How Do Enterprise Architecture Practices Mature?

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Introduction

Enterprise architecture (EA) represents a very complex and multifaceted organizational practice. It encompasses various interlaced processes, actors, documents, activities and decision-making procedures that together form a coherent system of disciplined business and IT planning integrated into the body of organizations (importantly, this article discusses specifically *in-house* EA practices and has nothing to do with short-term EA consulting engagements, or EA projects).

Organizations, as organic rather than mechanic entities, cannot be planned and then constructed. Instead, they evolve or grow over time in a path-dependent manner driven by the pressures and opportunities of their external and internal environments. EA practices also cannot be simply "brought" into organizations mechanistically, but need to be carefully cultivated, gradually embedded into the organizational organism and institutionalized to become established ways of getting things done.

Unsurprisingly, a number of specialized maturity models were proposed to guide the evolution of EA practices in organizations and assess their progress in passing through different maturity stages. However, the existing EA maturity models have virtually nothing to offer to the EA community.

What Is Wrong with the Existing EA Maturity Models?

Mainstream approaches to assessing the maturity of an EA practice are represented by the family of original EA maturity models from the 2000s inspired by the five-level Capability Maturity Model (CMM) for software development (e.g. EACMM and EAMMF)[1, 2, 3] and their modernized descendants promoted by different authors[4, 5]. These models have at least three critical problems.

First, all CMM-based EA maturity models are *imitative in nature* and mindlessly mimic the source. They represent superficial adaptations of the seminal CMM to the realm of enterprise architecture produced by merely putting new EA-related labels on the old five-level skeleton and applying some other adjustments.

Second, all these maturity models are *perfectly speculative* and have no traces of underlying empirical evidence substantiating their creation. On the contrary, the subsequent experience of using one of the foundational models, EAMMF, has demonstrated that EA practices generally did *not* mature in accordance with its suggestions[6], so that this model was later repositioned to be only "a flexible frame of reference" that "is not intended to be viewed as the sole benchmarking tool for informing and understanding an organization's journey toward architecture maturity"[7, pages 9-10].

Third, these maturity models either link to the flow of faddish step-by-step EA methodologies (e.g. preparing, initiating, developing, completing and leveraging), or fail to capture any
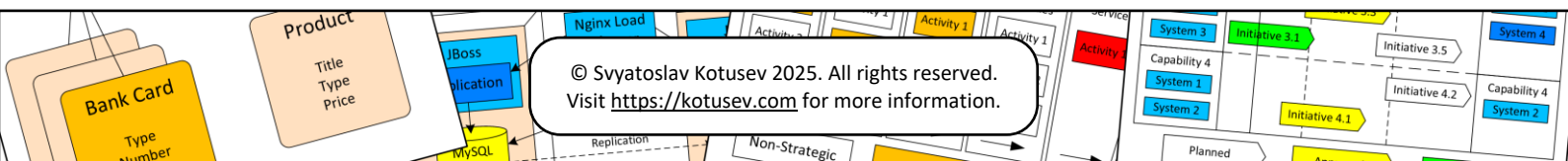
structural changes occurring in an EA practice at all (e.g. informal, repeatable, defined, managed and optimizing). In the former case, they are simply inapplicable because successful EA practices in organizations actually do not resemble any step-by-step, TOGAF-style methodologies[8, 9, 10]. In the latter case, they can be used, at best, as checklists or loosely related measurement scales for different aspects of an EA practice that, on the whole, hardly elucidate the logic of its maturation.

Another noteworthy EA maturity model was developed independently at the MIT Center for Information Systems Research (CISR) in the mid-2000s[11]. Even though the CISR model is free from the problems with CMM-based models described above, for a number of debatable and long-to-explain reasons, this model has not been adopted widely across the industry and has not entered the "arsenal" of most EA practitioners.

To summarize, despite the presence of many maturity models in the EA discourse, the notion of EA maturity still remains largely *undefined* in the sense that realistic and workable instruments for assessing the maturity of EA practices and guiding their evolution are absent (besides the intuitive judgment and wisdom of experienced architects). Currently, the word "maturity" in reference to an EA practice is, for the most part, just a sophisticated synonym for "quality", while "using maturity models" often means simply "ranking on a five-point scale".

# How Do Enterprise Architecture Practices Actually Mature?

Since 2014, as part of my continued research efforts, I have interviewed numerous architects from about a hundred different companies with internal EA practices. One of the contextual questions I normally asked them was "How long has your organization been practicing enterprise architecture?", and the most typical reply was "In the current form for N years, while before that we only did A, B and C", which allowed me to contrast the present and previous conditions of EA practices in various organizations. By means of comparing these conditions across the organizations and identifying common evolutionary patterns, I noticed that EA practices tend to evolve generally in the same way and go through a number of similar stages that form a rather consistent sequence.

Concretely, this sequence includes three distinct EA maturity stages, or four stages, if we consider the absence of any EA-related manifestations as stage zero. Using the commonly accepted industry jargon, these stages can be titled as "No Architecture" (stage zero), "Only Solution Architecture" (stage one), "Just IT Architecture" (stage two) and "True Enterprise Architecture" (stage three). Each of these stages is characterized by the presence of certain architecture positions, utilization of specific types of EA artifacts, institutionalization of particular procedures and governance arrangements, as well as some other important features. Together, these stages form a practical four-stage EA maturity model that can be used to assess EA practices in organizations and guide their further evolution.

Stage Zero: No Architecture

Stage zero (No Architecture) is characterized by the absence of any elements of an EA practice whatsoever. At this maturity stage, organizations employ no architects, create no EA artifacts and perform no EA-related activities. They have no EA practices to speak of.

In these organizations, the portfolio of IT initiatives is shaped based mostly on an intuitive understanding of what needs to be done, while the projects themselves are accomplished essentially in an ad hoc fashion using arbitrary technologies and implementation approaches
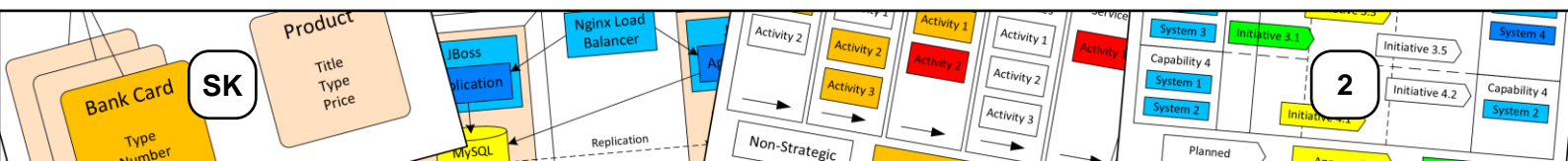
deemed appropriate by senior project team members. No one can say with certainty whether undertaken IT investments contribute to strategic goals, no one has confidence with regard to the timelines and costs of proposed IT solutions and no one knows for sure what IT resources exist in the corporate landscape.

Organizations at this stage of EA maturity suffer from all sorts of IT-related inefficiencies including, but not limited to, various technical and managerial project delivery risks, soaring maintenance costs, exceeding complexity and dangerous fragility of the IT landscape, inability to integrate isolated systems and obtain necessary information, as well as strategic misalignment between business and IT.

Stage One: Only Solution Architecture

Stage one (Only Solution Architecture) is characterized by the presence of a narrow subset of an EA practice that is generally known under the umbrella term "solution architecture" — systematic architectural planning of individual IT solutions. At this maturity stage, organizations hire professional solution architects to support IT projects throughout their entire implementation lifecycle, from an initial business idea all the way down to system deployment[12], but no broader-scope architectural planning takes place.

In these organizations, all IT projects follow repeatable, administratively enforced step-wise methodologies and involve competent solution architects to assist their progress during different steps. For example, in the early concept step, architects consult business managers regarding the possible approaches to solving the stated business problem with IT and produce the corresponding solution options based on which the way forward is determined. In the next decision step, architects create more elaborate solution overviews to better understand the structure of required IT solutions and substantiate business cases for the respective IT investments. In the concluding design and delivery steps, architects develop more detailed technical solution designs to define the necessary system components and then supervise project teams during their construction. This architectural planning, however, is still limited to separate IT projects and does not expand beyond the scope of specific solutions. For instance, these organizations have no global technology standards, they are poorly aware of their current IT landscapes and their initiative portfolios are formed mainly by some intuitive considerations of their business and IT leaders.

Organizations at this stage of EA maturity enjoy various benefits associated with disciplined solution implementation, e.g. reduced project risks, fewer unhappy surprises, improved accuracy of time and cost estimations, as well as a better understanding of the resulting business value. At the same time, due to the lack of any broadly scoped planning endeavors, such benefits as overall landscape efficiency, increased asset reuse and strategic business and IT alignment remain unrealized. Since the importance of carefully designing solutions is intuitively understood within both business and IT circles and these efforts are not associated with any serious conflicts of interests, reaching this maturity stage arguably poses no particular difficulties for organizations.

Stage Two: Just IT Architecture

Stage two (Just IT Architecture) is characterized by the developed global thinking that takes into account various landscape-wide considerations, though only of a purely technical nature. At this maturity stage, organizations employ dedicated enterprise architects, possibly on a part-time basis, who ensure the overall consistency, rationality and fitness of all IT-related planning decisions. Their IT infrastructure is managed organizationally, but not in a way integrated with strategic business planning.
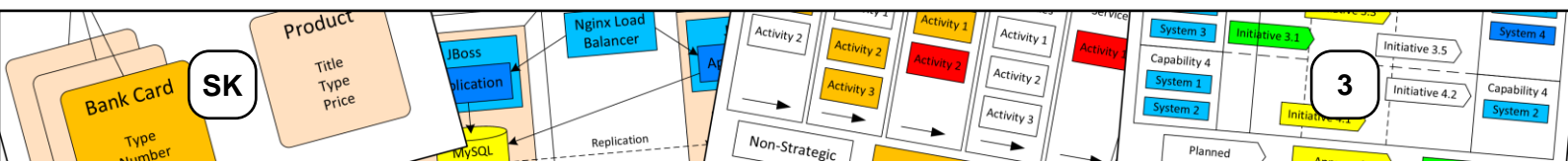
This maturity stage is associated with several concrete practices that enable global optimization of the corporate IT landscape. First, these organizations develop enterprise-wide technology standards, patterns and guidelines and also establish design committees (e.g. architecture review boards) or other simpler forms of control over the architectures of IT solutions to achieve their conformance to those standards, as well as exception management procedures to approve justified deviations from the standards. Second, these organizations create centralized architectural repositories to capture their current landscape structure and start to keep track of the existing IT resources, control their lifecycles and identify possible opportunities for asset reuse, renovation and retirement. Third, these organizations introduce separate mechanisms for funding architectural rationalization initiatives bringing no evident business value, but necessary for optimizing the IT estate, doing cleanup and "keeping the lights on". They may also adopt some more advanced architectural practices, e.g. explicit evaluation and management of architecture debts.

Organizations at this stage of EA maturity start to reap the core benefits of landscape-wide planning including decreased support and maintenance costs, reduced complexity and increased flexibility of the IT landscape, greater reuse and utilization of the available IT assets, lowered dependence on legacy products and technologies, as well as faster initiative implementation. However, because of the technical focus of the respective planning practices, strategic business and IT alignment in these organizations is still not achieved. Although the benefits of viewing the corporate IT landscape holistically are widely acknowledged in the IT community, this holistic approach provokes inevitable tensions between global and local interests and concerns of architects and project teams, and overcoming these tensions arguably represents the key challenge of reaching this maturity stage.

Stage Three: True Enterprise Architecture

Stage three (True Enterprise Architecture) is characterized by the direct participation of senior business management in architectural planning. At this maturity stage, organizations employ full-time enterprise architects, who actively engage with business leaders and develop collectively agreed long-term joint plans for business and IT[12].

In these organizations, enterprise architects frequently communicate with high-ranking business managers in a largely informal manner to come up with a shared understanding of what exactly business and IT need to do in the future. To facilitate these conversations and record their outcomes, architects often use such EA artifacts as principles, architecture strategies, business capability models and target states. Usually, these conversations also result in itemized investment roadmaps for the foreseeable future that subsequently shape the portfolio of IT initiatives executed in the organization. Roadmaps and other strategic EA artifacts are periodically revised and signed off to serve as official guidance for making investment prioritization, technology selection and project initiation decisions. Besides that, these organizations also involve senior business executives in architecture governance procedures and often establish C-level governance forums for discussing various architectural decisions with far-reaching repercussions for the business, thereby fusing business and IT decision-making.

Organizations at this stage of EA maturity realize the full potential value of enterprise architecture: align their IT investments with long-term business goals, implement their IT solutions based on proven technologies and approaches, restrain the complexity of their IT landscapes and technological diversity, fully utilize the existing IT platforms and capabilities, minimize potential IT-related risks and project failures. Arriving at this maturity stage, however, can be quite challenging in practice due to the necessity of penetrating cultural barriers, finding a common language and building trustful relationships between business
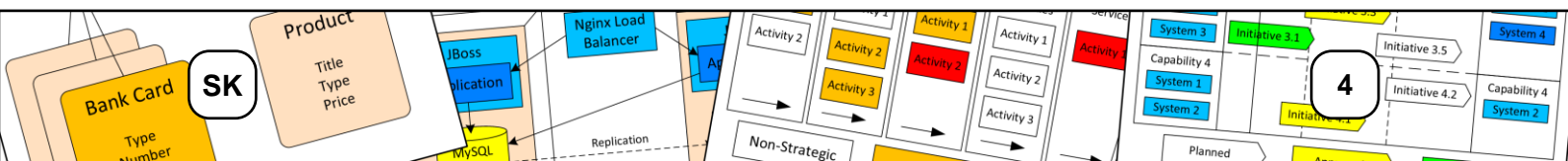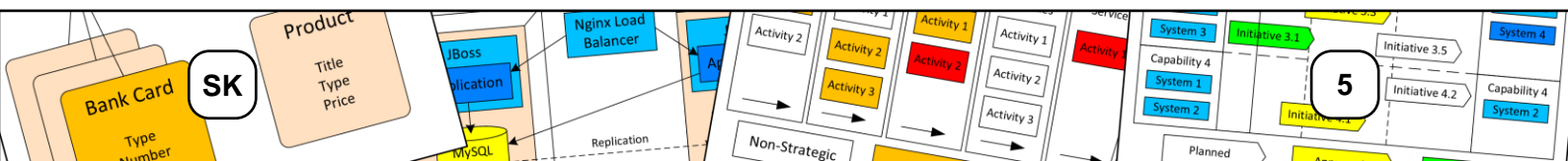
leaders and architects by eliminating their perception as "order takers" from IT and growing their reputation as helpful business partners, which is far from being a trivial task[12, 13].

Maturity Model of Enterprise Architecture Practice

The four maturity stages described above constitute a rather straightforward maturity model of an EA practice. On the one hand, this model is very practical, highly intuitive and most architects should be able to easily determine the approximate position of their EA practice on the maturity scale. On the other hand, this model is rooted in the extensive empirical observations of real EA practices and reflects the actual experience of numerous organizations with enterprise architecture. Veteran EA practitioners would arguably find it somewhat familiar and instinctively recognize in the model what they have seen with their own eyes happening in the industry over the years of their service in different companies.

In my earlier writings, I reported that all EA artifacts that proved useful in organizations can be classified into six general types: Considerations, Standards, Visions, Landscapes, Outlines and Designs (CSVLOD)[14, 15, 16, 17], which were neatly depicted in "Enterprise Architecture on a Page"[18]. Later, I also reported that an EA practice itself can generally be represented as a composition of three distinct but interrelated processes revolving around these six types of EA artifacts: Strategic Planning, Project Implementation (former Initiative Delivery) and Technology Optimization (SPPITO)[19, 20], which were depicted too in "Enterprise Architecture Practice on a Page"[21]. These six general types of EA artifacts and three core EA-related processes provide a very powerful conceptual framework for understanding and analyzing EA practices in their various aspects, including their maturity.

In particular, the maturation of an EA practice in an organization can be viewed as a sequential institutionalization of the three EA-related processes, where each maturity stage implies introducing (i.e. adding) a specific new process: stage one — Project Implementation, stage two — Technology Optimization, and stage three — Strategic Planning. Project Implementation is the process of disciplined solution initiation and realization supported by Outlines (e.g. solution options and solution overviews) and Designs (e.g. preliminary and full solution designs) respectively. Technology Optimization is the process of overall comprehension, rationalization and simplification of the corporate IT landscape that leverages Standards (e.g. technology reference models and guidelines) and Landscapes (e.g. landscape diagrams and asset inventories). Finally, Strategic Planning is the process of collective definition of the desired long-term future course of action via developing mutually agreed Considerations (e.g. architecture principles and policies) and Visions (e.g. target states and roadmaps). These three processes closely correspond to the stages of EA maturity distinguished by the presented model and their successive institutionalization reflects the most typical evolutionary path of an EA practice. The resulting maturity model of an EA practice is shown in Figure 1.

Benefits of Practicing Enterprise Architecture

Stage Three ("True Enterprise Architecture")

Stage Two ("Just IT Architecture")

Stage One ("Only Solution Architecture")

Stage Zero ("No Architecture")

Maturity of Enterprise Architecture Practice

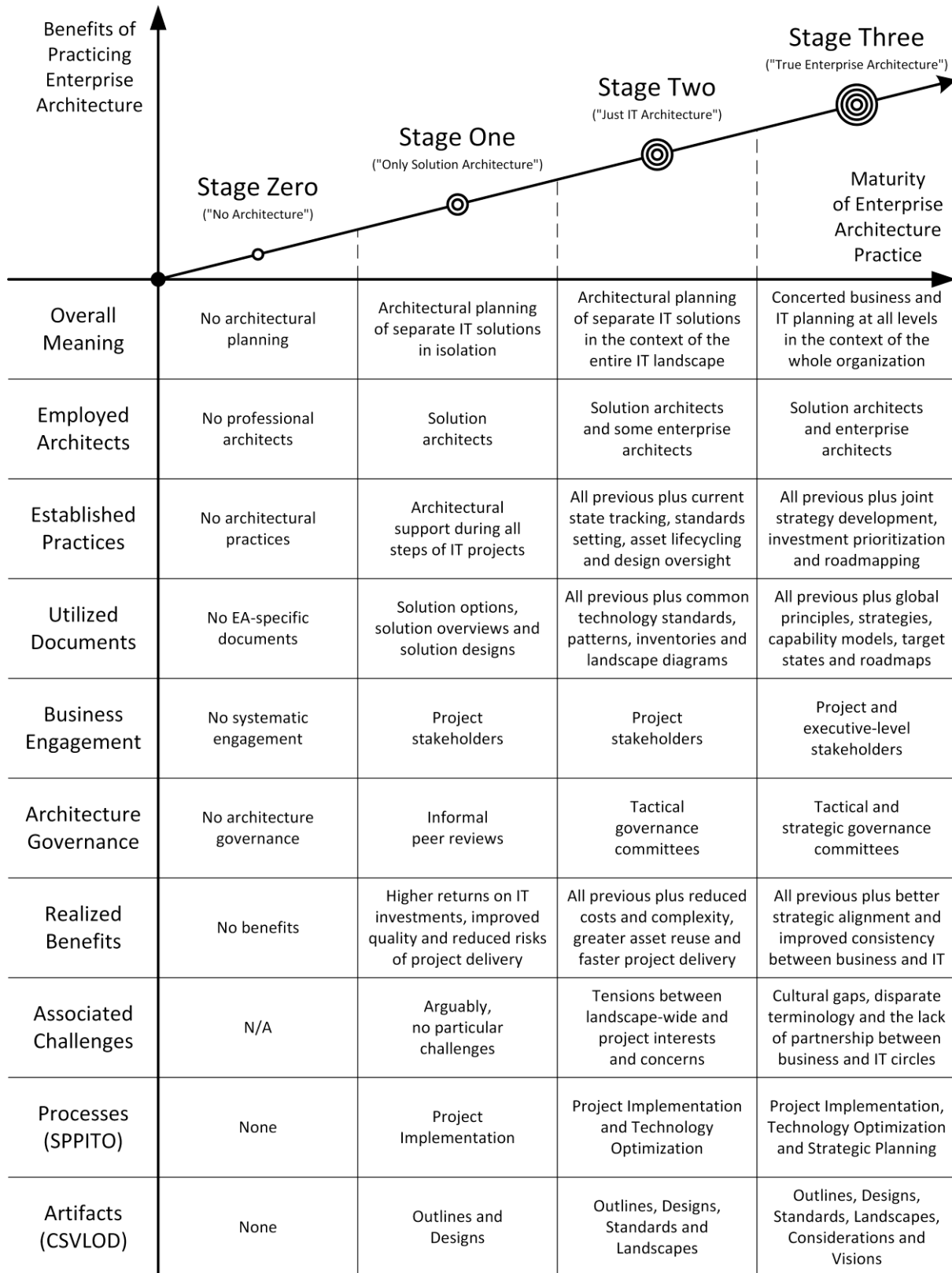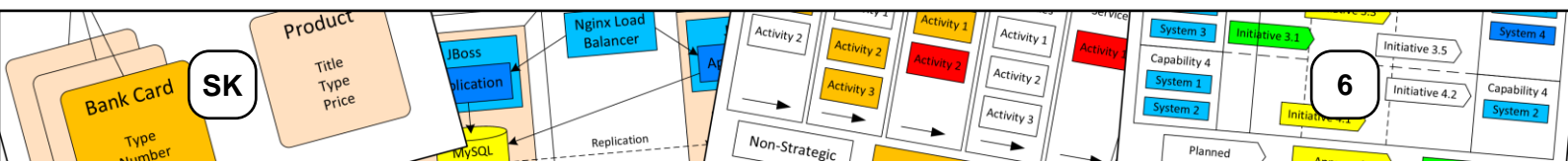|	Stage Zero ("No Architecture")	Stage One ("Only Solution Architecture")	Stage Two ("Just IT Architecture")	Stage Three ("True Enterprise Architecture")
Overall Meaning	No architectural planning	Architectural planning of separate IT solutions in isolation	Architectural planning of separate IT solutions in the context of the entire IT landscape	Concerted business and IT planning at all levels in the context of the whole organization
Employed Architects	No professional architects	Solution architects	Solution architects and some enterprise architects	Solution architects and enterprise architects
Established Practices	No architectural practices	Architectural support during all steps of IT projects	All previous plus current state tracking, standards setting, asset lifecycling and design oversight	All previous plus joint strategy development, investment prioritization and roadmapping
Utilized Documents	No EA-specific documents	Solution options, solution overviews and solution designs	All previous plus common technology standards, patterns, inventories and landscape diagrams	All previous plus global principles, strategies, capability models, target states and roadmaps
Business Engagement	No systematic engagement	Project stakeholders	Project stakeholders	Project and executive-level stakeholders
Architecture Governance	No architecture governance	Informal peer reviews	Tactical governance committees	Tactical and strategic governance committees
Realized Benefits	No benefits	Higher returns on IT investments, improved quality and reduced risks of project delivery	All previous plus reduced costs and complexity, greater asset reuse and faster project delivery	All previous plus better strategic alignment and improved consistency between business and IT
Associated Challenges	N/A	Arguably, no particular challenges	Tensions between landscape-wide and project interests and concerns	Cultural gaps, disparate terminology and the lack of partnership between business and IT circles
Processes (SPPITO)	None	Project Implementation	Project Implementation and Technology Optimization	Project Implementation, Technology Optimization and Strategic Planning
Artifacts (CSVLOD)	None	Outlines and Designs	Outlines, Designs, Standards and Landscapes	Outlines, Designs, Standards, Landscapes, Considerations and Visions

Figure 1. Maturity Model of Enterprise Architecture Practice

Interestingly, the presented maturity model highly correlates with the management practices associated with the different stages of EA maturity defined by the CISR model[11, pages 101-109], which confirms its empirical validity.

Beware of Dangerous Oversimplifications

Despite its apparent simplicity, the described EA maturity model (see Figure 1) should not be understood superficially. Organizations and their EA practices are too complex, diverse and multifaceted phenomena to be reducible to neat, simplistic models. The presented model, thus, explains the maturity of EA practices only in "broad strokes" and has many nuances that must be clearly acknowledged and accounted for.

First, the four stages of the model represent merely the pure archetypes, or snapshots, of EA practices at different moments of their maturity journeys that can be distinguished owing to their coherent properties. Real EA practices, however, tend to mature gradually. They rarely perform "quantum leaps" in their evolution and are not likely to match the descriptions of the identified stages in every detail. Little by little, they adopt various elements of higher maturity levels and incorporate them into their routine operations, though it is often difficult to say exactly when these elements have been introduced and institutionalized. For this reason, EA practices often combine elements characteristic of different maturity stages, but yet it would be nearly impossible to find any organizations where most of the elements of a certain maturity stage are present while most of the elements of preceding stages are not.

Second, EA practices in large and decentralized companies often have different maturity levels in different business divisions or areas. For example, a firm with several independent lines of business may establish more mature EA practices in some of these lines and less mature ones in the other lines. Therefore, the maturity of an EA practice in an organization can vary across its business units.

Third, the quality of every element of an EA practice can vary in multiple subtle and hard-to-measure aspects, but the proposed EA maturity model checks only the rough "presence" of some or the other elements without assessing their quality in finer detail. Essentially, each EA-related activity (e.g. standards setting, investment roadmapping and project oversight) can potentially have its own activity-specific maturity and even deserve its own maturity model, which is far out of the scope of the analysis expounded here.

Fourth, virtually all elements of an EA practice can be implemented differently in different companies depending on their specific contexts, circumstances and needs, e.g. the desired level of architectural agility[22]. Hence, the EA maturity model does not (and even cannot possibly) specify precisely what the relevant elements of an EA practice should look like.

Fifth, the presented EA maturity model is *descriptive* rather than prescriptive or predictive. It merely ascertains the fact that most EA practices across the industry in the past matured in a particular way, but it tries neither to prescribe how they *should* mature nor to predict how they *will* mature in the future. Certainly, an evidence-based analysis of the experiences of other companies can inform decision-makers and teach valuable lessons, but it cannot tell them exactly what needs to be done in their unique situations. Put it simply, instead of blindly following the suggestions of the model derived from generalized historical observations, EA leaders must always think and make decisions on their own.

Lastly, the EA maturity model captures the "mainstream" evolutional trajectory reflective of the majority of organizations, but some of the studied cases went manifestly different paths and represented remarkable exceptions from the typical scenario. Most notably, a few small companies that established their EA practices recently from scratch hired seasoned architecture managers with previous experience in building EA practices, who skillfully introduced all the necessary elements at once relatively quickly, in about several months' time, proactively prioritizing specifically those elements that addressed the most pressing
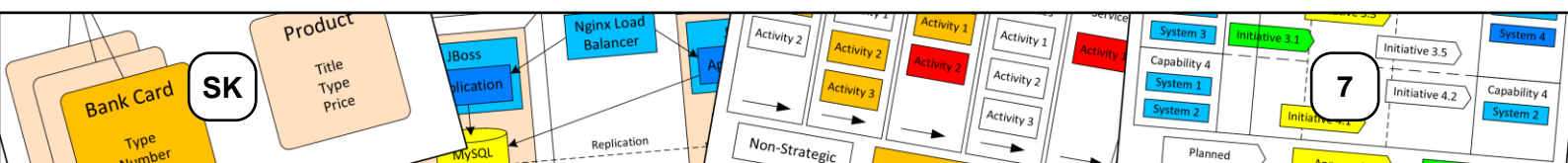
demands of business and IT. Consequently, this maturity model *cannot* be regarded as the only right or possible way to set up an EA practice.

To sum up, the EA maturity model described in this article provides arguably a very practical and convenient device for assessing the maturity of EA practices in organizations — a handy "compass" for navigating stormy seas during EA voyages. However, it does not substitute for sober judgment and its power should not be overrated.

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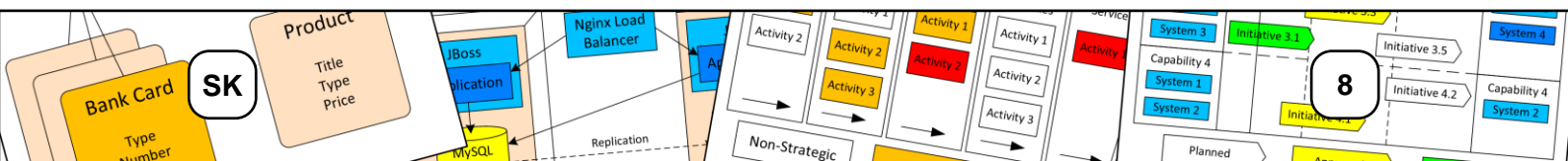
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