

# Meta-Study of Enterprise Modelling - Why and How

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**Abstract.** In the literature there are calls for a paradigm shift and (re-)organizing research on enterprise modelling in order to meet the challenges of modern enterprises and increase the impact of the field. In this paper we argue that a meta-study can strongly contribute in providing answers to these challenges. We present how the four components of a meta-study: meta-method analysis, meta-data analysis, meta-theory analysis, and meta-synthesis can contribute to the development of a theoretical framework that can provide a basis for future research in enterprise modelling. We also identify the research challenges to be overcome.

Keywords: Meta-study, Enterprise modelling, Theoretical framework

## 1 Introduction

The importance of conceptual modelling was understood as early as the mid to late 1960s [1]. Conceptual modelling focusses on “capturing and representing human perceptions of the real world” in such a manner that they can be included in an information system [2]. As such, conceptual modelling has always been an essential part of developing information systems [3]. In the late 80’s, Enterprise Modelling emerged as a discipline that investigated how to describe various aspects of an enterprise [4]. Since then, it is at the core of the Management Information Systems research domain and has been a subject of intensive research for about two decades [5].

In this period, a large body of research has been devoted to the development of enterprise modelling approaches. As a result, the discipline starts to show signs of modest maturity [6]. However, there are calls for changes in enterprise modelling research. The authors of [7] conclude that “paradigm shift is needed for dealing adequately with the challenges that modern enterprises face”. For example, one aspect are the informal organizational elements, like values, beliefs, leadership, culture, power, politics and others are largely neglected in the ‘enterprise model set’ [8]. One reason can be that, historically, the rational approach has dominated the research in Enterprise Modeling [9]. However, it is argued that this approach is essentially over simplistic in nature and reduces complexity to an easier, simpler structure that does not represent reality [10]. On the other hand, adding complexity to a model carries costs and it is needed to investigate whether a balance can be achieved. This is especially important in the new context of digital era, where the information and communication technology we use now are different from the one in the past [11, 12]. For example, the

case of Internet of Things [13]. In this direction, in [5] there is a call for (re-)organizing research on enterprise modelling in order to increase the impact of the field. One suggestion is enterprise modelling approaches to depart the machine-like logic of the organization [14]. Finally, enterprise modelling finds “their origin in the practitioners’ community and lack a solid scientific foundation, which hampers both theoretical and practical progress” [15]. Recognizing this, members of the community call “to develop new, appropriate theories, models, methods and other artifacts for the analysis, design, implementation, and governance of enterprises by combining (relevant parts of) management and organization science, information systems science, and computer science.... The result of our efforts should be theoretically rigorous and practically relevant” (cfr. the Enterprise Engineering Manifesto). The above calls for paradigm shift raise different why questions: why Enterprise Modelling is not appropriately developed to meet the current challenges, why it has lack of practical impact or why it has lack of theoretical rigor.

Reflecting on these developments, we feel it is both timely and worthwhile to examine the research on enterprise modelling. Based on the calls for paradigm shift, our goal is to explore why is enterprise modelling research as currently conducted emphasizing the wrong things or overlooking aspects that are worth investigating? When we will perform that, we will engage in reflexive investigation for “what might be”. To achieve this purpose, we propose that a meta-study on the enterprise modelling literature needs to be performed.

A meta-study [16] enables the synthesis of published research, which includes a systematic approach to the collection of studies, a critique of methodological approaches, and a synthesis of findings. The goal is the development of a theoretical framework that can provide a base for the future research in a discipline [17].

In this short paper we attempt to justify the usage of meta-study as an approach for moving forward the discipline of Enterprise Modelling and to present the challenges in the realization of such endeavor. As a result, we aim to initiate a discussion whether meta-study is the right approach and how its challenges can be overcome.

## **2 Justification for using meta-study**

The initial challenge of critically examining the state-of-the-art in enterprise modelling comes from the breadth and depth of the discipline. Enterprise modelling is a generic term which covers the set of activities, methods and tools related to developing models for various aspects of an enterprise or a network of enterprises [4]. An enterprise model may comprise a number of related “sub-models”, each focusing on a particular aspect of the problem domain, such e.g. capabilities, processes, business rules, concepts/information/data, vision/goals, strategies, business services, and organizational structures [18]. Furthermore, enterprise modelling can have different purposes, including human sense making and communication, computer assisted analysis, and model deployment and activation [19]. All this pose three central, but related, methodological challenges:

- How to analyze the primary research publications on enterprise modelling?

- How to synthesize the primary research publications on enterprise modelling?
- How to move from synthesis to reflection of “what might be” in enterprise modelling?

Disentangling the analysis, synthesis (“what is the story?”) and reflection (“what might be?”) of the primary research publications is complicated because they are inter-related. The work of these three aspects should not be seen as a linear, but as a back-and-forth cyclical process. During the analysis we will identify data points that are base for synthesizing to themes or dimensions, but this output is not definitive and can change. The reflective engagement through a process of theoretical sensemaking might require additional exploration and interpretation of the identified pool of primary research. Thus, we go back to the starting point and move forward in the process of analysis, synthesis and reflection. This cycle can be repeated many times. In this way we can ensure that breadth and depth of enterprise modelling literature can be appropriately integrated in answering the why questions and development of an integrative frameworks and theories for enterprise modeling. In such conditions, using meta-study and its four components could be a successful strategy.

Meta-study consists of four components [20]: meta-data analysis, meta-method analysis, meta-theory analysis, and meta-synthesis. The first three components refer to analytical phases, in which the findings, research designs, and theoretical frames of primary research publications are compared and contrasted. In the meta-synthesis phase, the findings of the analytical phases are considered in the light of the historical, sociocultural, and disciplinary context in which the primary research was conducted. This phase can be described as “digging deep to generate new knowledge about the phenomenon under study” [20]. In this way, meta-synthesis challenges common understandings of the phenomenon under study and the way in which it should be studied [21]. It is through the process of meta-synthesis that first, we evaluate the calls for changes in enterprise modelling research; and second, develop an integrated theoretical framework that can guide the future work in this area. In other words, meta-synthesis should help us evaluate whether enterprise modelling goes wrong in light of the calls for change of direction made by some scholars. Based on such evaluation, we should provide options for new directions. This is more easily said than done taking in consideration the typical challenges faced by meta-study.

### **3 Meta-study challenges**

The first challenge is selecting the primary research publications that will create the data set that will be analyzed. The breadth and depth of enterprise modelling literature raises not only the issue of comprehensiveness of the primary research that should be addressed, but also the inclusion criteria that are applied in a meta-study (for example goal of the research, methods, etc). When the data set is created, a second aspect that needs to be taken in account is which studies in the data set should be excluded because of a lack of rigor in the research or "How bad is too bad to be included in the meta-study?" [21]. Before the meta-study starts, justified criteria of inclusion and exclusion need to be provided.

The second challenge is how based on the results from synthesis we move to reflection of “what might be” in enterprise modelling. Most probably, for this we will need a diverse set of experience, knowledge and perspectives. On one hand, there is a need for people with strong experience and knowledge of enterprise modelling domain (frameworks, methods, techniques) but they might be caught in that existing knowledge and not be able to question the assumptions or look from different perspective. On the other hand, you need inexperienced scholars or domain outsiders that can provide new perspectives but might not be able to understand the logic behind the current research. One option is to create a larger diverse research team. The benefits of having a diverse team is beneficial because they can generate different perspectives and bring different experience that can improve the end-product of the meta-study [21]. The problem here is that the research might take too long due to integrating the experience, knowledge and perspectives of the team members, but it can create a more representative integrative framework. The second option is to have a narrow team that approximately covers the required diverse set of experience, knowledge and perspectives and share the results of analysis and synthesis with larger number of experts in the field and based on their feedback, improve the end result of the meta study. This raises the question of how to balance between quality and speed of performing the meta-study.

## 4 Conclusion

In this short paper, we make a proposal for meta-study of enterprise modelling. We make an attempt to justify meta-study as an approach through which we can move forward the discipline of enterprise modelling. We also present the challenges of applying meta-study to study the domain of enterprise modelling. The goal is to open a discussion with interested scholars on whether and how a meta-study of enterprise modelling should be done.

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