

Can boundary objects mitigate communication defects in enterprise transformation? Findings from expert interviews

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Abstract: Inappropriate communication is a major threat to enterprise transformations. While enterprise architecture (EA) models may be helpful to support communication, these models are often tailored to the needs of specialists like enterprise architects. Based on empirical data from 12 expert interviews, we analyze how EA models can become boundary objects that span knowledge boundaries and alleviate communication defects among heterogeneous stakeholder groups in enterprise transformations. We contribute a framework that maps six communication defects to three knowledge boundaries and to 12 boundary object properties as a foundation for future EA model design. Our findings also indicate that EA models alone are not sufficient for overcoming communication defects, but that facilitators like architects are needed in addition.

1 Introduction

Induced by various environmental pressures (originating from markets, regulators, customers etc.), enterprises face a constant need for change that often affects large parts of an enterprise. This kind of large-scale change is referred to as *enterprise transformation* [Ro05]. An enterprise transformation typically is a collaborative endeavor of diverse stakeholder communities. These communities are diverse with respect to their knowledge, values, and goals. The need for collaboration among diverse communities is well-recognized in organizational literature [Ca04; Ka01; NMS12]. To coordinate collaborative efforts during enterprise transformation, communication is a key success factor. Conversely, *communication defects* are a major threat to successful transformation. Communication defects lead to delays in transformation, increases in costs, and ultimately to struggles or even failure of transformation [FF95; HPK09].

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Enterprise Architecture (EA) models support such communication [Va11]. In line with [WF07], we understand an EA model to be a representation of an as-is or to-be state of an organization in its business to IT stack. However, we argue that not all EA models are particularly suitable for mitigating communication defects among diverse communities in enterprise transformations. Particularly, a model cannot be considered separately from its context of use: the role of the modeler (in our case: the architect) is paramount for the usefulness of EA models [SP12], while at the same time the fitness of a particular EA model depends on factors such as the addressed community or the purpose and scope of the model [An10]. Therefore, we take a boundary object perspective to analyze how EA models can help to prevent communication defects in enterprise transformations. Boundary objects, a concept from organizational science [SG89], aim at providing interfaces between different communities of practice and thus support knowledge sharing communication.

Our research question is the following: *To what extent can communication defects in enterprise transformations be mitigated by using EA models as boundary objects?*

In addressing this question, we build upon a set of boundary object properties pertaining to both (1) the model itself, and (2) the role of the architect, and discuss to what extent these properties can address communication defects in enterprise transformations. In addition to this theoretical grounding of our research, we provide empirical grounding of the proposed boundary object properties by illustrating each property with qualitative data on practical modeling experiences from senior enterprise architects. In so doing, we extend our earlier work [Ab13; NKC13] by (1) explicitly linking the role of the enterprise architect to boundary objects, (2) applying the boundary object perspective to specifically mitigate communication defects, and (3) providing an empirical grounding of the theoretically-derived boundary object properties found in [Ab13].

Note that work has been done on models that involve different stakeholders, prominently by [SP12; SPS07]. Yet, this work concerns collaborative modeling in general, while our focus is on EA models' application as far as they involve different stakeholder communities. Furthermore, work on model quality [Kr12; KSJ06; Mo98; Ne12] provides properties to assess both the process of modeling as well as the resulting model itself [Mo05]. However, in [Mo05] the focus is on evaluating the model quality for a single user community, while in the paper at hand we are interested in the interplay among different communities. The rest of this paper is structured as follows.

In section two, we discuss conceptual foundations of communication defects and boundary objects. Section three presents our research approach. In section four, we describe, based on empirical data, how various boundary objects have helped architects in overcoming communication defects. We discuss our findings, especially with regard to the role of the architect, in section five. Section six concludes our paper.

2 Conceptual foundations

2.1 Communication defects in enterprise transformations

Change-management literature shows that transformations often fail because of poor or too little communication [Ba02; Gi98; KD02; Ko95]. Elving [El05] for example points out that “poorly managed change communication results in rumors and resistance to change”. This raises a need to prevent or at least mitigate pitfalls such as communication defects among the involved communities [HPK09].

The EA function is consistently positioned as an instrument to improve communication in enterprise transformations [Ra10; Ta11]. Yet, recent research shows that communication defects also occur in EA-driven enterprise transformations. They contribute significantly to the struggling or failure of EA-driven enterprise transformations [NKC13]. Examples of such transformation struggles include delays in the transformation and not fulfilling the transformation goals. Based on qualitative data from interviews with mostly enterprise architects, [NKC13] provide a list of communication defects. They categorize those specific defects into three groups, namely *lack of communication*, *inappropriate communication* and *over-communication*. In the paper at hand we focus on the question of how EA models can be employed to overcome inappropriate communication. Inappropriate communication is found in the following communication defects [NKC13]: inappropriate communication means, inappropriate communication style, no shared frame of reference, communication against the transformation, non-aligned implicit and explicit communication, and dishonest communication.

The finding that communication defects are an important reason for struggles in or failure of EA-driven enterprise transformations is particularly interesting when considering that EA models are supposed to support communication [Va11]. This raises the question to what extent communication defects in enterprise transformations can be mitigated by using EA models, and whether existing models need to be changed.

2.2 Boundary objects

The differences of communities regarding their knowledge, values, and goals are manifested in knowledge boundaries. Carlile [Ca04] distinguishes three types of such boundaries: syntactic, semantic, and pragmatic boundaries. *Syntactic boundaries* exist due to different terminology among communities. *Semantic boundaries* are boundaries of interpretation, which can be crossed by identifying differences and dependencies of the communities and the creation of common meaning based on common terminology. *Pragmatic boundaries* are political boundaries. They represent differences in goals and interests. Communities have their own agenda and see their power position “at stake” [Ca04].

The three boundary types have an increasing level of complexity with syntactic boundaries at the lowest and pragmatic boundaries at the highest level. Crossing a higher-level boundary invariably involves crossing lower-level boundaries: To identify differences in meaning at a semantic boundary a common terminology must be provided first; being

able to negotiate common solutions at a pragmatic boundary also involves crossing syntactic and semantic boundaries.

To aid in crossing knowledge boundaries, boundary objects (originally introduced by Star and Griesemer [SG89]) are a widely-employed concept. Boundary objects are abstract or physical artifacts that support knowledge sharing and collaboration between different stakeholder communities by providing interfaces for communication. Examples of boundary objects include physical objects such as prototypes [Ca04], intangible objects like shared IT applications [PR04], maps and models [SG89], and abstract conceptualizations such as standardized forms and repositories [Ca04; SG89]. According to Winter and Butler [WB11], “boundary objects provide a sufficient platform for cooperative action – but they do so without requiring the individuals involved to abandon the distinctive perspectives, positions, and practices of their ‘base’ social world”. Boundary objects are emergent, and “designated boundary objects” only become “boundary-objects-in-use” when they are incorporated into the local practice of a stakeholder community [LV05]. A specific boundary object may therefore be used by two or more different communities of practice (see [Ab13] for examples).

Abraham [Ab13] identifies an initial set of boundary object properties based on a literature review. The identified properties can be classified into two groups: *object properties* that concern the construction of an object, and *management properties* that describe the way an object is used and managed in an organization. Depending on the type of knowledge boundary to be crossed, different properties may be required [Ca04].

The object properties are described as follows. For a detailed description, see [Ab13]:

Modularity enables communities to attend to specific areas of a boundary object independently from each other, such as attending to individual portions of an ERP system.

Abstraction serves the interests of all involved communities by providing a common reference point on a high level of abstraction. Local contingencies are eliminated from high-level views to highlight the commonalities.

Concreteness addresses specific problems relevant to specific communities. Communities are able to specify their concerns and express their knowledge related to the problem at hand. Thus, interpretive flexibility is provided.

Shared syntax provides a common schema of information elements, so that local use of information objects is uniform across communities.

Malleability entails that boundary objects are jointly transformable to support the detection of dependencies and the negotiation of solutions.

Visualization entails that boundary objects do not rely on verbal definitions, but possess a graphical or physical representation (e.g., a drawing or a prototype).

Annotation enriches boundary objects with additional information by individual communities in order to provide context for local use.

The management properties are described as follows. For more details, see [Ab13]:

Versioning traces changes to boundary objects, along with their rationale. Additional context is provided by reconstructing the chronological evolution of the boundary object.

Accessibility includes informing interested communities about the boundary object using appropriate communication channels and other measures aimed at helping communities to use the boundary object, such as trainings. As a result, the boundary object is easier to access for the involved communities.

Up-to-dateness includes timely communication of changes to the involved communities as well as responsibilities and processes for updating the boundary object.

Stability implies that the structure and underlying information objects of a boundary object remain stable over time. Despite different local uses and annotations, boundary objects provide a stable reference frame: While changes at the periphery are possible, the core of the boundary object remains stable and recognizable.

Participation means that relevant communities should be involved in the creation and maintenance of the boundary object, and that users should also include top management.

3 Research approach

To address our research question we conducted a series of semi-structured qualitative expert interviews. We chose this approach because it provides in-depth insights into complex phenomena [GG10] such as communication defects in EA-driven enterprise transformations. Semi-structured interviews are focused on the research problem while at the same time allowing for exploration of the field of research [Fl09]. This combination allowed us to focus on our research problem and be open to new ideas.

We used the snowball sampling technique. According to Miles and Huberman [MH94] snowball sampling is useful to identify experts that have a lot of experience concerning the phenomenon studied. In total, we interviewed twelve experts. We stopped collecting data when we did not gain any new insights into our research problem, i.e., at the point of theoretical saturation [Ei89]. Table 1 gives an overview of the interviewees.

Each interview took between 60 and 90 minutes. All the interviews were recorded and transcribed. We started the interview analysis with open coding following Flick [Fl09]. That is, the first codes were linked closely to the transcripts. For the specific purpose of this paper, however, we analyzed the interviews in a second step with regard to the three types of knowledge boundaries and with regard to the use of boundary objects. Furthermore, we specifically looked into the role of the enterprise architects in the context of mitigating communication defects. Eventually, this helped us to extract, combine and interpret the relevant data from the interviews.

The coded data was analyzed in two steps: (1) Based on the interviews we classified the specific communication defects presented in section 2 according to Carlile's knowledge

boundaries [Ca04]. The mapping of the six specific communication defects to the knowledge-boundary types is presented in section 4.1. (2) As a second step we analyzed the interviews with regard to the boundary object properties. We added those properties we could find support for in our interviews to the map created in step one. The mapping of the properties to the communication defects and the knowledge boundaries is described in sections 4.2 and 4.3.

Table 1. Characteristics of the experts.

Expert	Position	Industry	Works in	Nationality
#1	Enterprise architect	Consulting	Australia	The Netherlands
#2	Enterprise architect	Energy	The Netherlands	The Netherlands
#3	Enterprise architect	Insurance	USA	USA
#4; #7-9	Enterprise architect	Consulting	The Netherlands	The Netherlands
#5	Enterprise architect	Consulting	USA	USA
#6	Enterprise architect	Public sector	The Netherlands	The Netherlands
#10	Management consultant	Consulting	The Netherlands	The Netherlands
#11	Enterprise architect	Banking	Luxembourg	France
#12	Enterprise architect	Consulting	The Netherlands	The Netherlands

4 Results

4.1 Mapping communication defects to knowledge boundaries

In our analysis we focused on the category ‘inappropriate communication’ [NKC13], because the other two categories (‘lack of communication’ and ‘over-communication’) refer to the amount of communication, which is unlikely to be addressed by EA models and therefore is not relevant to the purpose of this paper. To answer the question to what extent EA models can be used as boundary objects to mitigate inappropriate communication, we first map the specific communication defects according to Carlile [Ca04] in syntactic, semantic and pragmatic knowledge boundaries (Table 2).

Inappropriate communication means. Communication means, such as face-to-face communication, newsletters or intranets, are used to transfer knowledge. However, our interview results indicate that the appropriateness of one and the same communication mean depends on the purpose of the communication and on the target group. For instance, one enterprise architect contrasted IT-oriented people and business-oriented people: While email, social-media channels or internet would work well for IT people, for business people he would rather arrange meetings where they could discuss things and have coffee together. The use of inappropriate communication means, e.g. using email threads towards business people, disturbs the transfer of knowledge and can thus be interpreted as an information-processing or *syntactic boundary*.

Inappropriate communication style. Different stakeholder communities have different preferences regarding the communication style. “*When you talk to architects you have to*

be sure that there is one mistake in the picture, so they really can find the mistake in the picture. And they are proud they found that mistake. [...] An architect thinks that's funny. That's the way they look at things. [...] When you are introducing a mistake in the picture when you are talking to managers, they are becoming insecure. They are not sure anymore that you really know what you are doing. [...] You have to fit your communication with the one you are talking to" [expert #6]. This quote shows that the inclusion of a mistake in a picture has a different meaning for enterprise architects than it has for management. Therefore, we classify this defect as *semantic boundary*.

No shared frame of reference. [NKC13] illustrate that different stakeholder communities can have different frames of reference. They distinguish two levels of differences: the level of vocabulary and the level of understanding. If two communities differ in terms of vocabulary, the *boundary is syntactic*. If they use the same terminology but have a different understanding of it, there is a *semantic boundary* between them.

Communication against the transformation. Stakeholders who do not want the transformation to happen sometimes try to stop it by communicating against it. As this communication defect is based on conflicting interests and can be understood as political intervention, we classify it as a *pragmatic boundary*.

Implicit and explicit communication not aligned. This communication defect concerns inconsistencies between what is communicated through explicit statements and what is communicated implicitly through actions, symbols, etcetera [NKC13]. If, for example, senior management explicitly declares the increase of service quality as a main goal and at the same time introduces the reduction of costs as a new KPI, the explicit and implicit communication is not aligned. This can be interpreted as a difference in interest and therefore as a *pragmatic boundary*.

Dishonest communication. An example for dishonest communication that was mentioned during our interviews is not telling the negative consequences of a transformation initiative. Such a communication defect is politically motivated and can therefore be labeled as *pragmatic boundary*.

Table 2. Communication defects and knowledge boundaries.

Communication defect	Syntactic boundary	Semantic boundary	Pragmatic boundary
Inappropriate means of communication	x		
Inappropriate communication style		x	
No shared frame of reference	x	x	
Communication against the transformation			x
Implicit and explicit communication not aligned			x
Dishonest communication			x

4.2 Mapping object properties to knowledge boundaries and communication defects

After mapping specific communication defects to knowledge boundaries we analyzed the interviews regarding boundary object properties. Table 3 shows which properties were supported as being relevant for bridging certain knowledge boundaries and for mitigating specific communication defects. When assessing the mapping of properties to knowledge boundaries it must be considered that crossing knowledge boundaries is a cumulative process. To cross a pragmatic boundary for example, semantic and syntactic boundaries must be crossed before. However, to not clutter the table only the properties that have been explicitly identified as relevant to a specific defect or boundary are marked (i.e., no accumulation effects are represented in the table). In our analysis we distinguish object properties (this section) and management properties (section 4.3). The latter are marked grey in Table 3.

Table 3. Boundary object properties, knowledge boundaries and communication defects.

Communication defect	Syntactic boundary	Semantic boundary	Pragmatic boundary
Inappropriate means of communication	Accessibility		
Inappropriate communication style		Visualization	
No shared frame of reference	Shared syntax	Modularity, Abstraction/ Concreteness, Visualization, Stability	
Communication against the transformation			Participation
Implicit and explicit communication not aligned			
Dishonest communication			Up-to-dateness

Shared syntax. If an EA model uses vocabulary that is common among different stakeholder groups in an organization, shared syntax and a common frame of reference can be achieved. This can, for example, be accomplished by agreeing on the terminology of one stakeholder community (“*you need to talk purely in business terms*” [expert #1]) and capturing this in an information model. Another possibility is to use external standards (if this is compatible with the organizational culture). One interviewee described an engineering-driven organization that was very keen on complying with ISO naming standards in their models. A communication defect resulting from a lack of a shared frame of reference due to different vocabulary can thus be solved, which means that shared syntax is primarily associated with a syntactic boundary.

Modularity. By providing different views of an EA model, where each view captures the concerns of a particular stakeholder community, these communities can focus on different parts of an EA model. Moreover, stakeholder communities can hide parts of an overall model they are not interested in. Since views enable each community to explicate their understanding, perspectives can be compared and differences detected. One inter-

viewee explained that views enabled him to communicate architecture “*in terms that can be understood by other stakeholders*” [expert #7]. A communication defect due to a lack of a shared frame of reference caused by different interpretations can be overcome by using an EA model and providing appropriate views to the involved communities. This property is therefore linked to a semantic knowledge boundary.

Abstraction/concreteness. Our informants stated that stakeholders needed to be able to overlook a transformation project at an early phase to “*really understand what this change means*” [expert #6]. As a specific example, the ArchiMate layer diagram was mentioned as being helpful in linking business processes at a high level to the organizational structure, and eventually to the technology layer. For an EA model as a boundary object this implies that architects should be able to provide a short and concise overview that will necessarily be at a high level of abstraction. Some informants mentioned a one-page overview, i.e., an architectural model showing the envisioned transformation in a very concise way, as an important success factor.

In an early phase of a transformation, a high level of abstraction is important for communicating the transformation goal to stakeholders. However, as a transformation goes on and concrete decision alternatives become available, more concrete models are becoming increasingly useful. Since EA models with an appropriate balance between abstraction and concreteness can help communities in quickly assessing differences in interpretation, they contribute to a shared frame of reference by providing common meanings. Therefore, abstraction/concreteness are associated with semantic boundaries.

Visualization. The interviewees argued for visually appealing, graphical representations of architectural models. From the majority of our interviews, it emerged that a visual representation is more highly valued than plain text. Cognitively effective models can address communication defects caused by inappropriate means of communication, as well as those caused by a lack of a shared frame of reference. Visualization is therefore particularly useful for crossing semantic boundaries. However, one interviewee reported on an organization that preferred written text over graphics. This shows that the usefulness of visualization depends to a certain degree on the communities’ preferences.

Our interviews did not support the properties of **malleability** and **annotation**.

4.3 Management properties and the role of the enterprise architects

We have shown that most of the object properties discussed in section 2.2 are supported by empirical data. However, we also must consider *management properties* of boundary objects (section 2.2). The idea of management properties is supported by our interviewees who point out that, next to the design of appropriate EA models, their management by the enterprise architects is particularly important. In the interviews we found evidence for four of the five management properties.

Stability/up-to-dateness. According to the experts an enterprise architect has to deal with the trade-off between stability and up-to-dateness of an EA model. They indicated that the more unstable a model was, i.e., the higher the update frequency, the more they

had to invest in communication to maintain a shared understanding among the stakeholders. Conversely, a high degree of stability of a model can lead to a structure that is well-recognized among diverse communities, and thus contributes to establishing a common meaning. Therefore, stability contributes to crossing semantic boundaries. However, EA models also have to be updated regularly *“because the world is changing, your enterprise is changing, people are changing”* [expert #9]. If an enterprise architect does not update an EA model although s/he knows that something relevant has changed, this can be interpreted as dishonest communication. Hence, up-to-dateness can help in crossing a pragmatic boundary.

Accessibility. According to our interviews making an EA model accessible does not only include putting it on a server that everyone can access. Depending on their preferences regarding the means of communication people would or would not access that server (section 4.1). One architect illustrated his way to make his one-page overview of a future architecture accessible: *“So using that paper everywhere you go and put it on the table, leave it on the walls is helping you because everyone knows where his part is on the project”* [expert #8]. This quote shows that accessibility can also be reached by personal interaction. By ensuring that everyone receives the information accessibility helps crossing syntactic boundaries. Moreover, if an EA model is made accessible by personal interaction of the architect, this can also help crossing semantic boundaries because the architect can directly explain or translate the model to the respective audience: *“I was naïve enough in the beginning to think that if it was written down and if you have models then people would understand what was written down and they would understand those models. And then everybody would be on the same page. But that turns out not to be the case. So it’s a lot of personal interaction with people”* [expert #1].

Participation. The interviewees mentioned participation as an essential condition for the acceptance of an EA model. *“People need to know about it, but also need to have the feeling that their voice is heard and that their concerns are included in the architecture”* [expert #7]. If a stakeholder has participated in creating an EA model for the transformation, s/he is more likely to support the transformation. Thus, the probability for communication against the transformation is decreased. Participation in the process of creating and maintaining an EA model of a future architecture by a broad number of stakeholders can therefore help in bridging pragmatic boundaries. However, developing common interests among different stakeholder communities requires strong personal involvement of the architects. Virtually all of our interviewees stressed the importance of conducting workshops in order to engage stakeholders instead of preparing a target architecture themselves and presenting the finished result.

However, the experts also pointed out that, if the architect does not intervene, letting different stakeholders participate in creating an EA model and conducting joint workshops often results in communication defects. The interviewees emphasized the architects’ role as a translator or mediator between the different groups: *“And I invite people to do not judge or make assumptions but listen what other people have to say before they reply. So don’t have their answers ready and just wait for the right keyword to jump in. Let other people speak. But I will always take the role of summarizer only. So whenever someone*

has spoken I will then give a summary. [...] So I will repeat what was said and use different words so that the different people will be able to pick it up” [expert #1].

Versioning. We did not find support for this property in our interviews.

We have illustrated that solely having EA models whose construction adheres to certain properties may not be sufficient to mitigate certain communication defects. The examples above show that to implement the management properties for EA models, the architect’s personal interaction is needed. They have to make sure their models are recognized and understood by the relevant stakeholders. Furthermore, architects act as translators between different stakeholder communities. The property ‘participation’ expresses the need for also engaging stakeholders when creating EA models. In summary, the involvement of enterprise architects is needed to cross all three boundary types (Table 33).

Furthermore, in the interviews, no management property was directly linked to the defect ‘explicit and implicit communication not aligned’. However, we argue that the combination of stakeholder engagement and personal interaction of the architects may also help to mitigate this defect. Through participation stakeholders express and document their concerns explicitly. If later the implicit communication contradicts those explicitly stated goals, the architects can point that out through personal interaction.

Finally, the interview analysis shows that pragmatic boundaries cannot be bridged by EA models and architects alone. However, an EA model that has invited participation from many stakeholders may help convey a de-politicized perspective that is considered more objective. When an EA model is recognized among stakeholder communities as providing a neutral, commonly agreed-upon perspective (instead of being perceived as disproportionately representing a single community’s perspective), it will be harder (albeit not impossible) for politically-motivated stakeholders to push their own agenda and communicate against the transformation.

5 Discussion

Our data suggest that EA models as boundary objects are particularly helpful for crossing semantic boundaries, especially when helping to identify differences in interpretation and thereby preventing communication defects caused by the lack of a shared frame of reference. For addressing semantic boundaries, visualization, abstraction, and modularity emerged as the most important properties of EA models. These properties help different stakeholder communities to identify misunderstandings and re-align their interpretations towards a shared understanding. To maintain shared understanding and a common frame of reference, mock-ups of user-interface screens or roadmaps have been named by interviewees as valuable tools supporting EA models. Particularly roadmaps received attention for highlighting dependencies between the actions of various stakeholder communities, and also for showing individual stakeholders when and to what degree their areas of concern will be affected by a transformation. However, also at a semantic boundary, the involvement of the architect is required to ensure that these boundary objects are actually used and that stakeholder concerns are adequately reflected.

Overall, the harder a communication defect is to fix, the more involvement of the architect is required: While an established and well-communicated information model, crossing a syntactic boundary, functions largely without the architect's intervention, overcoming pragmatic boundaries requires strong personal and time-consuming involvement, e.g., by conducting face-to-face meetings, negotiations, and workshops.

To cross pragmatic boundaries and address communication defects such as dishonest communication, or communication against the transformation, requires both EA models that are trusted for the accuracy of their content, and skilled architects that are trusted for the way they are managing and using these models. Especially when pragmatic boundaries are encountered, the architect needs to perform a role as a 'boundary spanner', i.e., s/he needs to invest significant effort in upholding communication between diverse stakeholder communities.

Levina and Vaast [LV05] identified three conditions effective boundary spanners need to meet: (1) Boundary spanners need to have sufficient knowledge and understanding of each of the fields they are about to span to be perceived as legitimate and competent. For architects, this means that they need to have an understanding of both business and technological terms to be respected as competent by both business-unit and IT-unit members and to be able to fulfill their translator role. (2) Boundary spanners need to be considered legitimate negotiators of their own field. For architects, this means that they need to be perceived as authorized to make architectural decisions, to give dependable advice. An example would be granting exceptions from architectural principles. (3) Boundary spanners need to possess the required communication and negotiation skills associated with this role. And they need to be willing to perform a boundary spanning role between two different fields instead of becoming functional experts in one field alone. For architects, this brings the risk that they are considered as being caught in the middle between the business and IT domain, without being seen as legitimate and competent members of either one. To mitigate this risk and support the boundary-spanning function, skilled architects need to be able to rely on the proper tools, one of which are boundary objects.

6 Conclusion

In this paper, we have analyzed the knowledge boundaries lying beneath various communication defects. In a second step we have shown how EA models acting as boundary objects can be used to overcome these communication defects. We conclude that EA models are most useful for crossing semantic boundaries when they possess the object properties abstraction, modularity, and visualization, whereas for communication defects residing at pragmatic boundaries enterprise architects are required to perform a boundary-spanning function.

Although this inquiry builds on both theoretical considerations and empirical data, the findings are still preliminary. Further in-depth studies are necessary to understand the construction of those (few) EA models that work as boundary objects, and the context of their use. Also, the EA function is implemented differently across organizations, e.g., with respect to governance structures. Thus, the architect's role, organizational position,

tasks and responsibilities, as well as his/her interface with specific stakeholder communities (e.g., project managers or HR managers) needs to be further analyzed. Finally, more work needs to be done regarding the theoretical framing of communication (defects) in EA-driven enterprise transformations. This will help in classifying specific situations as being communication defects or not and thus in identifying those situations where EA models are likely to work as boundary objects.

Summarizing, this inquiry is a step to eventually derive design principles for EA model construction and management that are particularly suitable for overcoming communication defects.

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