeiro J, Maciaszek LA, Filipe J (eds) 15h International Conference ICEIS 2013, Angers

Ross JW, Quaadgras A (2012) Enterprise Architecture Is Not Just for Architects. Center for Information Systems Research Sloan School of Management Massachusetts Institute of Technology, Cambridge, MA

Ross JW, Weill P, Robertson DC (2006) Enterprise Architecture as Strategy. Creating a Foundation for Business Execution. Harvard Business School Press, Boston, MA

Rouse WB (ed) (2006) Enterprise Transformation: Understanding and Enabling Fundamental Change. John Wiley & Sons, Hoboken

Schmidt C, Buxmann P (2011) Outcomes and success factors of enterprise IT architecture management: empirical insight from the international financial services industry. European Journal of Information Systems 20 (2):168-185

Tamm T, Seddon PB, Shanks G, Reynolds P (2011) How Does Enterprise Architecture Add Value to Organisations? Communications of the Association for Information Systems 28 (1):141-168

Teece DJ, Pisano G, Shuen A (1997) Dynamic Capabilities and Strategic Management. Strategic Management Journal 18 (7):509-533

The Open Group (2011) TOGAF Version 9.1. TOGAF Series. Van Haren Publishing, Zaltbommel

Tremblay MC, Hevner AR, Berndt DJ (2010) The Use of Focus Groups in Design Science Research. In: Hevner AR, Chatterjee S (eds) Design Research in Information Systems: Theory and Practice. Edition 2010 edn. Springer US, Boston, MA

Weiss S, Aier S, Winter R (2013) Institutionalization and the Effectiveness of Enterprise Architecture Management. In: 2013 International Conference on Information Systems (ICIS 2013), Milano

Winter R (2014) Architectural Thinking. Business & Information Systems Engineering 6 (6):361-364

Winter R, Fischer R (2007) Essential Layers, Artifacts, and Dependencies of Enterprise Architecture. Journal of Enterprise Architecture 3 (2):7-18

Winter R, Townson S, Uhl A, Labusch N, Noack J (2012) Enterprise Architecture and Transformation: The Differences and the Synergy Potential of Enterprise Architecture and Business Transformation Management. 360° – The Business Transformation Journal (5):22-31