

Architectural Thinking

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1 Capped Impact of Traditional Architecture Management

Except for very small systems, short projects and/or special situations, architectural considerations are usually regarded to be essential for systems development. The seminal architecture definition from the late 1990ies in ISO norm 1471 for software intensive systems states that, besides the “fundamental organization of a system”, also the “principles for its design and evolution” need to be specified (IEEE 2000). This definition has been re-used ever since – not only in the current ISO norm 42010 for requirements engineering of software systems (ISO/IEC/IEEE 2011), but also in the current TOGAF version (The Open Group 2011) for enterprise architecture.

Stakeholder groups that have a holistic, long-term perspective (such as IT or corporate management), believe or at least should believe that architecture is no emergent feature of a complex system, but needs to be explicitly planned, implemented, controlled and adjusted (Winter 2004). Stakeholder groups whose in-

terests are more focused or short-term, however, might not always share that belief. They often prefer an opportunistic systems development process with architecture being an ‘emergent’ feature.

As a consequence, architecture management (AM) is established at various levels of rigidity and impact not only across, but even within organizations. Regardless of the actual compromise between deliberate and emergent architecture in an organization (or parts of that organization), the AM discipline for information systems has matured over the last decades by

1. diversifying its object from software AM over application AM and process AM to business AM,
2. widening its scope from single solutions over functional/business areas to enterprise-wide or even cross-enterprise AM,
3. extending its scope from single object layer (IT artifacts or business artifacts) AM to AM across the entire business-to-IT stack (Enterprise Architecture Management), and
4. representing not only as-is or to-be systems states of architectural entities, but also roadmaps or scenarios in order to cover the entire architecture life cycle.

As AM matured, it gained importance and various ‘architect’ role models in organizations were established. Although many architects aimed at positioning themselves ‘between’ corporate management, business/project owners and IT, their backgrounds and competency profiles often kept them close to the corporate IT function (Aier et al. 2008).

A recent MIT CISR enterprise AM study reveals that “more mature architectures do not necessarily lead to business value” (Ross and Quaadgras 2012, p. 1). In contrast to the historical impact increase of AM, a turning point might have been reached where additional AM effort is no longer justified by appropriate impact gains. The MIT researchers believe that the capped impact results from the fact that AM is driven primarily by architects and is valued primarily by IT people, so that its effects in an organization are often limited to these stakeholder groups. Although it is possible to reach other stakeholder groups with

AM, e.g., by implementing tight governance mechanisms, too much effort is needed to make AM efficient. In order to further increase AM impact and justify additional maturity enhancements, additional stakeholder groups need to be reached without expensive measures. Non-architect decision makers in business units promise to be the most attractive targets for adopting architectural considerations.

2 Architectural Thinking – A Complementary Approach to Architecture Management

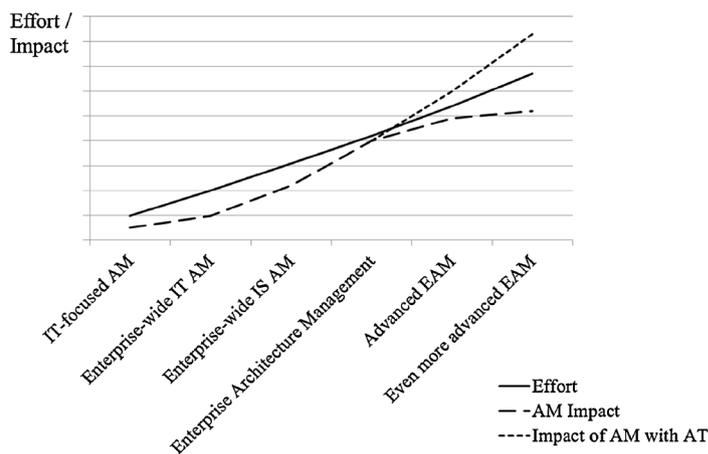
Ross und Quaadgras (2012) characterize Architectural Thinking (AT) as the way of thinking and acting *throughout an organization*, i.e. not restricted to architects and system developers. It considers holistic, long-term system aspects as well as fundamental system design and evolution principles in day-to-day decision making (e.g., change requests). If AT is adopted by these stakeholder groups, the impact of AM should also extend to the 90 % of an organization that is not directly related to systems development and where therefore “IT style” AM is not efficient (Gardner et al. 2012).

Figure 1 sketches illustrative curves for the effort associated with AM and for its overall impact. According to the MIT study, increasing sophistication of AM creates increased effort (solid line in **Fig. 1**), but beyond a certain maturity it produces decreasing value (broken impact line in **Fig. 1**) due to expensive enforcement efforts outside IT-related stakeholder groups. If “IT style” AM is complemented with AT, additional value is created (dotted impact line in **Fig. 1**) which justifies even highly sophisticated AM efforts.

In contrast to AM that addresses expert users, AT addresses business (and not architecture) professionals. As a consequence, AT positions itself as a lightweight (e.g., less formalized), utility-centered approach that is aimed to support non-architects and people outside the IT function to understand, analyze, plan, transform and communicate fundamental structures and design/evolution principles of what they

Table 1 Shared properties and differences of architecture management and Architectural Thinking

Shared properties	Traditional architecture management	Architectural Thinking
Granularity of the information basis for decision-making	Fundamental structures and design/evolution principles	
Goal dimensions	Reduce redundancies, increase consistency, increase manageability, exploit synergies, increase flexibility	
Decision scope and time horizon	Beyond specific (project, business line), medium- or long-term	
Differences	Traditional architecture management	Architectural Thinking
Driver/Owner	Architects	Individual decision-makers
Hosting organizational unit	Primarily IT; sometimes corporate center	Business lines
Addressed stakeholders	Various (IT, corporate management, business lines)	Individual decision maker (= owner)
Benefit type	Enterprise-wide, long-term: “what’s in it for the enterprise”	Local utility, medium-term: “what’s in it for me and why is it beneficial for all of us”
Threads for benefit realization (and solution strategy)	‘Ivory tower’ → engage architects in change projects	‘Local’ architectures → bottom-up consolidation
Method support	Dedicated, sophisticated methods and tools: expert users!	Lightweight, pragmatic (e.g., principle catalogues, calculation templates, charts): users are not architecture experts!

**Fig. 1** Illustrative visualizations of AM efforts, AM impact and the impact effects of AT

perceive as their work system, i.e. to adopt holistic, long-term considerations in their daily decisions. By establishing AT, “that other 90 % of the enterprise” (Gardner et al. 2012, p. 287) should be enabled to see the bigger picture instead of focusing solely on a specific line of business, a specific project, a specific function, a specific goal vector, or a combination of these. In **Table 1**, the shared properties and differences of AM and AT are summarized.

Enterprise-wide thinking ‘beyond functional silos’ is not new to management and has, e.g., already been advocated in the context of process orientation. AT goes beyond process orientation

by extending the decision scope beyond specific business processes and by stretching the decision horizon to medium- or even long-term considerations. As a consequence, goals like synergy exploitation, sustainability or changeability can be pursued that are traditionally not addressed by process orientation.

3 Establishing Architecture in the Business: A First Step Towards Architectural Thinking

After more than a decade of research and practice in enterprise-wide AM, a large

amount of academic as well as practical knowledge for its effective and efficient implementation is available. But how can AT be understood and implemented? A straightforward approach is to ‘bring architecture to the business’, i.e. to build up AM competency and responsibilities in business lines (and not in a central architecture unit or in the IT unit), thereby enabling many additional people in the organization to ‘think and act architecturally’.

In the exemplary case of a large Swiss insurance company, traditional AM is implemented in form of a central ‘Strategy and Architecture’ unit within the corporate IT function that is comprised of ‘Enterprise Architecture’, ‘Integration Architecture’, ‘Architecture Processes and Tools’ and ‘IT Strategy’ sub-units. While AM is implemented within corporate IT, an important step towards AT is made by establishing a ‘Business Architecture’ unit outside of corporate IT, namely within the ‘Corporate Services’ function that also comprises ‘Controlling’. This ‘Business Architecture’ unit is a service center (but not the organizational home!) for all ‘local’ business architects and solution architects which develop new products and services, change the organization, (re)design information flows, and thereby drive the evolution of the company’s work system in various small and large change projects. Thus a (logically) enterprise-wide, but not physically centralized practice community of architects

is established. While being supported by the (IT unit-hosted) competence centers ‘Business Analysis’ and ‘Solution Architecture’ in terms of tools, principles, standards, skill development and common aggregate models/roadmaps, these local architects report to their local business line stakeholders and not to a central unit.

While positioning solution-oriented architects in the business appears to be a good idea to extend the outreach of AM, it continues merely to affect a fraction of “that other 90 % of the enterprise” (Gardner et al. 2012, p. 287) which should adopt AT – still only business/solution architects and project teams become directly involved.

4 Creating Conditions for Wide-scale Adoption of Architectural Thinking

While the general AM/AT goals (see Table 1) are readily acceptable by all organizational actors, AM/AT’s downside is that “architecture restricts design freedom” (Dietz 2008). Despite reasonable arguments to pursue company-wide optimization (e.g., reducing functional redundancies of solutions) instead of realizing local optima found in the individual goals of projects or organizational units etc., organizational actors are often reluctant to follow AM’s norms and guidelines (Weiss et al. 2013). Short-term, ‘local’ goals appear to frequently overlay medium- or long-term, company-wide goals.

When AM exerts pressure to comply with ‘grand designs’, organizational actors’ reactions can range from acquiescence over compromise and avoidance all the way to defiance and manipulation (Oliver 1991; Pache and Santos 2013). In order to establish AT ‘beyond architects’ (in IT as well as in business), conditions need to be created that support acquiescence or compromise with restricted design freedom.

New institutionalism aims at explaining why and how imposed regulations in organizations are ‘institutionalized’ by the addressed actors, i.e. develop “a rule-like status in social thought and action” (Meyer and Rowan 1977). Weiss et al. (2013) have adopted this theoretical lens to AM/AT and show that social legitimacy, efficiency, organizational grounding and trust have significant influence

on the actor’s response towards restriction of design freedom ($R^2 = 0.632$). As a consequence, supportive conditions need to be created in the form that

- actors gain social fitness inside the organization when complying with architectural guidelines (social legitimacy),
- actors become more efficient when following architectural guidelines (efficiency),
- AM is anchored within the organization’s values in terms of strategy definition, top management support or the position in the organizational hierarchy (organizational grounding), and
- actors are confident that the AM function does the right things in the right way (trust).

While AM cannot directly ‘create’ AT, it can create conditions under which AT is more likely to develop and sustain.

5 Future Research on Architectural Thinking

AT promises to significantly extend the impact of AM in organizations, thereby ultimately justifying AM investments. Creating favorable conditions for AT has however not been specifically addressed by most approaches and frameworks for AM. Future research is needed to close that gap:

- Mechanisms need to be investigated that impact the social fitness of organizational actors and relate it to architectural compliance.
- Co-creation mechanisms need to be investigated that link actors’ ‘tasks to be done’ to architectural guidelines. Those guidelines are not a ‘product’ that is consumed by “that other 90 % of the enterprise”, but instead are an affordance that should create ‘value in use’ for these actors. As a consequence, context and situations of use need to be better understood, and architectural guidelines need to be configurable to those contexts and use situations.
- Architects need to be positioned as valuable business supporters instead of annoying ‘restrictors of design freedom’. This implies that actors’ activities need to be thoroughly understood and can be effectively supported by architects. While solution architects are a common example, a more specific example is architectural support for enterprise transformations (Labusch

et al. 2014). In many cases it might be more appropriate to choose job titles other than ‘architect’ for such support functions.

- Architects need to constantly demonstrate and communicate their value contribution. Again, this cannot be achieved as long as architectural output is regarded as a ‘product’. As providers of a service, architects need to understand their share of value creation for diverse stakeholders, need to tailor their support to a variety of ‘tasks to be done’, and should be able to accept different degrees of architectural compliance.

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