Stephan Aier, Christian Riege, Robert Winter

Classification of Enterprise Architecture Scenarios

An Exploratory Analysis

Enterprise architecture (EA) provides a powerful basis to transform an organization and to continually align the organization to external and internal demands. The process of transformation can effectively and efficiently be supported by appropriate EA methods. There is however no "one-size-fits-all" method, which is suitable to support all kinds of transformations in all kinds of organizations. Different project types and different context types require different methods – or at least different configurations or adaptations of a method. Based on an exploratory empirical analysis, we classify three different EA scenarios in this article. The identified EA scenarios can provide the basis for situational EA method engineering.

1 Introduction

Enterprise architecture (EA) describes the fundamental structure of an enterprise [TOGR07], [Rood94], [Sche04], [WiFi07] and supports transformation by offering a holistic perspective on as-is as well as to-be structures and processes [Lank05].

EA is widely accepted as an approach to manage transformations and to foster IT/business alignment by (a) propagating strategy and organizational changes to the software and infrastructure level, by (b) supporting consistent business transformation enabled by technology innovations, and by (c) decoupling business-oriented and technology-oriented partial architectures [BuSo02], [FiAW07], [RoWR06], [Veas01], [WBLS05]. Empirical studies confirm the strategic importance of EA. According to a study conducted by the Institute for Enterprise Architecture Developments (IFEAD) in 2005, 66% of the respondents consider EA as an important element of their strategic governance processes [Sche05]. Another study conducted in 2006 among Swiss and German companies reveals that 38 of 51 interviewed companies are either currently implementing EA models or are already using them [WBFK07]. Besides supporting strategy execution, a large number of other EA applications exist, e.g., business continuity planning, IT consolidation, compliance management, and sourcing management [RoBe06], [WBFK07]. EA is the primary tool for impact assessment and tradeoff analyses in these applications.

In summary it can be stated that the main goals of EA are [FiAW07]:

- documentation and communication of as-is corporate structures/processes,
- support for the design of to-be structure/processes, and
- support for projects, which transform as-is into to-be structures/processes.

Especially for the design of to-be structures and for project support, EA methods are needed. While there are a number of EA methods available, e.g., [PeSo04], [Wegm02], a classification of methods is needed in order to understand in which situation a certain method is appropriate, how a method should be adapted to a certain situation, or for which situations new methods have to be developed. This is based on the assumption that there is no "one-size-fits-all" method, but that, depending on a certain situation, different methods – or at least different configurations or adaptations of a method – are needed. As a foundation for situational EA method engineering, this paper explores a basic classification of EA scenarios. The proposal is based on an exploratory analysis of existing EA approaches among practitioners.

The remainder of this paper is organized as follows: Section 2 provides an overview of the theoretical background and related work. The discussion of the concept of situation in method engineering is reflected, and a short review on the state-of-the-art of enterprise architecture is given. Section 3 describes the details of the explorative empirical analysis aiming at identifying basic EA scenarios. Section 4 discusses the findings. The paper ends with a conclusion and an outlook on future research activities.

2 Theoretical Background and Related Work

In this section related work in the field of EA is discussed and the concept of situation in situational method engineering is introduced.

2.1 Enterprise architecture

Enterprise architecture literature provides a broad range of results that may be grouped into three categories. Category one comprises enterprise architecture frameworks. Popular examples are the Zachman Framework [Zach87], The Open Group Enterprise Architecture Framework – TOGAF [TOGR07], and the Federal Enterprise Architecture Framework – FEAF [Cioc99]. Category two is comprised of a large number of publications by scientists as for example [Fran02], [JoEk07], [Lank05], [Wint05]. The third category is defined by practitioner's publications who predominantly publish for practitioners. Examples are [Dern03], [Kell06], [Sche04], [Theu04]. The classification of literature is not always clear. Especially the boundary between scientific and practitioner approaches (regarding authorship as well as readership) is often fluid. Examples are [Bern05], [RoWR06], [SpHi93].

A fundamental method provided by almost all of the contributions cited above is comprised of a meta model – or at least an implicit meta model – and a basic approach for documenting the as-is and/or to-be EA. Some frameworks as for instance TOGAF provide a top-down approach (from business to IT) for EA development. Other approaches provide a number of analyses that may be employed in an EA transformation method [Lank05], [Niem05] or a list of EA application scenarios [Niem05] for which methods may be developed. However, this list is neither complete nor are its items disjunctive.

Discussion in the field of EA is highly concerned with questions as which artefacts belong to EA, what their relationships are, and how to document and model EA, e. g., [ABB+07], [BEL+07], [JLB+04], [LiPr96], [PeSo04]. Only recently, it is discussed how to maintain EA models [FiAW07], how to use EA, or what benefits EA may provide to an organization [ScSt07]. Especially the latter issues require sound methods. EA application and EA application scenarios are still relatively immature in practice and differ significantly from industry to industry [WBFK07]. Although there are isolated EA methods taking the situation of application into account, e. g., [YiHa06], there is no overall landscape of EA methods available. It is unclear, which situational factors have an effect on the appropriateness of existing methods.

Therefore, this paper proposes a basic classification of EA scenarios, which are derived from observations in practice. The classification is based on a combination of determining factors into statistically relevant clusters. Methods tailored to EA have to take into account these determining factors. They can be referred to as decisive factors describing the context in which projects transform EA. Therefore, certain scenarios can be identified which provide insight on how to approach EA.

2.2 Situational method engineering

It is the very nature of EA that the EA itself, the questions addressed by EA, the stakeholders concerned with EA, and methods transforming or using EA cover a broad range. It is unlikely that there is a "one-size-fits-all" EA method. Depending on project type and context type, different methods – or at least different configurations or adaptations of a method – are needed.

Approaches like this are discussed as situational method engineering [BKKW07], [HaBr94], [KuWe92], [SlHo96]. A method may be defined as a systematic aid that guides the transformation of a work system (WS) [Alte03], [Alte06] from an initial state (S_A) to a target state (S_Z) [BKKW07] (Figure 1). For describing a situation, Bucher et al. differentiate *context type* and *project type* [BKKW07].

A project type is defined as a tuple (S_A, S_Z) of a work system WS_S. Examples of different project types in the field of enterprise architecture may be the "green field" introduction of new business processes and information systems for a new business, which expands EA. Another project type may be the "consolidation" of existing information systems for similar business processes. Both EA project types will require different method support.

However, Bucher et al. state that not only project types significantly impact the effectiveness and efficiency of method application, but also environmental contingency factors not affected by method application. Examples for methods taking environmental

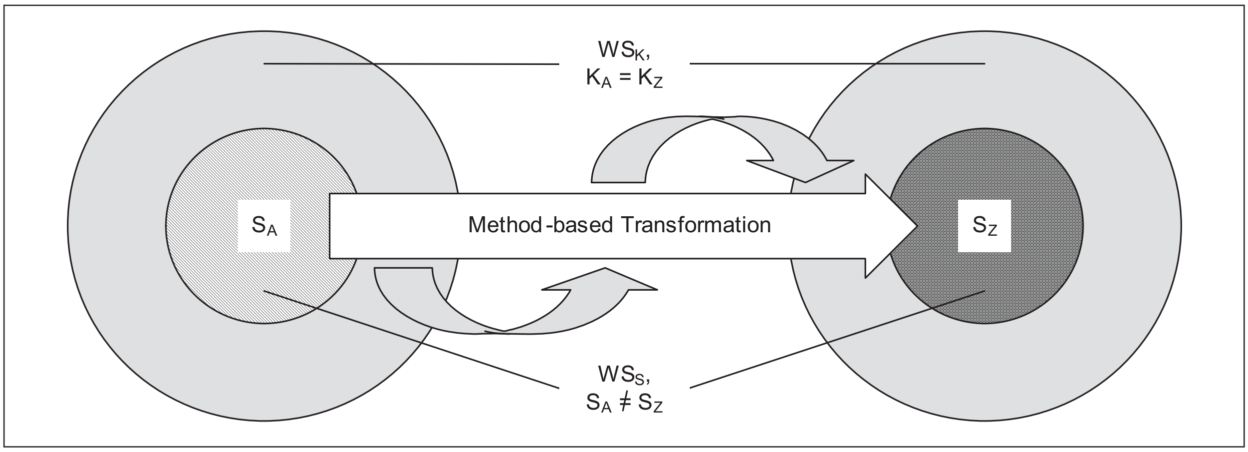

Figure 1: Situational method engineering: Context type and project type [BKKW07, BuKl06]

contingency factors into account may be [YiHa06] or [FiRO03]. This environmental work system WS_K is referred to as context type.

The specific combination of project type and context type is referred to as situation. The aim of this paper is to identify EA scenarios describing contextual factors of relevant situations. While similar research has been conducted in the field of business process management [BuWi06] or process-oriented information logistics [BuDi08], no classification of EA scenarios is available. This contribution may be the basis for the selective development of EA methods and for a well-founded choice among existing methods in a specific situation.

	Number of employees				
Industry	0 to 249	250 to 499	500 to 1000	More than 1000	Total
Manufacturing	0	0	0	5	5
Retail	1	0	0	1	2
Telecom.	0	0	1	7	8
Banking	0	1	3	7	12
Insurance	0	0	0	5	5
Public Auth.	0	0	0	3	3
Software/IT	7	1	0	1	9
Others	1	2	1	8	12
Total	9	4	5	37	55

Figure 2: Absolute numbers of returned questionnaires grouped by industry and size of organization

3 Exploratory Analysis

An exploratory analysis was conducted in order to identify different EA approaches in practice. The data was collected by means of a questionnaire filled in by participants of two practitioner conferences in 2007 – one in Germany, the other one in Switzerland. Both conferences focused on EA in particular. Attending were IT management executives, IT service providers, and consultants as well as EA experts. In advance of the conferences, the questionnaire was subject to a pre-test carried out by a group of enterprise architects and revised in order to ensure its clarity.

3.1 Characteristics of the data set

A total of 69 questionnaires were returned. If the data set was incomplete regarding one of the 15 items presented in 3.2, the questionnaire was discarded. After applying this selection criterion, 55 valid questionnaires were analyzed. Although the sample size is rather small, the data set is considered adequate to provide a basis for an exploratory analysis.

The observed organizations (cf. Figure 2) mainly represent mid-size and large companies from the financial services sector as well as software vendors and IT consultants ("Others"). In addition to demographic characteristics and information on modelling approaches concerning EA framework and EA level of detail, the data set comprises items which describe determining factors of EA. These variables can be divided into four groups and characterized as follows:

Constitution of EA: Architecture in general includes a set of IT artefacts like hardware assets, software components, and applications. According to Section 1, an EA approach extends the focus to business related artefacts. To ensure that business/IT alignment is adequately supported, EA also spans artefacts like business processes, products, customer segments, etc. Due to the large number of potential artefacts, EA is requested to represent the essential parts of the organization [Zach87]. The data set contains information regarding the aforementioned variables.

Application scenarios and analysis techniques of EA: The employment of EA in an organization primarily refers to a specific set of applications like business process optimization, IT consolidation, business continuity management, etc. [Lank05], [Niem05], [WBFK07]. Applications however are external to the EA approach. The aim is to integrate EA into the organization's initiatives to secure that the organization develops in accordance with the structures defined in EA. For this reason, the EA model is subject to a range of analysis techniques. Techniques reveal dependencies between different EA artefacts, identify gaps or redundancies (e.g., application support of certain business processes), and reveal artefacts that might interfere with a homogeneous EA structure [Lank05], [Niem05], [WBFK07]. The data set incorporates details on application scenarios as well as analysis techniques.

Maintenance of EA: This part of the data set contains information to which extent EA models are part of strategic planning, and to which extent EA models support transformations. Furthermore it covers the approach how EA data is gathered and maintained within an organization. A central instance for EA-related information facilitates a less complex and consistent EA improvement. In this holistic approach, a "leading" EA model is maintained covering all artefacts used to describe EA. A federated approach puts more emphasis on specialized architectures and their models. The EA model is then supplied with data through periodically performed replications. EA data, which is maintained via local repositories yields more flexibility, but also ensures that the stored information is up-to-date [FiAW07].

Communication and organizational structure of EA: On the one hand, the data set contains information on organizational roles, which should be established to ensure EA is adequately represented within the organization – e.g., the role of an expert in EA modelling. On the other hand, EA offers benefits that take effect across IT and business units. It is important to capture how the concept of EA spreads within the organization. According to the understanding that EA is also involved in management activities and addresses business related objectives, it is of high importance how EA is perceived [JoEk07]. The information in this part of the questionnaire also covers the integration of EA processes into the organization's governance structure.

The respondents were asked to assess the current degree of realization of each item in their organization. Therefore, the questionnaire chooses a five-tiered Likert scale. The minimum value (1) that was possible to check represents "nonexistent", whereas the maximum value (5) indicates an "optimized" realization.

3.2 Identifying determining factors of EA

In order to identify determining factors of EA, a factor analysis is applied. A factor analysis involves extracting a small number of latent factors among the variables in the data set. It is necessary to test the adequacy of the data set prior to the application of a factor analysis. To form an adequate foundation, the data set has to meet two criteria. The first criterion is derived from the variables' anti image covariance. The anti image covers the part of the variance which cannot be explained by the remaining variables in the data set. As factor analysis aims at finding latent factors based on the data set, a data set is suitable for factor analysis if the anti image is rather low. According to [DzSh74], the percentage of none diagonal elements of the anti image covariance matrix, which are non-zero (>0.09), should not exceed 25%. In the case presented here, this parameter is about 17%. The second criterion involves the computation of the Kaiser-Meyer-Olkin measure of sampling adequacy. In the data set at hand, the measure is 0.798. According to [KaRi74], it puts a data set with a value of 0.7 or above into "middling" range, bordering the "meritorious" range. In this case, the results proof that the data set is generally appropriate for factor analysis. The factor analysis was performed based on a reduced data set of 15 items. While some items, which are excluded from subsequent analyses, relate to company properties such as staff size and industry sector, others were previously characterized as covering the constitution of EA within an organization.

As extraction method the principal component analysis was applied. Principal component analysis identifies few independent factors that contain the fundamental aspects of the data. Figure 3 depicts the components, their eigenvalue, and the cumulative variance.

Component	Eigenvalue	Cumulative Var(X) %
1	6.282	41.881
2	1.872	54.362
3	1.375	63.528
4	0.939	69.788
…	…	…
15	0.110	100.000

Figure 3: Eigenvalue and cumulative variance (Var(X)) of extracted components

In order to identify the optimum number of factors, the eigenvalue was computed, which represents the amount of variance accounted for by a factor. According to the Kaiser criterion a factor's eigenvalue should exceed a value of one [HaBl06]. As a result, three factors that account for 64% of the total variance were extracted. Figure 4 depicts the component matrix. In order to better interpret the nature of the factors, the component matrix was rotated applying the Varimax method with Kaiser normalization.

	Factor 1	Factor 2	Factor 3
Item 1.1	0.839	0.094	0.060
Item 1.2	0.767	0.173	0.182
Item 1.3	0.626	0.264	0.295
Item 1.4	0.871	0.247	0.020
Item 1.5	0.684	0.092	0.269
Item 2.1	0.198	0.723	0.400
Item 2.2	0.275	0.701	0.232
Item 2.3	0.233	0.764	-0.075
Item 2.4	0.059	0.629	0.477
Item 2.5	0.088	0.707	0.072
Item 3.1	0.184	0.528	0.526
Item 3.2	0.344	0.187	0.627
Item 3.3	0.019	-0.016	0.765
Item 3.4	0.123	0.416	0.709
Item 3.5	0.364	0.165	0.740

Figure 4: Rotated component matrix

An item is assigned to a factor by analyzing its factor loadings. A factor loading represents the correlation between a variable and a factor that has been extracted from the data. To be assigned, the absolute value of an item's factor loading is required to represent the maximum of its factor loadings and also to exceed a value of 0.5 [HäSi03]. Regarding item 3.1, there is an exception to this rule due to logical reasons. As the item shapes the perception of EA, it therefore explains more accurately the organizational penetration than the deployment of EA data. A similar high loading regarding factors two and three would technically allow for a different assignment.

Before using these factors in subsequent analyses, it is recommended to run a reliability test. Therefore Cronbach's alpha was computed in order to assess the internal consistency. The rationale is that all items assigned to a factor should be measuring the same construct and thus should be highly intercorrelated [HaBl06]. The values for Cronbach's alpha regarding *factor 1 (0.814)*, *factor 2 (0.810),* and *factor 3 (0.843)* indicate good fitting considering that 0.7 is the commonly acknowledged lower limit [HaBl06]. Each of the three factors consists of five items and can be described as follows.

The items that load on factor 1 describe valuable ways to adopt the concept of EA. On the one hand, it involves well established architecture design paradigms which emphasize the layered structure of EA.

Item 1.1	EA is developed with regard to modularization as an architectural design paradigm.
Item 1.2	The principles of service orientation form a basis on which EA is designed.
Item 1.3	EA models represent the current structure of the organization.
Item 1.4	Documentation of EA models includes target architecture.
Item 1.5	EA models support transforming EA from as-is structure towards to-be structures.

Figure 5: Factor 1 – Adoption of advanced architectural design paradigms and modelling capabilities

The findings denote that developing EA needs a certain degree of decoupling between the different EA layers as indicated by the principles of service orientation and thus foster re-use of EA artefacts. On the other hand, factor 1 makes clear that a further enhancement of EA also depends on the dimension of the EA documentation. To allow for a continuous development, not only loosely coupled artefacts, but also an idea of how to approach a future development stage is decisive. EA then contributes to business/IT alignment by offering simulation capabilities, which presupposes different variants of its to-be structures.

Item 2.1	EA is measured and/or reviewed on a regular basis.
Item 2.2	Processes concerning EA management are subject to regular reviews.
Item 2.3	The role of an EA quality manager is established fostering and communicating EA concerns.
Item 2.4	EA is aiming to improve the overall homogeneity of architecture elements by applying heterogeneity analysis.
Item 2.5	EA is used to perform coverage analysis in order to illustrate redundancies or gaps regarding EA artefacts.

Figure 6: Factor 2 – Deployment and monitoring of EA data and services

Factor 2 describes the deployment of EA within the organization. It is required to establish a consistent monitoring of EA data and services to further enforce the deployment. This can be assisted by the role of an EA quality manager who is responsible for observing periodic reviews of EA data and EA processes. A high degree of EA deployment puts the organization in the position to reduce its costs for maintenance activities, software and hardware licenses, but also to ensure that similar concerns are treated equally and according to the parameters of the EA roadmap. A high factor value also points to the application of sophisticated EA analysis techniques within the organization.

Item 3.1	EA is perceived as being valuable to the business units.
Item 3.2	IT departments explicitly refer to EA as a helpful instrument.
Item 3.3	IT departments use EA data in broad range of use cases.
Item 3.4	Business units base their work on EA data.
Item 3.5	EA data is part of the decision support for management units.

Figure 7: Factor 3 - Organizational penetration of EA

The third factor accounts for the penetration of EA in the organization. The findings suggest that the overall level of penetration is influenced by the degree EA results and EA documentation are used by a broad range of stakeholders. According to this analysis, EA is a suitable tool not only to support IT related work, but also to serve the business units and to provide reliable information to management units. The findings suggest that as the level of organizational penetration increases with the organization's capability to clearly communicate EA benefits to the potential stakeholders – regardless if they actually operate on EA results or not. Therefore, the third factor describes the way EA is perceived and utilized across the organization. A high level of organizational penetration leads to a higher acceptance, and less misinterpretation of EA within the organization, respectively.

3.3 Clustering EA scenarios

In order to point out how EA is actually realized, the data set was partitioned into different subsets by means of a hierarchical cluster analysis. As input data, the calculated factor values of the three aforementioned factors were used. Respondents, which are grouped within the same subset, can then be characterized by a common trait. Ward's method has been used as clustering algorithm. It combines the two clusters, which lead to a minimal increase in the within-cluster sum of squares with respect to all variables across all clusters. The squared Euclidean distance was selected as distance measure to determine the similarity of two clusters. Although the application of alternative measures may lead to different clustering results, the squared Euclidean distance was chosen as it is the most commonly recognized procedure [HaBl06] and moreover provides a comprehensible representation with respect to the sample's data structure. To gain information about the cohesiveness of clusters, a tree diagram – designated as dendrogram – serves as a visualization. Figure 8 illustrates the arrangement of clusters and helps to assess the appropriate number of clusters to keep.

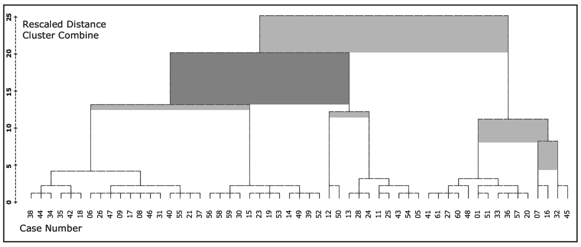

Figure 8: Representation of hierarchical classification

There is no standard selection procedure to derive the number of clusters [HaBl06]. As the applied fusion algorithm aims at minimizing the within-cluster sum of squares in each step, it is appropriate to keep the number of clusters if the subsequent clustering step accounts for the highest increase of the total sum of squares [Gord96]. In the dendrogram (Figure 8), the increase is represented by the rescaled distance (depicted on vertical axis) required to combine two clusters. In the analysis at hand, this heuristic suggests to distinguish between three clusters, which in turn represent three different EA scenarios. Figure 9 exhibits the arithmetic means of the calculated factor values for each of the three clusters. A high value implies a high degree of realization among the cluster members regarding the factor items that load on the respective factor.

	Factor 1		Factor 2		Factor 3	
	$\bar{x}$	s	$\bar{x}$	s	$\bar{x}$	s
Cluster 1 (n =15)	1.24	0.74	0.26	1.11	0.29	0.95
Cluster 2 (n =10)	-0.20	0.83	0.62	1.26	-1.33	0.53
Cluster 3 (n =30)	-0.55	0.51	-0.34	0.70	0.30	0.77

$\bar{x}$: arithmetic mean
s : sample standard deviation

Figure 9: Arithmetics mean and standard deviation of factor values

Based on the information depicted in Figure 9, the three different clusters can be characterized as follows:

Cluster 1: All 15 organizations, which are assigned to this cluster, are characterized by sophisticated implementation of architectural design paradigms. They understand EA as instrument to represent a current structure of the organization, but also to deliver a roadmap for a future structure. It is reasonable to assume that organizational penetration is rather advanced among the members of the cluster. They are using EA rather as IT instrument, but also as a means of communication with the business. The organizations which belong to this cluster constitute an EA scenario, which may be designated as "EA Engineers". EA engineers understand EA as a valuable instrument to develop and thus transform EA in its holistic understanding. They can also rely on a progressive perception of EA within the business and management units. EA engineers in its current state have an intermediate maturity regarding the employment and monitoring of EA data and services (factor 2). Moreover the variance within this cluster is rather high regarding factor 1 and 3. Thus cluster 1 may be interpreted as a not fully developed instantiation of EA engineering.

Cluster 2: The second cluster is made up of 10 organizations, which have a low level of both the organizational penetration of EA and the adoption of advanced architectural design paradigms and modelling capabilities. This combination can be characterized as observant attitude regarding a holistic EA. In this case, EA focuses primarily on IT architecture and, therefore, EA data is basically used in traditional IT project development. The relatively high value regarding the second factor supports this characteristic as it indicates a high deployment of (IT related) EA data. The EA scenario represented by the organizations, which are merged in the second cluster, can be designated as "IT Architects". They are well anchored in the IT domain and have reached an average maturity there. However, this limited architectural understanding is an obstacle in order to really leverage the value of available IT understanding, models, and methods. Rather advanced architectural design paradigms – e.g., service orientation – are not much developed in this cluster, because they require a certain amount of organizational penetration.

Cluster 3: A total of 30 organizations are grouped into the third cluster. They are characterized by a high level of organizational penetration of EA – comparable with cluster 1. It is therefore reasonable to assume that the potential benefits of EA are recognized among these organizations. EA is understood not only as IT architecture, but also as an instrument to foster the alignment between IT and business. However, EA primarily focuses on documentation. Organizations, which belong to this cluster, can be designated as "EA Initiators". EA initiators put emphasis on transparency as the necessary precondition to realize benefits from EA application. Therefore, it seems reasonable to conclude that EA initiators in particular are interested in implementing relevant applications to demonstrate these benefits. This also explains the need for more sophisticated analysis techniques – which EA initiators lack of. This typically is a hint for a tool driven or model driven EA approach as opposed to an application driven approach. Such a tool driven approach may be dangerous since it requires significant efforts to survey and model the architectural data without a clear idea of future application scenarios.

4 Discussion

The three EA scenarios can be visualized by positioning the corresponding clusters in a coordinate system (Figure 10). The horizontal axis of the coordinate system is represented by the factor *adoption of advanced architectural design paradigms and modelling capabilities* whereas the vertical axis displays factor 3 *organizational penetration of EA*. To provide a clear view on the three clusters Figure 10 does not take factor 2 into account, as factor 2 does not lead to additional clusters. The clusters are arranged according to their arithmetic mean (cf. Figure 9). To estimate the mean of the population when the sample size is small it is suggested to calculate the confidence interval that is derived from the Student's t-distribution [HäSi03]. For this purpose the confidence interval was calculated for each cluster based on the respective mean factor value of factor 1 and factor 3 (cf. Figure 10) as:

As a result the three rectangles visualize that each

$$\left[\bar{x} - t(1-\frac{\alpha}{2}, n-1)\frac{s}{\sqrt{n}}; \bar{x} + t(1-\frac{\alpha}{2}, n-1)\frac{s}{\sqrt{n}}\right]$$

cluster differs significantly from another cluster in at least one dimension. Figure 10 also exhibits the corresponding two-dimensional classification matrix. The matrix illustrates the distinct EA scenarios in order to indicate different levels of EA maturity in terms of the determining factors 1 and 3. For both dimensions, high and low level are distinguished, which refer to either high or low parameter values.

The size of the different clusters (Figure 9) leads to the assumption that most organizations acknowledge the benefits of EA as EA initiators account for more than 50% of the three EA scenarios. Still a minority of organizations represented by the cluster IT architects is not able to convince potential stakeholders of EA benefits and thus is not able to leverage advanced design or modelling capabilities. The EA scenario with

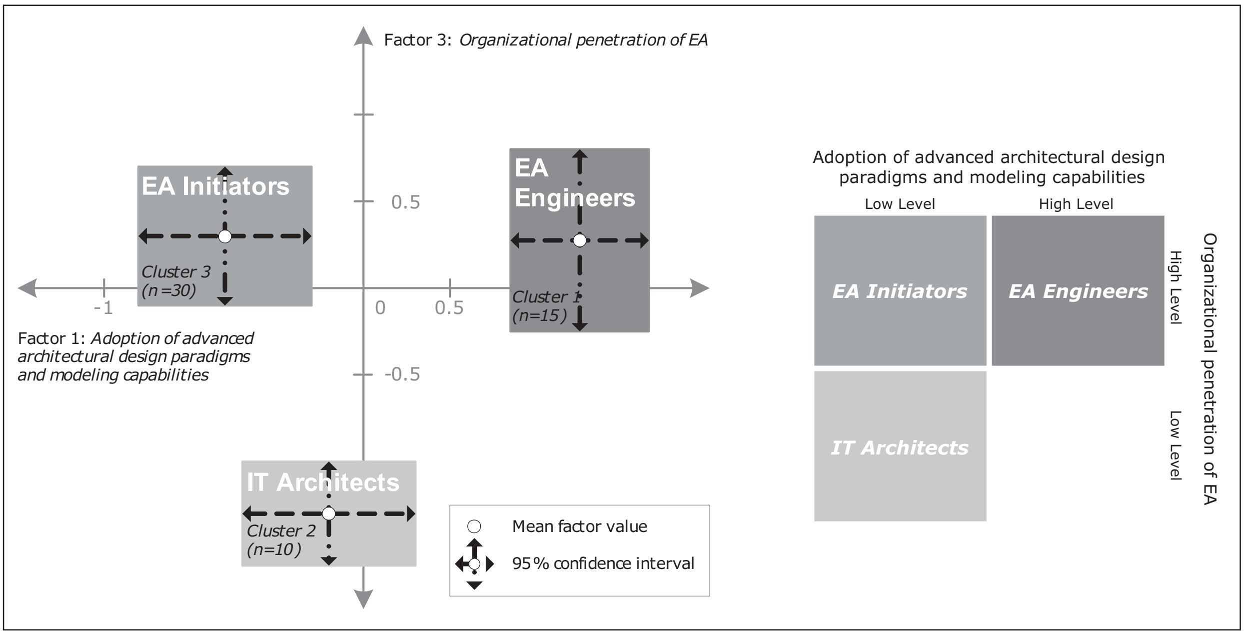

Figure 10: Enterprise architecture scenarios

most mature application of EA is represented by EA engineers.

All three scenarios represent different situations regarding context types and possible project types in these contexts. An example may be again IT consolidation: EA engineers have transparency on relevant business processes as well as the IT landscape. Furthermore they may have a number of suitable analyses ready on hand in order to, e.g., identify applications supporting the same business process and thus may be redundant. The IT architect requires a completely different method to gain the same results. Either the IT architect may develop his or her recommendations on the basis of different data, or he or she needs additional project phases for gaining the same transparency EA engineers already have. By a combination of the applications mentioned by [WBFK07] and the EA scenarios describes here existing EA methods can be classified and new methods can be developed.

5 Conclusion and Future Work

Based on the discussion of situational method engineering and the current EA state-of-the-art, this paper proposes to differentiate determining factors of EA. The results of the exploratory analysis confirm the assumption that there is no overall approach to adapt to EA in practice, but to distinguish between three EA scenarios. These EA scenarios represent three different approaches on how to grasp EA in terms of its determining factors. The exploratory analysis (Figure 10) shows that *adoption of advanced architectural design paradigms and modelling capabilities, and organizational penetration of EA* are relevant factors to discriminate between different EA approaches in practice.

The fact that EA is a pretty novel topic can be an explanation for the absence of situational methods in the field of EA so far. With increasing knowledge, appreciation of and demand for appropriate, situational methods will increase as well. A different realization of EA in practice requires differentiating methods in terms of a specific context and project type. The determining factors then provide a basis on which situational EA method constructions should derive their contexts in future.

A possibility to consolidate and to validate the findings of the analysis at hand is to expose the determining factors and EA scenarios to a larger empirical analysis. If applicable, the analysis may include cases from a broader range of industry sectors. Further research on EA and methods to be applied in a specific EA scenario should also address the different applications in detail to derive a valid set of central project types for EA. This will help to further enhance the construction of methods for an effective EA management, where methods specifically fit to the situations in which they are applied.

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Stephan Aier, Christian Riege, Robert Winter

Institute of Information Management
University of St.Gallen
Müller-Friedberg-Strasse 8
CH-9000 St.Gallen
Switzerland
{stephan.aier; christian.riege; robert.winter}@unisg.ch