Explorative Survey into Goals, Focus, Experiences and Extent of Enterprise-Wide Process Modelling in Practice

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Abstract. Enterprise modelling promises many potential returns to companies but also entails some challenges for those institutions who engage in enterprise-wide modelling activities. To improve understanding in this area, an explorative survey has been devised with a number of companies from diverse industries. The focus is on business process modelling but also IT models are addressed. Most companies align their enterprise process modelling to one leading goal. While the extent of the model portfolios is very impressive, modelling often still does not cover all of the company. Further in many instances reported issues were the motivation of experts to cooperate with modelers, the integration of organizational and IT-models, and modelling tool related topics.

Keywords: Modelling goals, Modelling practice, Enterprise modelling, Business process modelling, Experiences

1 Introduction

Enterprise modelling comprises many facets, notably strategy, organization, and resources, particularly IT-systems. In practice and research diverse modelling methods have been devised (e.g., MEMO [1], ArchiMate [2], BEN [3], or ARIS [4]). In this but also other respects, research in enterprise modelling is predominantly constructive or technically oriented. Only a smaller part of research is concerned with the creation and usage of models in an extensive organizational context.

To provide some more insights in this field, the research documented in this paper is set up to gather a) experiences on major issues in enterprise modelling and b) evidence on the extent and the complexity of practical modelling in companies.

Communication with practitioners in enterprise modelling often indicates that enterprise-wide modelling is not executed as intended by management and specialists in charge of modelling methodologies. Therefore, also unresolved questions, dependencies between different areas and frictions in organizational practice are searched for, as they are important for management of enterprise-wide modelling and can well direct new research.

1.1 Explorative Research in Enterprise Modelling Practice

Enterprise modelling is in many ways crucial to company interests. Information presented in the models is oriented towards future plans of the company, or it can uncover problems which would otherwise remain unnoticed. For these reasons, it is rather subtle to gather and compile findings on practical usage of enterprise modelling in companies. In chapter 1.3 and 2 the related problems will be discussed in more detail.

This paper is a first step in research to collect practical experiences in enterprises on the usage of modelling, its extent and main issues to manage enterprise-wide modelling activities. It is connected to endeavours to better understand the underlying mechanisms and dependencies in large concerted modelling activities to support its management and sustainability. [5], [6]

It complements other research like a) related research in theoretical areas with validation by company examples, e.g.: [7] and [8], b) reports from industrial practice cases, e.g.: [9] and [10] or c) surveys on influential factors for success of enterprise modelling in industry [11] and [12].

1.2 Issues in Enterprise-wide Modelling

Enterprise modelling comprises a plethora of aspects which influence the results an organization can reap from its modelling effort. [13] Therefore, in an exploratory study to get more insight into influential factors for management, only a few prominent aspects can be investigated. Hence, the survey centres on: a) the organizations and their goals which direct the modelling, b) basic methodological aspects, like, the modelling language, the organization of model development and integration between different kinds of models, c) crucial elements are captured in two categories, c1) the modelling tool and c2) further emphasized experiences. d) Finally some results from enterprise-wide modelling are reported, the extent of modelling, success stories and economic issues. Figure 1 depicts an overview on the topics.

1.3 Consideration of Potential Research Methods on Enterprise Modelling Practice

Research in enterprise-wide modelling practice is challenging in various respects. The company models often contain vital information of and for an organization. Therefore, also their creation and other aspects are handled confidential. Another aspect is comparability and precision of data. In many contexts of business research one is accustomed to a high degree of precision, especially, if information can be gathered by measurements. But the field of modelling is quite diverse and highly specialized. Also measurements are rarely used. Hence, a study in the practice of enterprise modelling usually relies on information provided by experts. This and the differentiation of organizations advise to consider the effect of varying perspectives and potentially resulting differences in interpretations.
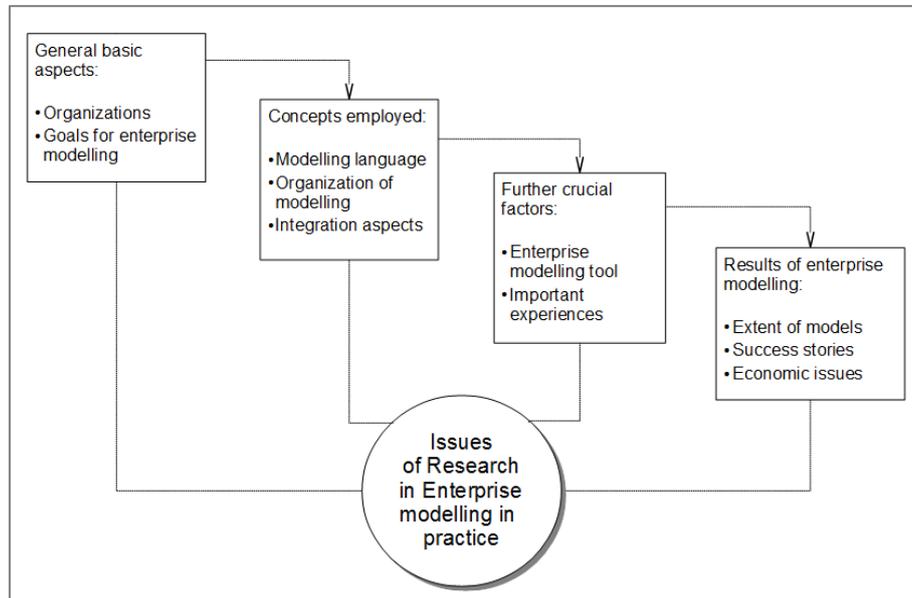
Fig. 1. Issues for research in practice of enterprise-wide modelling activities.

Before considering the demands of adequate interpretation of collected data, the method to gather information must be determined. Generally, there are a number of different methods available to collect evidence from a number of organizations. Most prominent are questionnaires and interviews. [14]

A questionnaire can be well adapted to standardized or properly understood objects of investigation. As the practice of enterprise modelling as a wider organizational effort has seldom been described in a homogenous frame, an investigation with a questionnaire is not advisable. Also the response rate, in this kind of surveys, is quite low and would probably distort the results. [15]

For these reasons and because of the exploratory character, it was decided to base the survey on semi-structured interviews with practitioners. The discussions were directly documented in notes and compiled afterwards. Unclear information was validated after the interviews in a number of cases. Criteria for the selection of partners were: a) the organization practiced a concerted modelling covering most or crucial parts of its business; b) it employed a central repository for integrating different results; and c) the organizations should vary in respect of size or industry or another major characteristic to provide for a more realistic account of enterprise modelling in practice.

In the beginning, it was intended to investigate different perspectives in enterprise models, like business process models, IT models, and strategic models. However in the early stages, most contacts were established with practitioners in the field of business process modelling. This provided a common basis and had positive effects for the documentation of the findings. While not looking at enterprise architecture models directly, nevertheless, the IT perspective was very prominent as for numerous companies the processes are fundamental for IT-system development. Another topic,

which was regularly addressed, was supplementing the business processes with relevant information on supporting IT resources.

There are some limits inherent in this kind of approach and research. They are rooted in the subjective judgements and interpretations of the participants, and further connected with the impossibility to reach statistically satisfying samples. Nevertheless, the research is based on input from very experienced practitioners with in depth knowledge on the topic. Also often different hierarchical levels of the organization were involved like senior manager and modelling specialist. So information from different perspectives had been collected. Sometimes a person was only able to provide information from one perspective or specific information was not available. This is a limitation in this survey. It is due to the sophisticated topic and the exploratory character of the talks. Anyway, very illuminative, although not all desirable, information could be obtained. To account for this, the specific number of entries has been documented in most findings of this survey. For the reasons stated, it is in a number of cases lower than the total of the surveyed organizations.

The general method used was the interview. But as the interview part was complemented with information provided by the researcher, the term *talk* is used frequently in this paper. The organizations represented in the survey stem from diverse industries and also have different sizes. However, there are some industries represented with a higher proportion as in industry in general.

Another challenge was to interpret the individual elements of information in an appropriate way. In this respect the interpreter had to work carefully, as the statements from the practitioners in many cases were bound in their experiences and background. [16] It was an advantage that the researcher had worked in this field for many years. So it was usually possible to specify the specific terms used and information given by inquiring their context and meaning.

2   Results of the Survey on Selected Organizations

The talks with the organizations presented in this study started in the middle of 2015 and the last was in spring 2016. When this research was initiated, it was intended to focus on qualitative issues but also collect some quantitative data. This quantitative data was meant to complement the qualitative information. When the interviews were analysed and prepared for communication, another challenge emerged. As the information originated from confidential contexts, it could not be straightforwardly presented. This potentially would have revealed specific organizations described. When considering this, the author remembered research findings of a survey on numerous modelling methods in morphological boxes. This kind of box can represent the distribution of characteristics giving an overview on the findings.[1] This quality makes it particularly suitable for communicating a rich, but nevertheless realistic picture of the current state of enterprise-wide modelling with focus on business processes.

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[1] The research on modelling methods using the morphological box was [17]. In general, the morphological box has been mainly utilised to foster creativity but it is also employed in business analysis.[18]

The organizations examined represent a wide variety of typical users of business process modelling as shown in Table 1. The financial industry seems to be over weighted. This may be due to the available contacts but it also reflects the more widespread use of process modelling in this sector because of legal requirements. The size of the organizations varies widely between medium sized organizations with 400 employees (minimum of stated values) and large organization with 130,000 employees (maximum of stated values). The average number of employees was 31,000. The distribution of sizes of the organisations is mixed in relation to industry, so there are smaller and bigger organizations in most of the industries. Six of the organizations are international. Most of them use an integrated approach with common process patterns shared in all countries and only adapted for specific regional requirements.

Organizations	Overall: 11 - (Major interviews: 10 ; partial interviews: 1)			
Industry	Financial: 6	Production: 3	Logistics: 1	Public: 2
Employees	Max. 120,000	Aver. 31,000	Min. 400	Entries 7
International Organization	Encompassing Approach 5	Separate Modelling 1	Local organi-zation 5	Entries 11

Tab 1. Overview on the organizations presented in the study.

2.1 Goals of Enterprise-wide Business Process Modelling

The goals of a modelling activity are pivotal for many aspects, how modelling is set up and performed in an organization. [19] As modelling can support multiple goals of an organization, this aspect is separately presented in a) the main goal of business process modelling (Table 2), and b) further goals the organizations are striving to reach with its modelling activities (Table 3).

Main Goal	*Number of Organizations*	*Remarks*
Fulfillment of legal obligations for documentation	6	Increased focus on international governance standards like COBIT or Sarbanes-Oxley Act
Specifying IT-systems	4	Main focus development projects and integration
Standardization of procedures	1	One focus is to easily establish new sites

Tab 2. Main goals of organizations questioned.

The fulfillment of legal obligations is the main goal to model business processes for most companies. Organizations have to comply with standards from regulatory agencies, e.g., in the finance sector or in health care, but also with other governance standards like Sarbanes-Oxley Act or COBIT. Fewer organizations, but still one third, stated that their main focus was on IT and other development projects. One international organization used its models to standardize procedures in different locations, and to swiftly establish new sites.

Most, but not all, organizations mentioned further goals, they pursued with business process modelling. Some mentioned more than one additional goal. Perhaps not surprisingly, most organizations (6) regard their models as source to find options for improving their business. Four organizations use their business process models in projects and as knowledge base. Two organizations employ their process models for process controlling. Also mentioned was the provisioning of information for data protection laws and an additional use in risk management. Anyway, the emphasis in the reported experiences was always placed on the main goals.

Additional Goal	Number of Organizations	Remarks
Business Reorganization and Improvement	6	
IT-Projects and Business Changes	4	
Knowledge Management	4	
Process Controlling	2	
Provision of Documentation for Data Privacy Protection	1	
Risk Management	1	Often contained in main goal of obligatory documentation

Tab 3. Further goals for business process modelling of organizations questioned.

2.2 Methods and Structures used for Enterprise Business Process Modelling

The organizations represented in the survey are using different modelling languages and furthermore their methodological rules for model structure vary. In Table 4 the characteristics of the distribution of values are described.

Most organizations used EPC (Event driven Process Chains) as their modelling language. Some tendency was noted to switch to BPMN (Business Process Modelling Notation). Sometimes BPMN was used in parallel with other languages. But in other cases, depending on the overall integration of processes and the repository, a more sophisticated transition was deemed indispensable. Anyway, also disadvantages were noted in respect of BPMN and the compactness of its representation of roles in separate lanes. Besides EPC and BPMN also Process modelling based on ISO

(International Standards Organization) Flowchart notation was employed by 4 companies. They noted a good acceptance by readers of the models of business departments.

Process modelling methods	EPC: 9 (decreasing)	BPMN: 2 (rising)	ISO Flowchart oriented languages: 4 [2]	Entries: 11 [3]
Levels of modelling	Max. 6	Aver. 5	Min. 4	Entries 4
Types of base processes	Max. 26	24 [4]	Min. 7	Entries 3

Tab 4. Methodological characteristics in process modelling of organizations in the study.

Concerning the levels of modelling (from process overviews to detailed steps of work), the organizations had similar structures with the number of levels ranging from 4 up to 6 and an average of 5 levels. The number of types of base process areas in the company process map varies to a greater extent, in this study between 7 and 26. As Footnote 4 indicates, this number is depending on diverse organizational conditions and may be dominated by the domain or political valuations of its management.

2.3 Organization of Modelling

The organization of modelling reflects the distribution of work between the central modelling department and the specialists in the field who know how actual work is done and by that the fundamentals of the business processes.

For reasons of the different required know-how[5] and the motivation to share it in models, some advocate a central modelling approach and others a decentralized

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[2] Two of the methods used standard symbols from the business modelling tool employed and two other organizations had custom designed symbols and elements. However, they were semantically close to the ISO Standard for Flowcharts which has been noted in the table.

[3] The overall number of modelling languages used is bigger than the entries (organizations represented in this aspect of the study). The reason for this is that two organizations are temporarily using two languages in parallel.

[4] As for this aspect only three values were available, the value 24 was the middle value stated. It was annotated by the responsible for modelling that the top management had mentioned the extreme values of their competitors having 10 or 32 types of processes which were both reckoned as inacceptable. The result with 24 types was well situated in the middle.

[5] This refers, on one hand, to the knowledge of the domain and, on the other hand, to the knowledge of process modelling and the integration of processes into comprehensive repositories. If modelling is performed only by modelling specialists, the motivation for the domain specialists is lower to support the creation of models than if they are self-constructed. But high demand on quality and integrity seldom can be realized by decentral modellers.[13]

approach. This was reflected in the approaches chosen by the examined organizations. Five of them followed the strategy of central modelling and the same number used decentralized modellers. All persons responsible for modelling were aware of the limitations of both approaches. One organization reported to use a combined or mixed strategy depending on the know-how of the department. Others mentioned internal discussions to switch from one mode to the other.

Kind of division of work	Central modelling: 5	Decentralized modelling: 5	Mixture of both: 1	Entries 11
Central modellers	Max. 10	Aver. 7	Min. 5	Entries 4
Decentralized modellers	Max. 500	Aver. 130	Min. 30	Entries 6

Tab 5. Characteristics of division of labor in modelling activities in organizations of the study.

A main influential factor in both scenarios is the number of active modellers. The number of central modellers ranged between 5 and 10, and the minimum number of decentralized modellers was 30 and its maximum 500. While the number of central modellers is more likely to be criticised for the associated cost, the higher numbers of decentralized modellers require more support and effort to create high quality models.

2.4 Integration of IT-Modelling and Business Process Modelling

Enterprise modelling is based on an integration of different perspectives. In practice of business process modelling which became the focus of this survey, this is reflected by the high importance of the integration of IT-systems in process models. All partners of the dialogues were aware of the relevance. One organization is using a single repository for IT-system and process models. Two large organizations are replicating their IT-Systems from the EA models or CMDB to the process model repository and three organizations plan to implement a replication. Only two organizations stated that they will not combine the information of the IT and the process sphere. Although there are convincing arguments for full integration (compare [1], [4]), the vast majority of organizations decide for a separated approach. This may originate in its correspondence with the internal department structures.

Integration of IT-system- and Process models	Single repository: 1	Replication of IT-Systems: 2	Replication of IT-Systems planned: 3	None 2

Tab 6. Integration between process models and information on IT-Systems used.

2.5   Some Important Aspects of Enterprise Modelling Tool in Practice

The modelling tool is an indispensable prerequisite for effective modelling in a long-term and wider organizational context. [1] In many organizations the tool is synonymous for modelling activities. This may entail issues, if a tool gets a bad reputation. In these cases the organizations introduced new labels for the access of the process models. For several organizations a major update of the modelling tool version was mentioned as an important challenge and change. Some organizations reported that they had completed a corresponding update or were considering it. This was independent of the type of tool employed. Some had completed this update, including e.g., new symbols in their models. They reported a considerable effort with 5 or more people working 2 to 4 months to transfer and adapt the models to the new version. This may be a reason, why the other 4 organizations stated, they did not want do this kind of change in the near future, although it would be possible.

Big tool version change with change of modelling elements	Change accomplished: 3	Change planned: 1	Keeping version as long as possible: 4	No version change required until now: 2

Tab 7. Effect of major version changes of the modelling tool.

Some other aspects concerning the modelling tool were indicated more briefly by a number of the organizations. Two organizations referred to a change of their modelling tool. All others were steady and consistent concerning the tool. Anyhow, some participants mentioned internal discussions about other options to the current modelling tool. More than half of the questioned organizations reported that besides the standard modelling tool, also other tools were used by some departments or for different objectives.

Four organizations used dedicated views for different stakeholders. Additionally, some important supplementary functions were mentioned by the practitioners. These were a) the provision of workflows for the quality assurance and b) a publishing portal for an easy access to the models for all employees.

Aspect	Number of Organizations	Remarks
Change of process modelling tool	2	One after 20 years of usage, the other due to problems in the beginning stages of its utilization
Different tools in the organization besides the central tool explicitly noted	7	
Dedicated views for special stakeholder groups required	4	

Tab 8. Further aspects of modelling tools.

2.6 Further Important Experiences

Emphasized experiences by the practitioners	Number of Organizations	Remarks
Support or direct linkage of process responsibilities to top management	3	E.g., having a CPO in top management or executive manager fostering process governance
Process interfaces and common role models	3	One participant reported good experiences with well-defined interfaces, while another referred to interface problems due to cultural differences
Training of users and modelers	2	A start with E-learning was not sufficient, only when classroom courses started modelling activities were taken up by departments

Tab 9. Emphasized experiences of crucial factors for their enterprise-wide process modelling.

A few more crucial factors for successful enterprise wide modelling were addressed by the practitioners. Three organizations emphasized the relevance of having a sponsor with a high senior management position in the organization. Similarly important to that, others deemed the existence and practical realization of having a) common reference or contact points for process interfaces and b) role models employed in a consistent way. For one organization, this was a clear success factor while another organization reported problems due to low realized standards in

this respect. Further, two organizations stressed the significance of the training of users and modellers for creating good models and achieving the desired results with them.

2.7 Extent of Enterprise-wide Business Process Modelling

One motive for this survey was to investigate the actual realization of extensive integrated models in practice. So it also inquired on this aspect. The answers were split in two categories. Many, but not all, practitioners declared to have models that were integrated for major parts of the organization. But they also reported of other repositories (or parts of it) that were only fragmentarily integrated.

The maximum number of process models in a systematic framework was 4000. The average was 1850 models and the minimum value stated was 400 process models. These numbers may be criticised because they have not been standardized by weight factors, to account for the fact that the models vary usually in size. Anyway, they convey a notion on the substantial effort the organizations accomplished. The size of an integrated model also accounts for a main influence on the complexity of the models. The overall coverage of the processes of the organization by the available models was asserted only in a few cases. The respective statements supported the impression that the coverage varied by a considerable degree. While some claimed to have an almost full coverage others had just increased the coverage to 50 percent.

The number of the systematic models is complemented with the number of models in all repositories of some of the organizations. It is much higher. This was mostly attributed to the fact that these models also contain older versions. Additionally, they also comprise more detailed or specialized models not included in the central core. Overall, the sample represents very experienced organizations and practice. A number of the participants reported systematic process modelling for 20 years and the average was 12 years. Only very few organizations only had a short experience (min 2 years) in enterprise-wide process modelling.

Systematic (parts of) overall model	Max. 4.000	Aver. 1.850	Min. 400	Entries 8
Number of actual models in the repository	Max. 55.000 [6]	Aver. 22.600	Min. 3000	Entries 4
Active number of years in process modelling	Max. 20	Aver. 12	Min. 2	Entries 10

Tab 10. Number of process models in organizations presented in the study.

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[6] One administrator of a very large organization indicated to have 900.000 models in about 200 repositories of the company's divisions. They practiced process modelling for more than 20 years. Anyway, this value was not included in the main study, as only few other characteristics of the organization were available.

2.8 Success stories of Enterprise Business Process Modelling

An important boost for an extensive modelling endeavour may be provided by a very successful application of the process models in an organization which is communicated widely. In this respect, four success stories were reported explicitly. They were based on vital projects of the organizations and ranged from extensive reorganizations for new business requirements over the accomplishment of regulations to providing plans and analytical information for improvement of organizational designs and IT systems.

	Reported success story of the presented organizations
1	Reorganization of one division including a subsequent quality certification.
2	Fast accomplishment of regulatory requirements. The solution was taken up as blueprint by the modelling tool provider.
3	Reorganization of the SEPA-Payments of a company, with continual improvement activities based on the processes.
4	Design of a new logistics center based on optimized processes.

Tab 11. Success stories reported.

2.9 Economic Issues for Enterprise Modelling Organizations

A complete and monetary economic evaluation of enterprise modelling activities would be desirable but, from a practical point of view, it would be extremely challenging. In the first place, this is due to inherent problems in the valuation of the benefits. [20] The benefits of models are often connected with a long-term usage and most of the benefits have quite subtle effects on other activities, so a valuation would have to rely on many assumptions. In the second place, in practice, the cost for modelling is not attributed to dedicated cost centres. [13]

In the survey, this was reflected by answers of all participants that no direct capitalization of modelling costs is practiced.[7] Hence from a financial perspective, they are not regarded as assets. Anyway, if one considers the typical effort for average models, the number of models and then calculates the value, this easily results in values of several million Euros for the large organizations.[8]

Six organizations explicitly mentioned their current concern to minimize cost for modelling. This is quite reasonable for organizations which are forced by legislation

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[7] The number of organizations is lower than the complete survey as public organizations in Germany do not use typical commercial accounting schemes with the activation of costs for long-term assets.

[8] Although this practice may be justified by the relatively low amounts for these companies in relation to other assets, nevertheless, they represent a distortion of information with relevant motivational effects that impede modelling in many cases. (For the effects of distorted cost information, compare [21])

to conform to standards but do not directly reap other substantial benefits from the models.

Important economic issues of enterprise modelling	Number of Organizations	Remarks
No capitalization of modelling costs	8	Modelling costs are sometimes capitalized as costs in larger IT- or change projects
Low cost of modelling	6	One organization is considering to switch from central to decentralized modelling to minimize visible costs
Modelling effort for average business process model = 2 working days	2	To include also the cost for domain specialists, this value has to be multiplied by a factor between 2 and 4

Tab 12. Economic issues in enterprise-wide business process modelling.

In respect of the typical effort to create a process model, two organizations stated similar experiences for the average effort to model a process. It was 2 days for the modeller and this effort had to be multiplied by 2 up to 4 for the work of other participants in the modelling process. At first glance, this factor may seem somehow too high, but it becomes more reasonable, if one considers the diverse additional effort connected with more people getting informed a few times and involved in quality assurance. This increases the effort for a design activity in enterprise modelling by much more than is obvious and straightforwardly noticed.

3 Critical Remarks, Conclusion and Further Research

The information gathered in this survey represents genuine findings from modelling practice of a considerable number of organizations. But the study has drawbacks in some aspects. They are rooted in a) the not overall representative sample and b) a necessity to interpret the statements of the participants. These pitfalls have been addressed in the methodological section.[9] Both have impacted the findings.

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[9] One further condition, which was not explicitly addressed, is that the study has been performed in one country, in Germany. Nevertheless, it comprises directly a small number of companies from other countries. Furthermore, the author attended several international conferences of business process modelling practitioners. In these conferences much evidence has also been given on the respective topics of this survey. This evidence corresponds in its general tendency quite well to the findings in the survey. For some respects e.g., the

Nevertheless, the interpretation has been carried out cautiously. This has been documented in the paper by numerous additional notes. The concentration of the survey on enterprise-wide process modelling helped to reach more consistency than if process and IT modelling would have been covered simultaneously.

The findings illustrate a multifaceted picture of process modelling practice. While it is normally emphasized that models easily support a number of goals, most organizations clearly focus on one main goal. This may indicate further potential for higher gains from models. On the other hand, organizations do not systematically care for the economics of their modelling activities. Partly they are concerned with the cost aspects, but from a management accountant perspective, it is performed merely superficially. A complete long-term evaluation of benefits and costs is not established in any of the surveyed organizations. It will not be easy to improve on this, while there is only a limited awareness of the economic potential of enterprise models in organizations. This may be connected with the relatively small number of success stories reported in the study.

In respect of IT modelling, there has been high evidence on the demands for a high level of integration in its models. Nevertheless, this is not achieved easily. The challenges only partially appear to originate from the technical domain. However, they are predominantly rooted in the social interaction between the different participants of modelling. The impressive number of process models in the repositories of large organizations demonstrates the relevance of practical modelling in organizations. Combined with the identified challenges, this also indicates some potential for improvements which hopefully may be facilitated by further research.

Generally the findings of this survey advocate research with focus on issues of long-term commitment in enterprise modelling associated with specifically adapted approaches to observe and steer effort and benefits of modelling, in other words, the performance of the crucial interdependent factors involved in the modelling activities.

Further research directly connected to this survey may take a number of directions. This includes the following alternatives: a) to directly build on this survey and enlarge the sample, b) to change the perspective and investigate the practice of enterprise architecture modelling (concentrating on IT artefacts), c) to explore the reasons why most organizations are not able to employ the models for more than one purpose or d) to investigate the practical obstacles to integration of models. The last questions c) and d) seem to be most interesting because they are crucial to improve the options for organizations to obtain substantially higher benefits.

References

1. Frank, U.: Multi-Perspective Enterprise Modeling: Foundational Concepts, Prospects and Future Research Challenges. In Software and Systems Modeling, Vol. 13, pp 941-962 (2014)

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modelling language used other distributions may be found, as EPC have roots in Germany. Nevertheless, EPCs are also in widespread use by many non-German international organizations.

2. Lankhorst, M. et al.: Enterprise Architecture at Work - Modelling, Communication and Analysis. 3rd ed., Springer Berlin (2013)
3. Braun, C., Winter, R.: A Comprehensive Enterprise Architecture Metamodel. In: Desel, J., Frank, U. (Eds.): Enterprise Modelling and Information Systems Architectures, Proceedings of the Workshop in Klagenfurt 2005, pp. 64-79. GI LNI P- 75, Bonn (2005)
4. Scheer, A.: ARIS: Business Process Modelling. 3. Edition. Springer, Berlin (2000)
5. Wolff, F.: An Evaluation Framework for Enterprise Architecture Modelling. Enterprise Modelling and Information Systems Architectures 3(1): 48-61 (2008)
6. Franz, P., Kirchmer, M.: Value-driven Business Process Management - The Value Switch for Lasting Competitive Advantage, McGraw-Hill (2012)
7. Persson, A.: Enterprise Modelling in Practice: Situational Factors and their Influence on Adopting a Participative Approach. Dissertation, University of Stockholm (2001)
8. Löhe, J.; Legner, C.: Overcoming implementation challenges in enterprise architecture management: a design theory for architecture-driven IT Management (ADRIMA). Information Systems & e-Business Management, XII(1), pp. 101-137 (2014)
9. Kopetzky, M.; Reich, G.: When Giants Learn How to Dance – The Introduction of Process Management to a Health Insurance Fund. In: A. Scheer, H. Kruppke, W. Jost & H. Kindermann, eds. Agility by ARIS Business Process Management. Heidelberg New York: Springer, pp. 27-37 (2006)
10. Kogelschatz, D.; Wyss, P.; Bucher, M.; Seifert, S.: Closed Control Cycle for Business Process Management on the Credit Suisse Securities Platform. In: A. Scheer, H. Kruppke, W. Jost & H. Kindermann, eds. Agility by ARIS Business Process Management. Heidelberg New York: Springer, pp. 251-268 (2006).
11. Yilmaz, N.; Stirna, J.: Factors Influencing Productization of Enterprise Modeling: A Qualitative Inquiry into the Scandinavian Strand of Methods and Tools. In: Ralyté, J.; España, S.; Pastor, O. (Eds.): The Practice of Enterprise Modeling. Springer, London, pp. 193-208 (2015)
12. Eikebrokk, T; Iden, J; Olsen, D; and Opdahl, Andreas L.: Towards a Model of Process-Modelling Practice: Quantitative Validation and Results. ECIS 2008 Proceedings, Paper 52 (2008)
13. Wolff, F.: Ökonomie multiperspektivischer Unternehmensmodellierung. Gabler, Wiesbaden (2008)
14. Babbie, E.: The Basics of Social Research. Cengage, Boston (2014)
15. Dillman, D.; Smyth, J.; Christian, L.: Internet, Mail and Mixed Mode Surveys. Wiley, New Jersey (2009)
16. Bonsack, R.: Rekonstruktive Sozialforschung. Budrich, Opladen. (2010)
17. Kühn, H.: Methodenintegration im Business Engineering. Dissertation, University of Vienna (2004)
18. Ritchey, T.: Wicked Problems - Social Messes. Springer London (2011)
19. Wolff, F.: Better Segmentation of Enterprise Modelling Governance through Usage Perspectives. The Practice of Enterprise Modeling, Proceedings PoEM 2014, Springer, LNBIP 197, pp 224-234 (2014)
20. Wolff, F.; Frank, U.: A Multiperspective Framework for Evaluating Conceptual Models in Organisational Change. In: Bartmann, D.; et. al. eds.: ECIS 2005 - 13th European Conference on Information Systems. Regensburg, Association for Information Systems, pp. 1-12 (2005)
21. Johnson, H.; Kaplan, R. S.: Relevance Lost: The Rise and Fall of Management Accounting. Boston (MA): Harvard Business School Press (1987)