

Communication with Models

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Abstract. In enterprise modeling focus has been on capturing the right level of information and how the models represent this information. This paper purposes a project, which aims to look at the stakeholder and their participation in the modeling process. The paper proposes a solution for how the stakeholders can be included in the process by drawing inspiration from knowledge of visual conceptual models, knowledge from industry modeling processes and digital interactive collaborative techniques. The result is a collaborative framework or methodology, which can make communication with models more flexible and engage a wider audience in the creation and maintenance of conceptual models.

1 Background

One of the key tasks in Enterprise Architecture (EA) is to analyze the current situation and existing challenges in the enterprise with the active participation of domain experts and decision makers [10]. 2 of the elicitation approaches use in this phase are interviews and participatory modeling workshops [10]. After an iteration of the before mentioned elicitation approaches, possibly in combination with other approaches [10], modelers create conceptual models of the knowledge captured [10]. The models are created by using one or several different notations, e.g. Business Process Model and Notation (BPMN) [8], Unified Modeling Language (UML), ArchiMate[7] and/or a framework, e.g. Architecture of Integrated Information Systems (ARIS), Department of Defense Architecture Framework (DoDAF). One of the fundamental attributes of the methods and/or frameworks, is the ability to circulate the captured knowledge back to the domain experts and decision makers, such that they can evaluate and use the created models. Enterprises operate in a ever-changing marketplace; this means that, if the enterprises want to stay competitive, it is crucial that it rapidly respond to any changes. The challenge with the current enterprise modeling approach is that it can be time consuming and difficult to manage; e.g. gathering all domain experts (or a selection) can be a challenging task. Additionally, engaging all the experts in a continuous discussion on the current conceptual models can be difficult.

2 State of the art

Conceptual modeling of organizations is not a new concept. 2 of the pioneers of this topic were Young and Kent in 1958 [13][2]. Through the years, the topic has

matured in complexity and application. In the 90-ties, the focus seemed to change from the question of the 80-ties: "What are we modeling?" to the questions: "Why are we modeling and how are we modeling?". Furthermore, the scope of the conceptual models changed from relatively well defined applications into vaguely defined conceptualized applications or organizations [2]. This widened the scope significantly and in response, there emerged different approaches for modeling the enterprise architecture of the organizations for example: ARIS¹, DoDAF² and Zachman³. Among the common assumptions for these frameworks, is the notion that enterprise modeling, to a certain extent, is a collaborative process among modeling experts and stakeholders (domain experts and decision makers) [3][1]. Furthermore, they promote the idea of a single, consistent record of the enterprise model, which should allow for multiple viewpoints [6]. One newer approach, which builds on the Zachman framework, is the EA3 cube [1]. This approach claims to be a holistic method to model the enterprise architecture in a current state and one or several potential future states. In spite of all the attempts to create an enterprise architecture framework, which embraces the whole enterprise as well as both current and future states. Practitioners have argued that enterprise architecture is flawed and fails to deliver on promises [12][4].

To summarize, the application space of conceptual models has continually increased since the 80-ties, both in context, scope and size. There have been purposed a number of different frameworks in order to manage and make actionable, the enterprise architecture models. The research has not focused on involving the stakeholders in a continuous modeling discussion. If large enterprise are to be able to respond to rapid changes in the marketplace, the engagement of the stakeholders is important. Secondly, structuring the discussion between stakeholders and modelers is another area, which needs to be explored, such that the discussions can be effective and efficient.

3 Proposed Solution

Given the overview of enterprise modeling presented in section 2 and the problem description in section 1. I conclude that, this area presents considerable exploration opportunities. Furthermore, I envision that my solution will take the path of empirically founded research, which will demonstrate and provide evidence for the stated claims.

The goal of this research project is to effectively and efficiently engage the stakeholders and modelers in a cross-enterprise collaboration, such that the enterprise can rapidly respond to any changes in the marketplace. I propose that we position the visual conceptual model at the heart of the conversation, such that the message is also the medium. I will elaborate with the following question:

¹ http://www.softwareag.com/corporate/products/aris_alfabet/default.asp

² http://dodcio.defense.gov/Portals/0/Documents/DODAF/DoDAF_v2-02-web.pdf

³ <https://www.zachman.com/about-the-zachman-framework>

1. How can visual conceptual models be used to communicate necessary changes in a enterprise and how can all the relevant domain experts and decision makers be included in the communication?

From section 2, responding to rapid changes in the enterprise through stakeholder participation and using conceptual models to communicate the required changes, has not been researched before. To explore the different aspects, I have chosen to break, the overall question, down into the following sets of questions:

1. What are the main phases of a modeling process in a enterprise context?
 - (a) Which stakeholders are involved in the different phase?
 - (b) What is their motivation?
 - (c) Which tools are used in the different phase?
2. What do we know about comprehension of visual conceptual models?
3. What do we know about collaborative creation of visual conceptual models?

First we need to establish, what the different phases are in a modeling process in a certain context, which stakeholders are involved, their motivation and which tools they use. This is necessary, in order to establish an initial state or the current state of affairs. Dialogs with modelers, seems to indicate that there are 3 different phases, knowledge elicitations, model creation and circulation. I have not been able to find any empirical evidence for this statement, therefore it would be interesting to see, if this holds true.

Secondly, there are several different visual conceptual modeling languages, e.g UML, BPMN and Event-driven Process Chains (EPC). I have chosen to base my focus on empirical studies regarding visual aspects of UML. The intent is to identify the existing knowledge about visual aspects of UML models and their correlation to human comprehension. This knowledge could be used as a building block when evaluating visual aspect and their influence on visual conceptual model construction.

Enterprise modeling is a collaboration between modelers and stakeholders (see section 2). The keyword is collaboration and this will add the third dimension to this research project. In [9], the author explores the topic of subject-oriented business process modeling and how this can enable people to represent their knowledge about their individual ways of performing parts of a cooperative work process. This article provides an interesting insight into mental models and their externalizations. In [11], the author examines the role of social media artifacts in collaborative software development. The thesis defines the role of social media artifacts as the timely dissemination of scenarios and concerns to a diverse audience ... triggered by questions from users or articulation work. The question is, can we draw inspiration from social media artifacts and subject-oriented modeling techniques to enhance cross-enterprise communication with visual models, such that it improves stakeholder participation and possibly also the quality of the enterprise models?

4 Methodology

In order to evaluate and validate the outcome of this project, I plan to use an empirical approach. The idea is to conduct an ethnographic study in the enterprise setting, such that I can establish an initial state or more formally a null hypothesis. In this study, I plan to observe how models are created and continually updated in an enterprise. The strength of this approach is that it gives a very precise insight into a certain context and population. A weakness is that the insight gained might be influenced by aspects which are outside the scope of the research. Nevertheless, the intent is to find a model of the process, which is used to create a conceptual model.

In order to establish a foundation regarding visual aspects of conceptual models and their correlation to human comprehension, I plan to conduct a Structured Literature Review (SLR) on the empirical studies of visual aspects of UML models. This will provide the basis for me to explore how visual aspects affect communication with models. The strength of conducting a SLR is that the literature is searched in a structured manner, which done properly could be repeated. This will strengthen the outcome of the SLR.

It is clear that in any collaboration, there are human factors, which affect the collaboration paradigm [5]. It is therefore important to consider and evaluate factors that can influence communication with models. In particular, it is important to identify any social factors, which could influence participation in a collaboration. To identify human factors, the plan is to conduct a qualitative interview study, with stakeholders involved in the ethnographic study.

Technical solutions, which could be used to enable cross-enterprise collaboration; such as social networks [11], blogs [11], wikies [11] or digitally augmented tabletops [9], is another area, which will be examined. The plan is to develop a mobile application (phone or tablet) in order to evaluate different collaboration approaches. These approaches will draw inspiration from the before mentioned social artifacts and others. The mobile application is expected to be a part of the product portfolio of QualiWare ApS.

5 Expected Contributions

The expected contributions of this research project are the following:

1. A Structured Literature Review on empirical research of visual aspects of UML models.
2. A case study, which studies the process of conceptual modeling in a given context.
3. A study that focuses on the visual aspects, which affect comprehension/understanding of conceptual models.
4. A study that focuses on which stakeholder aspects, which can influence participation in conceptual model creation.
5. A framework for creation and maintenance of conceptual models in a distributed environment.

6. A mobile application, which implements the framework in 5.

The contributions above have relevance in different fields. The SLR has relevance in the UML and empirical research communities in computer science. A study on how conceptual models are created in industry, could provide an interesting insight in a wide range of different conceptual modeling communities; e.g BPMN and EA. An study into, which aspects can influence stakeholders participation in a modeling process can provide profound insight, for the development of a collaborative framework and also a base for the evaluation of the same framework. The framework aims to answer the over arching question of this thesis and as such it's focus is on the aspects, which motivate and engage stakeholder participation in the collaborative creation of visual conceptual models and providing the functionality for updating and continually evaluating the created models. The mobile application is the concrete instantiation of the framework and is intended to empirically evaluate it.

The insight gained from this research project could potentially contribute to a wide range of different modeling communities, because the question of this thesis can be applied to software development development, information systems and obviously enterprise modeling.

6 Current status

The emphasis of the project has up until this point been 2 different activities. The first activity is an SLR. The SLR aims to identify, which visual aspects of UML models have been evaluated empirically, in addition to the identification , the SLR aims to collect and map the results from the different studies. This should result in a condense overview of the empirical studies, which have been conducted and also identify areas, that could be explored further. The SLR will also provide valuable insight into, which visual aspects could influence the understanding and communication with visual models.

The second activity has been the development of a mobile application with the primary functionality of showing stakeholders the conceptual models, which address their concerns. The application also provides functionality, such that the stakeholder can provide feedback and/or request a change to be made to a given visual model. The first version of the application was demonstrated in a industrial conference hosted by QualiWare on the 05 - 06.05.2015.

7 Future

The table 7 show the current time-line for this project. The time line is split up in to half-year periods where the major focus points of that period are described. The focus of the time-line is the are the research activities, which are planned in that half-year. Industrial and academic commitments such as courses and other activities are not considered. At this early stage of the project the time-line is subject to possible changes.

Half-year	Project outline
	Started working on SLR with the aim of a publication in Spring 2015. Develop a mobile application, with the aim of a demonstration in Spring 2015. Conduct interviews with enterprise modelers in order to gain familiarity with the industry, possibly use the interviews as a pilot study.
Autumn 2014	Finish SLR and prepare mobile application for industry conference hosted by QualiWare. Prepare for ethnographic study and establish industry contacts, possibly inside the MADE research project.
Spring 2015	Conduct ethnographic study and present observations in an article.
Autumn 2015	Explore digital interactive collaboration techniques and evaluate their usefulness in an enterprise setting.
Spring 2016	Research stay at foreign university with an interest in digital interactive collaboration.
Autumn 2016	Synthesising research results from SLR, the ethnographic study and the digital interactive collaboration in to a framework or method. This can then be empirically evaluated in an industry setting and possibly contrasting to an academic or other industry setting.
Spring 2017	Writing thesis and futhur empirical evaluation.
Spring 2017	Writing and submitting thesis.

Table 1. Project time-line

References

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