Cooperative-Intrinsic Planning and Model-Driven Design of Business Information Systems

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Abstract. The planning and design of information systems is an increasingly complex and challenging task. With respect to recent developments regarding an individual as a constituting and highly creative impact on the respective organizational structures and application systems, methods are required for a sophisticated inclusion of these actors in the design of information systems. Therewith, the roles of system analysts shift from a prescribing and governmental role to a supportive actor that targets a resource-orientated vision of business information systems. Because of that methods and techniques are required that support the elicitation of potential and the effort for a collaborative identification of a development direction. "Cooperative-intrinsic" refers to the inclusion of any individual of an information system in the act of planning, in order to support agility and flexibility of an enterprise. Model-driven design aims at the support by enterprise models for the analyses and clarification of information systems, to prevent alignment faults, errors and redundancy. Furthermore, technologies need to be adapted purposefully to support the agility and flexibility of modern industries by cooperative-intrinsic planning and model-driven design of business information systems.

1 Introduction

Modelling remains a capstone in an engineering process, whereby it enables, among other aspects, the sophisticated analysis, the inquiry and elicitation of requirements as well as ultimately the design of an actual artefact. However, with its increasing importance and capabilities, a bidirectional and exclusive relation between a modeller and a model is not suitable any more. It becomes important to consider the respective lifecycle of a model and the respective actors that need to interact differently with the model. Thereby, a model continuously evolves instead of being a set of undoubtable facts. For example, enterprise modelling, initially had the primer objective for the planning and realisation of software systems [1] and in some cases is rather perceived as a method for enterprise architecture sketching [2]. However, enterprise modelling has evolved to a paradigm of holistic planning and suppresses as well as incorporates existing paradigms [3]. However, while planning is an iterative and refining process [4], modelling is usually rather result-orientated than action-oriented. Whereby, the latter seeks for completion and correctness [5], planning requires a level of information that enables the respective needed actions. Controversially, the act of enterprise modelling does not orientate towards a certain hierarchy of an enterprise and its respective planning

processes, but a single individual rather selects and interviews respective domain experts.

Therefore, enterprise modelling requires a reflective and participating contention that rather seeks for completion of the level of argument. The process of modelling rather is unaligned with the process of organisational planning. The planning of an enterprise by means of an enterprise model does not necessarily require a complete, but a holistic representation. Thereby, completion does not refer to the holism of knowledge domains, but rather to the holism about application domains. Thereby, it is required to inter-connect the different individuals that intrinsically create the enterprise by means of their actions. Thereby, the usage of upcoming and social technology in order to enable a reflective and purposeful performance of an enterprise is mandatory.

2 State of the Art

Enterprise modelling is a diverse field with propositions of various modelling languages as well as methods. Initiated by the aim of conceptual modelling to provide a graph-orientated and semi-formal representation of a domain [6], more and more evolutions of such a paradigm have to lead to modelling orientations that provide modelling concepts with enriched semantics. Most popular among them, is the idea of business process modelling [7]–[9], which supports a more holistic lifecycle of business process management. With respect to the identification of a business relevance, even languages were proposed that support the depiction of an information system [10], respectively an enterprise as a whole, through the establishment of the term of enterprise modelling [11], [12]. Thereby efforts have been undertaken in order to support the different identified domains of an enterprise, whereby one is goal modelling [13].

As the creation of a model, especially an enterprise model, requires a methodological foundation, various proposals have been made that all come with different abilities. For example, process engineering [14] divides between an as-is analysis and a to-be construction and aims at a sophisticated introduction of business processes and their related software systems. Evolved from these initiatives, the need for modelling the actual requirements has been elucidated in various works [15], [16], due to the success in modern handled software development projects. Advanced from these insights, are agile approaches for both modelling and software development have been developed [17], which primarily aim at a more efficient action-ability and rapid development of software systems. Due to the high risk of failure in human interaction, approaches such as model driven engineering abstract from such and promote models that can be executed on the run and do not further depend on development processes [18]. Despite that recent approaches such as adaptive case management [19] have identified the need for promoting actions that were previously unconsidered on a conceptual scale and try to provide mechanisms for modelling that barely provides enough information and empowers the actual individual in its own problem-solving capabilities [20]. With respect to further upcoming ideas, such as the model driven organisation [3], these advances have to be purposefully integrated in order to enable a holistic creation of an enterprise model that includes such knowledge in a relevant-to-the-actor manner (Req.

1). This requirement is valid regardless, if the model needs to be consumed by a machine or a human. Further the enterprise model actually needs to be an evolving subject and this evolution needs to be coordinated by the same processes that drive the evolution of the enterprise [21] (Req. 2). For example, strategic issues have to be valid on the long-term and operative issues have to be valid on the short-term. However, although such an evolution of an enterprise model, the content must be accessibly and adaptable by the respective actor (Req. 3) and it needs to be integrated in order to identify the value of an enterprise action with respect to the set strategy [22] (Req. 4).

3 Research Questions and Research Goal

With respect to the previously stated requirements, the ultimate goal is to show how enterprise models can be used for planning purposes and further to examine if enterprise modelling languages already provide the necessity concepts or to properly extend them. Initially, the stated requirements demand the analysis of the structure of enterprises and their respective actors. Especially, it is required to integrate various individuals who are not necessarily able to model. Therewith the initial research question for such analysis is the following.

Who are the actors that need to be involved in the creation of an information system and what is the required level of planning that needs adequate support by enterprise modelling?

As it is assumed that not every type of employee of an enterprise is necessarily capable of enterprise modelling per se, new technologies need to be identified that are capable of including the identified individuals in the process of modelling. For example, it might be necessary in a company with a high fluctuation rate to gain knowledge of experienced employees, which is usually not available in a structured sense and not part of an enterprise model. However, individuals with the same tasks will dramatically depend on such knowledge.

How can the various actors be included in order to let them contribute to the actual enterprise model in cooperative manner?

Accordingly, the sophisticated use of such technologies requires to integrate them in a certain model-driven planning process. This is even more important if such individuals from the operative staff are included in the modelling process (as discussed in the previous given example). In that sense, it is not necessarily useful to manage the best practice for sales conservations on the level of content. Moreover, its decision for relevance should be based on the level of a business process model that includes such a task, or even more efficient; based on the strategic plan that e.g. has decided to outsource the sales-department to contractors.

What is the form of a process that supports enterprise modelling as a manner of enterprise planning?

Ultimately, with having developed such a method, it is required to show any value that can be gained by the enterprise and to identify the advantages. One of the most promising advantages might be that issues, such as strategic alignment can be shifted on a conceptual scale and that enterprises can discuss these issues tangibly, identify the source of the issues within misaligned plans and maybe solve the issues by means of the methodological support, e.g. with support of artificial intelligence.

What is the use in creating plans by means of enterprise modelling and implementing a flow of enterprise modelling as an organisational planning process?

4 Research Method

The research method of the targeted research, while underlined by the social constructivism by BERGER and LUCKMANN [23] and the critical rationalism by POPPER [24], uses a configuration of multiple research paradigms, respectively methods, as proposed by FRANK [25]. Initially, a structured literature review of enterprise modelling theories is used to identify present academic work. Especially these theories are examined according to their integration of different levels of planning and their respective methodological support with respect to the initially stated requirements. Thereby, the presented work will examine the following three propositions.

Proposition 1: Reducing the cognitive effort for understanding an enterprise model is more beneficial than any syntactical or semantic precautions.

Proposition 2: The design of enterprise modelling languages requires the consideration of application domains instead of knowledge domains.

Proposition 3: Knowledge in application domains is possessed by individuals and not by enterprise models.

These propositions do not conflict with the need for a general information-, knowledge- or even experience management, but they highlight the relevance of individuals within enterprises. Thereby, the ultimate goal of the work is the transition of organizational behaviour in enterprise modelling methods for sakes of the management of enterprise models and -modelling. During the research, experiments will be chosen for strengthening the stated propositions.

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