Establishing 'Architectural Thinking' in Organizations

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1 Extended Abstract

Over the past decades, we have witnessed an enormous growth of investments in information systems (IS) in organizations. On the one hand, increasing investments in IS had a significant impact on most organizations' performance. On the other hand, these investments resulted in a significant complexity of the corporate IS architecture (i.e., the organization's fundamental IS components, their inter-relationships, and the principles governing their design and evolution [1]), which mainly results from the allocation of project ownership and IS design decision authority to local (business) units. This practice of managing the IS architecture has brought about a large and ever-growing number of heterogeneous IS, which are costly to maintain, tightly interrelated, and which lack flexibility with regard to business changes and technical innovations. Over the years, many organizations have lost control of their IS architecture complexity, i.e., were unable to steer the evolution of their IS architecture so that it maintains a sufficient flexibility in conforming to constantly changing business requirements and technical innovation.

To address this challenge, scholars and practitioners have broadly propagated the concept of enterprise architecture management (EAM) for systematically aligning locally governed IS investments with enterprise-wide objectives. In its traditional fashion, EAM establishes centralized, top-down driven, enterprise-wide governance mechanisms that aim at maintaining transparency, coherency, and ultimately flexibility of IS architecture. Such governance mechanisms include, but are not limited to developing, maintaining, and enforcing top-down, centralized architecture principles, architecture compliance checks, to-be architectures, and committees or procedures for architectural coordination, to eventually influence local IS development projects. The EAM discipline has matured over the last decades by (i) diversifying its scope from software architecture to application architecture and from process architecture to business architecture, (ii) widening its focus from single solutions to functional/business areas, to enterprise-wide, or even to cross-enterprise architecture management, (iii) expanding its sphere of influence from a single architectural layer (e.g., IT artifacts or business artifacts) to various interdependencies across the entire business-to-IT stack, and by (iv) representing not only as-is or to-be states of

architectural entities, but also roadmaps or scenarios to cover the entire architecture life cycle. Following EAM's raise in maturity, it has largely gained momentum so that organizations established various 'architect' roles and functions.

Notwithstanding the abovementioned advances, the EAM discipline still struggles with some formational challenges. First, although many architects tried to position themselves as a linking-pin 'between' corporate management, business/project owners and IT, their backgrounds and competency profiles often kept them close to the corporate IT functions [2]. Second, exercising EAM as a centralized mechanism for coordinated IS development, which aligns local projects with enterprise-wide priorities, is the antagonist of un-coordinated IS development projects in pursuing local goals. From local business stakeholders' perspective (e.g., a particular market, product, function owner), the promoted enterprise-wide coordination by EAM are naturally regarded as a "restriction of design freedom" [3]. The latter hence threatens EAM's acceptance by those local actors that not only own business change problems, but also respective IS development projects.

EAM's traditional way of dealing with "resistance to coordination" is (i) to communicate its local efficiency contributions (e.g., reduced IT operations costs due to less heterogeneity and more re-use) and (ii) to increase its local effectiveness (e.g., by governance measures). For both strategies, however, empirical research demonstrates an S-shaped benefit curve [4]. After harvesting 'low hanging fruits' in early stages of EAM, it becomes increasingly difficult to keep up with large benefit realizations in later stages. At some point, an optimal productivity level of EAM will be reached after which additional EAM efforts cannot justified with the argument of realizable business value [4]. Simultaneously, IS architecture complexity can be expected to remain high or even increasing.

The abovementioned observation cannot be related to immaturity of EAM concepts or deployment, but rather to general acceptance problems of EAM by local stakeholders [5]. Convincing local stakeholders that overall benefits on the enterprise-wide level justify individual sacrifices remains a difficult undertaking. Illustrative examples of such challenge cannot only be found in enterprises (e.g., centralizing procurement processes), but are also common in public policy (e.g., imposing speed limits around schools, imposing smoking bans in public areas, transforming energy production and consumption).

In order to move to the next level of EAM productivity, it appears necessary to shift the focus from an enforcement-centric view (i.e., enhancing EAM governance) towards an influence-centric view (i.e., improving the EAM influence on local stakeholder decisions) [5]. This implies not to focus on the traditional EAM players (IT unit, architects, enterprise management) any more, but instead on "that other 90% of the enterprise" that are not directly related to the IT function [6]. As these stakeholders (e.g., business market, product, function owners) cannot be controlled by EAM measures with a reasonable effort, EAM needs to focus not only on enforcement, but also (or even more) on influence. As a consequence, control as a central theme of EAM research is complemented by informing, legitimating, and socializing [7].

How can the behavior of independent actors be effectively influenced so that enterprise-wide objectives are sufficiently addressed even if they require individual

sacrifices? The "New institutionalism" offers an explanation why and how regulations become institutionalized by actors, i.e., develop "a rule-like status in social thought and action" [8]. Relying on this theoretical lens, when a pressure is exerted with the aim of complying with some 'grand design', individuals' reactions to such pressure can be explained in a range of acquiescence, compromise, avoidance, defiance and manipulation reaction [9, 10]. Weiss et al. [11] employed this theoretical lens to study EAM and show that an individual actor's response towards EAM measures (i.e., pressures) depends on social legitimacy, efficiency, organizational grounding, and trust. Following Social legitimacy, actors gain social fitness inside the organization when they comply with architectural guidelines. Furthermore, actors become more efficient when following architectural guidelines. Organizational grounding that EAM is anchored within the organization's values in terms of strategy definition, top management support or the position in the organizational hierarchy. Finally, trust reflect actors' confidence on the fact that the EAM function does the right things in a right way [11].

Based on these insights, which explain under which conditions individual actors comply with restricted design freedom, appropriate preconditions can be derived to increase the acceptance of EAM:

1. Actors need to be convinced that their social status will be raising if they comply with EAM measures – and vice versa.
2. Actors need to understand that they can be more efficient if they comply with EAM measures – and vice versa.
3. Actors need to perceive EAM as something that is strategically important for the organization.
4. Actors need to perceive EAM deployment as transparent, useful, and professional.

Exemplary measures to create such preconditions can be:

1. Create transparent conditions to business people who of their peers is compliant and who is not. For instance, label applications in a way that users see whether they use a compliant or a non-compliant application (works like energy efficiency labels) – and provide evidence that the user perception of an actor's compliance is impacting his/her social status.
2. Demonstrate the positive impact of EAM measures – as well as the damage of ignored or compromised EAM measures. For instance, seriously calculate the avoidable lifetime ownership costs of a redundant application. For IS portfolios of a business unit, as another example, explain complexity costs and show how EAM measures reduce operations or project costs.
3. Position EAM leaders on high levels of the organizational hierarchy – and not as a specialist team in IT management. Discuss architectural issues in important/powerful corporate committees. Promote successful specialists or line/project managers to architect functions and successful architects back into line/project management.
4. Ensure that architects and architectural artifacts are not only visible in the business, but also are able to credibly position themselves as business- and synergy-oriented. For instance, the use of coherency-oriented, high complexity models should be

avoided. Instead, when interacting with local business stakeholders the focus of architects should be on lightweight artifacts and local concerns ("boundary objects" [12, 13]).

The presented measures promise to influence local decision-makers on the business side towards increasing their acceptance of EAM-related design restrictions. This way of thinking and acting by local and individual actors (i.e., not only restricted to architects and IT people) in considering enterprise-wide, long-term concerns as well as fundamental IS design and evolution principles in day-to-day decision making practices (e.g., change requests), has been termed "Architectural Thinking" (AT) by Ross and Quaadgras [4]. AT promises to move EAM to the next productivity level, as additional acceptance (and thus EAM impact) can be achieved without heavily increased (and expensive) EAM governance efforts. However, AT can neither be designed, deployed, nor implemented like traditional EAM governance. As a way of thinking, AT can only be propagated in an organization by creating supportive conditions [5].

While we have yet not witnessed large-scale AT initiatives in practice, many organizations have become aware of the approach and have implemented selected measures in order to explore potentials of EAM evolution (e.g., [14]). A frequently implemented measure is to move the architecture function away from IT and more towards a business unit, and to create architecture spin-offs in business units or project offices of large projects ("Design Authority"). We also note an increasing number of initiatives to broadly demonstrate the value contribution of EAM and/or to explain architectural coordination goals to the business. Likewise, architecture functions have started to develop and track strategy- or business-oriented performance indicators (e.g., resistance to change, solution sustainability, or architectural fit [15]).

In order to design effective and efficient artifacts that raise EAM impact to the next level, further insights into the institutionalization mechanisms are necessary. From a static perspective, explanatory research may identify additional or modified justificatory foundations. Differentiated studies are also needed to better understand contingencies, such as organizational subcultures, industry characteristics (e.g., speed), or management styles, among others.

From a dynamic perspective, one avenue is to analyze the overall performance of EAM (both on the project and the enterprise-wide level) as a result of de-central knowledge acquisition and cooperative learning [16]. Being very much in line with our call for shifting EAM focus on influence rather than enforcement, the autonomous character of knowledge acquisition as well as learning would imply major EAM capability and instrument adaptations.

A second avenue for dynamic analysis is based on archetype theory [17] which understands organizations as configurations of (i) structural arrangements and (ii) interpretative schemes. An interpretative scheme describes an organization's conception on what it should be doing, how it should be doing, and how it should be judged. This conception is shaped by the prevailing set of ideas, beliefs, and values. The structural arrangement implements and reinforces the ideas, beliefs, and values through establishing organizational structures and processes that reflect the respective beliefs and values [18]. In an ideal case, organizations will evolve towards a situation of organizational coherence, where the structural arrangement and the interpretative

scheme represent an "appropriate design for adequate performance" [18] Schilling et al. [19] explore this lens from an IS research perspective. Such an analysis could help to better understand how "measures aimed at creating preconditions for EAM acceptance" interact with organizational ideas, beliefs and values so that, ultimately, local actors can be effectively influenced to better comply with enterprise-wide goals.

While the static and the dynamic perspectives help to better understand AT and design appropriate interventions, continuing empirical analyses will be needed on how organizations learn to move from traditional EAM towards AT and how these two approaches complement each other.

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