A FRAMEWORK OF ISSUES IN LARGE PROCESS MODELING PROJECTS

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Abstract

As process management projects have increased in size due to globalised and company-wide initiatives, a corresponding growth in the size of process modeling projects can be observed. Despite advances in languages, tools and methodologies, several aspects of these projects have been largely ignored by the academic community. This paper makes a first contribution to a potential research agenda in this field by defining the characteristics of large-scale process modeling projects and proposing a framework of related issues. These issues are derived from a semi-structured interview and six focus groups conducted in Australia, Germany and the USA with enterprise and modeling software vendors and customers. The focus groups confirm the existence of unresolved problems in business process modeling projects. The outcomes provide a research agenda which directs researchers into further studies in global process management, process model decomposition and the overall governance of process modeling projects. It is expected that this research agenda will provide guidance to researchers and practitioners by focusing on areas of high theoretical and practical relevance.

Keywords

Process Modeling, Business Process Management, Large Modeling Projects, Issues, Focus Groups, Framework.

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1 INTRODUCTION

Business process modeling is used to support a variety of business and information technology (IT) initiatives including process documentation, business process improvement, process simulation, process cost analysis, enterprise architectures, workflow management, enterprise systems and increasingly also as part of compliance management for ISO 9000 and Sarbanes-Oxley requirements (Melao & Pidd 2000). This has contributed to an overall increase in the number of modeling techniques, modeling tools and active modellers within one organisation.

Multi-national organisations such as BP, Ericsson, Shell, Siemens and Vodafone are conducting worldwide modeling projects with the aim to standardise their processes. Moreover, improved accessibility to process models for all the employees of an organisation through publication on the Internet increases the number of model users significantly. These trends motivate many large organisations to centralise all modeling initiatives, thereby leading to comprehensive business process modeling projects with a high number of models, modellers, users and modeling purposes. This phenomenon is referred to as "Modeling in the Large". The scale of these initiatives raises a number of issues, amongst them the complexity in managing multiple models, modeling purposes and concurrent active modellers, the usage of reference models and the centralisation of all modeling initiatives.

Previous research on business process modeling is focused on modeling techniques, meta models, notations and tools (Becker et al. 2000, Curtis et al. 1992, Krogstie 2000, Rosemann & Shanks 2001). Empirical work on conceptual modeling and on issues related to the scalability of techniques, methodologies and tools as required in large modeling projects needs to be explored. As companies reportedly continue to fail to realise the benefits of business process modeling while incurring huge costs and schedule overruns, a holistic view of problems and issues associated with business process modeling should be on the agenda of researchers (Dalal et al. 2004).

This paper reports on the outcomes of a study of large-scale process modeling projects. This study highlights that despite advances in techniques, tools and methodologies, the fundamental issues relating to business process modeling projects remain unresolved. While some of these issues are prevalent in any process modeling project, irrespective of size, others are specific to large-scale initiatives because of the context and characteristics of such projects. In particular this study focuses on the representation of large-scale models and the design, communication, maintenance and the use of these models by teams of modellers and users. The issues are presented in a holistic framework that can serve as a foundation for future research, process modeling improvement and next-generation enterprise systems development.

The following section of the paper provides a brief overview of related work conducted to date. It also includes a detailed description of the criteria which has been used to distinguish large scale projects from smaller ones. The third section outlines the research design and provides an insight into the use of focus groups for data collection. The fourth section presents the proposed framework and includes a description of the identified issues. The concluding section summarises the findings of the study and provides an overview of the ongoing research agenda.

2 BACKGROUND

2.1 Literature Review

Over the past decade, previous research on process modeling has been studied in many disciplines such as software engineering and information systems in different contexts. In the system and software development domain, process modeling has been used within software engineering to better understand, manage and control the development process (Potts 1984). Process modeling has been increasingly used in conjunction with traditional software development, and investigations into

requirements and analysis activities have been conducted (Carroll & Shanks 2002, Phalp & Shepperd 2000, Richards 2000).

An examination of the leading MIS journals and proceedings revealed a lack of empirical studies relating to process modeling projects, specifically large-scale process modeling projects. The benefits of business process modeling, have been widely recognized, especially in large IT-enabled business process reengineering projects such as Enterprise Systems (ES) implementations (Sedera et al. 2002). Practitioners and researchers have discussed extensively the various applications of process modeling at different phases of an IS project (Curtis et al. 1992, Gulla & Brasethvik 2000, Rosemann 2000). These applications include business process reengineering (Chen et al. 2004) and simulation and workflow management (Liu & Shen 2003, Sadiq & Orlowska 2000).

The ontological evaluations of process modeling techniques (Green & Rosemann 2004) and the competence and impacts of tools for Business process reengineering (Im et al. 1999) have been previously researched. A more recent inclusion in the literature includes a critical success framework for process modeling projects developed by (Sedera et al. 2004). Sedera et al. (2004) also concluded that empirical studies on business process modeling are scarce, with most of the published work on process modeling discussing the application of modeling tools and modeling languages. Apart from some articles which provided practical accounts of process modeling from past projects (Scheer 2002), the existing empirical work does not address the issues in large process modeling projects.

2.2 Modeling in the Large

Today large organisations conduct their business globally leading to the need to manage a centralised repository of models. An increased trend of their modeling initiatives from a local to a globalised based project has been also observed in practice. This paper proposes a definition for the phenomenon called "Modeling in the large (MODILA)." Process modeling initially found its roots within the software engineering community (Curtis et al. 1992). The concept of large scale modeling in the large is not a new one, however the definition of what constitutes "large" differs vastly across disciplines.

In the software development context, the definition of large scale projects takes on a more technical perspective. Bandinelli et al. (1993) associates the description of modeling in the large to programming-in-the-large. In order to provide a specific definition for process modeling in the large together with the characteristics that distinguish a large modeling project from a small one, a comparison was made between process modeling projects and large software development projects. Various characteristics and metrics in classifying software development projects have been proposed in the past including project size, technological complexity defined as size of the project, dollar value of the project, the number of people on the project team, and the number of components of the project (Boehm 1984, Chidamber & Kemerer 1994, Dreger 1989, Martin et al. 2005, Laranjeira 1990).

By consolidating the parameters used for software estimation, the criteria for distinguishing large-scale modeling projects was established as being application size, development effort, development time-scale, tools, languages and organisational impact. These are presented in Table 1 together with the metrics that are used to differentiate large-scale process modeling projects from smaller ones.

In applying these criteria and metrics to the selection of projects for this research study, several examples of large-scale process modeling projects were found. For example, a financial institution reported an on-going modeling project involving over 300 modellers, with a model repository of over 1,800 models as part of its $190 million investment in business process management initiatives and improvements. In the course of each week about 30 modelers access the repository of a national utility provider which includes approximately 4,850 models.

Criteria	Large Information Systems Project	Large-scale Modeling Project
Application size	*Three common software sizing metric:*	
	Lines of delivered source code: >128,000 lines of code	> 20 business processes to be modeled
	Functionalities of software: 40-50 logical inputs, 40-60 outputs, 25-30 inquiry screens	> 2 concurrent modeling purposes
	Objects (Methods and Inheritance)	>100 active models
Development effort	*Typically defined measured in:*	
	People effort: 50,000 work hours or 40-50 person years	>10 modelers >25 model users
	Capital equipment investment and organisation on-costs: >US$ 1M	Cost: >US$250,000 or >AUD300,000
Development time-scale	12 -18 months based on the 40-50 person year effort required.	≥1 year time-scale for modeling
Tools	1-2 tools used in IT development	1 – 2 modeling tools / languages
Language	1-2 language used in IT development	
Organisational Impact	High level of intra-organisation coordination and organisational change involved	> 2 geographical sites or locations

Table 1: Criteria used in large IS projects and proposed large modeling projects.

3 RESEARCH METHOD

Qualitative data derived from focus groups are extremely valuable when vivid and rich descriptions are needed. Focus group research is based on facilitating an organised discussion with a group of individuals selected because they are believed to be representative of some class; in this case, large modeling projects (Saulnier 2000). Focus groups are useful for generating hypotheses based on informants' insights, evaluating different research sites or study populations, developing interview schedules and questionnaires, getting participants' interpretations of results from earlier studies and orienting oneself to a new field (Morgan & Krueger 1998).

For reasons outlined in the preceding paragraph, focus groups were deemed to be the most appropriate method for data collection for this study. The participants were selected from a pool of national and multi-national organisations, within both the public and private sectors that conduct or are involved in large business process modeling initiatives. Both software vendor and customer perspectives were considered in the selection of participants. The stakeholders were researchers, experienced process modellers and other corporate personnel, including project sponsors, project managers, business analysts, consultants and representatives of enterprise systems vendors. The diversity of participants ensured that insights into large-scale process modeling issues were gained across various project types and at different levels within each organisation.

3.1 Interview and Focus Groups

A semi-structured interview with an enterprise architect from the above-mentioned national utility provider was conducted as the initial step. This organisation has been using an integrated process modeling tool since 1996. The outcome of this interview was documented and used to develop the protocol for the focus groups which were conducted in the next stage of the project (Table 2).

Questions	**Time allocated (mins)**
1. Introduction	5
2. How do you do process modeling?	45
3. Why do you do process modeling?	30
4. What are the characteristics of your modeling projects: i.e. number of modellers, models, business processes, users?	15
5. What do you consider are the major issues in large process modeling projects?	45
Total Time Allocated	2hr 20 mins

Table 2: Summary of the Focus groups protocol

The focus groups were conducted in Brisbane (February 2005), Canberra (April 2005), Melbourne (May 2005) and Hoboken, USA (May 2005), Frankfurt, Germany (September 2005), and Walldorf, Germany (September 2005). The demographics of the sampling pool are presented in Table 3. The use of the protocol ensured that consistency was maintained between the focus groups during data collection.

Profile	Numer of represented companies			
	Australia	**USA**	**Europe**	**Total**
National / Multi-national	6 / 4	0 / 4	5 / 0	11 / 8
Sector/ Industry				
Finance, Banking & Insurance	2	2	4	8
Consulting	1	0	1	2
Government agencies	4	0	4	8
Utility	2	0	3	5
Manufacturing	1	2	1	4
Software Vendor	0	0	3	3

Table 3: Focus group demographics

As an analytic technique for focus groups, summaries of the contents of the discussions, systematic coding or content analyses are suggested (Morgan & Krueger 1998). The focus group sessions were audio-recorded, transcribed and checked after the sessions. Notes, including outstanding points and interesting quotes, were also taken down to allow further discussion during the debriefing. The transcripts of the semi-structured interview and the focus groups were analysed by two researchers.

Coding was followed by categorisation of issues under the umbrella of the main concepts. The first coder conducted open coding, i.e. clusters of issues emerged bottom-up from iterative coding exercises. The main categories used were derived from the literature review, i.e. modeling-specific, organisational, technological issues (Ewusi-Mensah & Przasnyski 1994). The second coder followed a top-down approach based on Sedera's framework of critical success factors and measures of process modeling success (Sedera et al. 2004). The framework identified nine critical success factors as well as six success measures. These factors are information resources, project management, top management support, modeller's expertise, modeling tool, modeling language and modeling methodology. The identified issues were assigned to these factors. A session was conducted with the two coders and two other investigators, who had participated in the focus groups to identify and reconcile the differences between the codings. The following section outlines the framework which resulted from this exercise.

4 MAJOR ISSUES IN MODELING IN THE LARGE

Based on the focus groups results, a framework was developed forming logical groupings around related issues. The MODILA issue framework (Figure 1) is loosely based on Ewusi-Mensah's (1994) categorisation of IS project issues and adapted to fit the characteristics of a modeling initiative. It consists of three main clusters. The strategy cluster, which overlooks the rest of the layers, is related to top management support, economics (the cost-benefit evaluation) and governance (accountability and decision processes in the context of large modeling initiatives). The second cluster, the process modeling lifecycle comprises three main phases of a modeling initiative. These phases relate to setup, design and maintenance respectively. The setup phase relates to pre-modeling activity and includes the definition of modeling guidelines, standards, etc. The design phase covers the actual modeling activities. Maintenance phase is the post-modeling stage and is concerned with quality assurance, model consolidation, etc. The third cluster in the framework relates to resource and includes involved stakeholders (modellers, users and information providers) and modeling tools and languages which are constant inputs to the modeling lifecycle phases.

The following sub-sections of the paper discuss the issues identified in the focus groups under appropriate categories of the framework. An interesting observation that resulted from the analysis of these issues is that although focus group is a technique that is used to explore uncovered characteristics of a population, it was found that some of the identified issues are not new to research and practice. Issues such as the lack of top management support and strategic alignment have long been discussed in different context such as IS management and IS development but what *is* an interesting observation is that they still exist as unresolved issues in current projects. Furthermore certain issues in the framework could be considered novel because of the particular characteristics which they exhibit in the context of large modeling projects. For example issues such as governance and variant management surface specifically in large-scale initiatives. An additional observation is that certain issues that appear as general concerns in small-scale initiatives have the potential to emerge as significant issues within large-scale ones.

In comparing the customer and software vendor perspectives, it was found that the software vendors revealed specific interest in issues of integration between process lifecycle phases, model types, related model languages and tools. However, these issues are not mentioned even once by the customers who were more interested in the management rather than the technical capability of the process models.

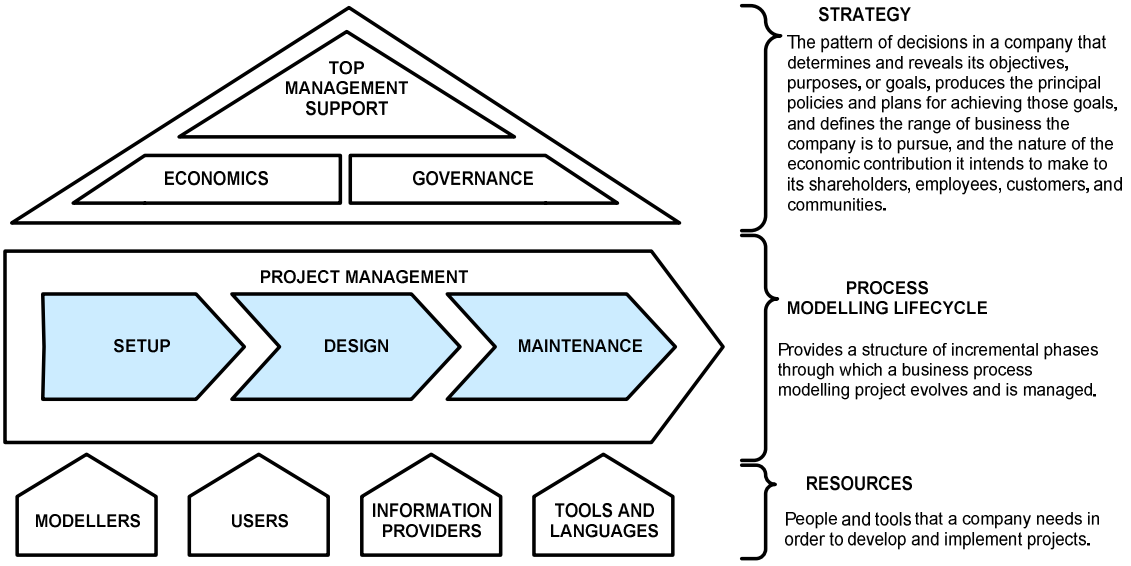

Figure 1: Modeling in the large issues framework

4.1 Strategy-level related issues

Lack of top management support

The participants of the focus groups highlighted the lack of top management support as an issue that can impact the process modeling project outcome. The absence of top management support has been identified as a fundamental determinant of project failure or abandonment (Ewusi-Mensah & Przasnyski 1994). Similarly in process modeling, leadership and top management support are seen as critical success factors. According to the perceptions of the participants, active top management support is seen through "*commitment*", "*sponsorship*", "*end goals perception*", "*attention to initiatives*", "*understanding the goals*" and "*provision of incentives*". Commitment to the longer term through "*funding*", "*training*" and "*sponsorship*" is considered as an indicator for better management of modeling projects.

Lack of Governance

Governance relates to roles and responsibilities of a committee that include reviewing projects and prioritising initiatives according to strategic direction. Governance issues occur rather specifically in

large-scale modeling projects. The participants pointed out that a focus on "*corporate rules, compliance to new legislation, goals and politics*" can impact and drive business process modeling initiatives and related decisions.

A high degree of coordination and exchange of information across the business areas/departments is also crucial in large-scale projects. One participant emphasized on the importance of having a *coordination point*, in order to keep the models up-to-date. Most participants reported that there is no clear indication as to who the "*responsible owners*" of the business models are, resulting in lack of control when models need to be updated or accessed by other modellers or users, especially in large projects that are often distributed across business units. When projects are developed using contractors, an additional issue of "*intellectual property ownership*" of these models has been revealed.

Doubts about the Economic Value

Because large projects are characterised by high complexity and risk, senior management require justifications in the business benefits such as reasonable return on investments, of a project (Yetton et al. 2000). However, the difficulty in perceiving both tangible and intangible benefits impacts the lack of perceived value of modeling projects. The participants were unable to support "*the return of investment justification*" as they failed to quantify the value of a project to an organisation with the use of "*a balance scorecard approach*" or "*the use of benchmarks*". The value of the modeling project thus pales in comparison with the others, thus leading to a lack of response on actual modeling success.

Also observed from the focus groups, the reluctance in management to invest in a new or more powerful tool and in training the employees involved in modeling activities can be further indications of doubts in the economic value of the initiatives. Another issue of concern raised by the participants was the "*cost of updating models*", described as maintenance cost. Model maintenance is an ongoing process in the process modeling lifecycle. Especially in large modeling projects, it requires higher effort in comparison to small projects and not surprisingly, incurs a substantial proportion of project costs.

4.2 Process Modeling Lifecycle Issues

Process modeling lifecycle provides a structure of incremental phases through which a business process modeling project evolves and it is managed. The management of this lifecycle is of particular importance for large-scale modeling projects where coordination and consistency are often lacking across modeling activities and project deliverables (Gulla & Brasethvik 2000). Therefore, this paper employs a generic three-step lifecycle which cater to the different nature and purpose of the deliverables (i.e. process models in general).

4.2.1 SETUP Phase

The *Setup* phase describes the pragmatic hands-on activities involved in the initial stage of a modeling project. It takes into consideration the identification and validation of project objectives, scope and fit, the installation of the modeling infrastructure, the guidelines for the information collection and the development of modeling standards. The following section consolidates the issues that arise during the Setup phase.

Lack of Project Setup Guidelines

Several comments were made regarding the challenges faced in the initial start up of the modeling projects. The participants faced with the problem of having no modeling guidelines or a procedural model which can guide them in determining where to start, what tools to choose and other decisions that need to be made. Although this issue is common to modeling projects irrespective of their size, it is highly significant to large-scale modeling projects due to the complexities associated with the size of such projects.

Lack of Modeling Objectives

The purpose of the modeling initiative needs to be identified, as different objectives result in different outcomes. It is also essential that a consensus is reached with regards to the definition of process modelling and its objectives. A comment was made from a representative of an organisation involved in a global modeling initiative that "*participation is not an issue so long as the modeling has a target*". Similar situations were observed in a number of organisations that "*there is no understanding of end goals*

Lack of Modeling Procedures (Standards / Policy)

Lack of procedures to facilitate reuse and sharing has also been identified as the root cause of many issues faced by the participants. The concept of sharing must be determined and reinforced during the Setup phase as it influences the modeling process in terms of the tools, methods and models used. This is observed from a government agency which selected "*the use of pattern-based approach*" in order to facilitate reuse. In another organisation, a decision for reuse was considered unfavourable as it incurred increased overheads. The reuse of models is often hindered by the reluctance in the sharing of models between different business units. Based on a participant, it is a "*familiarity breeds contentment*" situation. The business units are so emotionally attached to their existing models that they are unwilling to allow modellers access to their model repository. This poses as a problem for modellers as they are unable to reuse existing models for their business process integration efforts. Another decision to be made during the Setup phase is whether or not the models should be kept current at all times (just-in-time) or only updated when needed (just-in-case).

Lack of Common Modeling Methodology (Standardisation)

As observed from the focus groups, the need for standardisation consistently echoes throughout most organisations. The use of different contractors and consultants leads to a divergence in modeling techniques, notations and assumption of certain business rules.

The absence of a corporate modeling standard can also result in great inconsistency during the integration of models across different business units and among stakeholders. Furthermore, inconsistency in modeling style can result in different modeling perspectives. Achieving the right level of abstraction, also known as the "*model depth*" or "*granularity*", is one of the most challenging issues in the modeling process. While the lack of experience of modellers contributes to uncertainty regarding the level of granularity, the question of "*How much detail do you go down to?*" is subjective to different stakeholders and target audiences. In an example, an interviewee whose work is focused on the application of business process management to knowledge intensive processes does not consider diagrams to be a good tool, despite its widespread use. In order to facilitate communication he implements the rule that "*a process model has to fit on one piece of paper or a PowerPoint slide*". In another organisation, there were instances where people went into too much detail due to their lack of experience. A standard for model granularity will alleviate such problems.

Lack of Supporting Infrastructure

Infrastructure includes the installation of modelling tools, database repository and user access rights. System and tool deficiency are one of the issues faced by the organisations during the Setup phase. One evident issue is the lack of access to the model database repository. A participant commented that there was nothing on the intranet where people can access despite the organisation's efforts to develop both written processes and models in order to cater to everyone's needs. An even more critical problem faced by another participant is the modellers' lack of access to the modeling tools, which ultimately results in additional overhead incurred during the model conversions. Therefore, considerations in deciding the right infrastructure must be made in order to leverage the maximum modeling benefits and to best fulfil the modeling purposes. One such issue faced by a participant lies in the decision to continue developing their in-house tool or to move on to another existing commercial tool, which is based on the fit between the organisational goal and tools.

4.2.2 DESIGN Phase

The *Design* phase describes the actual modeling process where business processes are modelled with the selected tools and techniques along the chosen methodology. Modeling is done along different

views (Data, Organisation, Processes, Services, etc) and on different levels of granularity (from a business perspective to a technical or executable representation) (Lippe et al. 2005). This phase also involves continuous verifications/validation of the process models to ensure model accuracy in terms of semantic, syntactic and pragmatic quality. A strong commitment in communication between stakeholders is extremely crucial in this phase. With standards put in place during the Setup phase, the Design phase revolves around the issues of model aspects and quality assurance.

Model Aspects and Levels of Granularity

The issues brought up by the software vendors fall mostly into this category. The integration of different aspects (mostly names: organisation and processes) was considered as a crucial issue that has not been resolved so far. A further issue heavily discussed was the variety of tools and modeling languages and the problems arsing from their inappropriate use and required model transformation from a business level to a technical level. This relates to technical problems as well as a missing procedure or methodology.

Model Quality Assurance

The lack of maturity in business process management in many organisations means that there are no formal measurements in place to determine how much and how well the global models have been implemented. It was revealed that the effects of modeling on quality (both semantic and syntactic) are usually not taken into serious consideration. Many projects are faced with the assumptions over the quality of previously documented processes which can result in a "*domino effect*" if not dealt with properly. The final sign-off from involved stakeholders is a critical step "*to ensure that the models are complete and accurate*." One interviewed organisation attempted to change the process culture by "*forcing project managers to ensure that all models are up-to-date and consistent"* before a project can be formally closed.

4.2.3 MAINTENANCE Phase

It is essential for process models to be kept current and updated to maintain their credibility. Despite the large amount of money invested in modeling efforts, an observation revealed that existing models are often neglected. Although the issue of maintenance is not novel, and in fact has been an issue in small modeling projects, this issue escalates in its significance due to the large number of models in the repository, often requiring coordination between several databases. The maintenance of process models can create issues in four different aspects: rework, timeliness, variant management and evaluation.

Rework

The introduction of a new modeling tool requires a certain level of model rework. For example, an organisation looking to switch from Visio to ARIS toolset needs to translate all the relatively unstructured and often non-standardised models into EPC models (of ARIS) and the re-mapping can become a significantly time-consuming project.

Update

Constant update of models is necessary to ensure their alignment with practice and credibility in user value. However, updating the models in a large modeling project is no small feat. An issue cited by several participants is the (lack of) "*currency of models*" as a changing business context can invalidate models very quickly. Various concerns are voiced with regards to updates in multiple databases, the critical points at which updates are required and even the concern of an increasing workload and cost related to model maintenance. One participating organisation struggles to identify the value in ensuring the currency of multiple sources (work-in-progress database, web and corporate-database). His concern is further confirmed by another participant who brought up his fear that modellers will "*become a bottleneck for maintenance*". Yet another participant came up with a notion of "*just-in-time*" and "*just-in-case*" strategy to deal with the 5,000 active models in his organisation.

Variant Management

Process variants, also known as scenarios, are maintained in a number of projects. The issue of variant management is arguably more specific to large-scale modeling initiatives. There is a need for variant management in the maintenance phase to ensure clean-up of unused variants and to identify the final version of a model from among multiple variants.

Consolidation and Integration

The complexity of models as described by the participants can arise in two aspects. The first difficulty is the incorporation of a process that crosses different business units. Another difficulty is the integration of existing models from multiple business units. Different modeling tools, techniques, political issues are some hindrances to model integration. Another issue in consolidation is the duplication in the model contents.

4.3 Resources-level related Issues

Process modeling projects make use of four basic resource roles: modellers, who design the as-is and to-be process models; users who receive and use the results of the modeling process for a particular purpose; information providers who are interviewed during the modeling process about the specifics of individual processes and activities and the modeling language and supporting tools.

Modeller-related Issues

Issues related to modellers arose around the skill set of the modellers and their familiarity with the application domain. The quality of a model depends both on the ability of the modeller to extract relevant information from business experts and on their own knowledge of the business context. The turnover of contractors was lamented, which leads to a loss of both domain and modeling knowledge. It was also noted that the choice of modeling language imposed a certain mindset on the modeller. This leads to problems in the definition of knowledge-based decision processes, as opposed to tangible value-creating activities, since some modeling languages are better suited to capture one over the other.

User-related Issues

The stakeholders of modeling projects and the ultimate users of the resulting models have high expectations in terms of cost efficiency and turnaround times. "***Resistance to change and modeling adoption***" was repeatedly raised as an issue. Some participants noted a lack of model utilisation due to lack of alignment between business and modelling "***jargon***". The reuse of information across departments or business units is impacted by this.

Information Provider-related Issues

The willingness of information providers to collaborate with process modellers was a point of conflict identified by several participants. Documentation is generally seen as a cumbersome activity and modeling may appear excessive due to the formalisms of the modeling language employed. Besides the effort of participating in a modeling project, information providers were often perceived as reluctant to give up proprietary information. Information with regards to actually performed activities are withhold particularly in projects targeting process automation. Documenting embedded processes in application systems is another problem area since knowledge about these processes may be unavailable due to the absence of the original programmers and a lack of documentation. Finally, the integration of customer-related activities in a process model raised concerns due to the possible restrictions on the use of external information in terms of intellectual property rights.

Tool and Language-related Issues

Issues related to modeling languages and supporting tools include the limited acceptance of certain methods by business users, the fast increase in diagrammatic complexity and the lack of support for proprietary extensions to languages by common modeling tools. In terms of tool sophistication, some participants chose to use simple modeling tools because time or budget constraints restricted them from procuring more sophisticated ones. The users of sophisticated tools complained that these were sometimes too complex, resulting in too much time spent on modeller training and having difficulty to

distribute it to large numbers of users. Some participants noted that the limitations of a modeling tool often determine what is being modelled rather than the actual business context.

5 CONCLUSION, LIMITATIONS AND FUTURE RESEARCH

This paper makes several contributions to existing research in process modeling which is expected to be of interest to both academics and practitioners. Firstly, the criteria for defining large-scale process modeling projects have been defined. Secondly, a framework of issues related to such projects has been derived. Thirdly, the study has confirmed the existence of several unresolved issues in process modeling projects that have a particular relevance to large-scale initiatives. Finally, the study provides valuable input for a research agenda in the area of large process modeling projects.

To our knowledge, this is the first study which explores the actual issues various stakeholders (e.g. business analysts, modellers, vendors and managers) face in large modeling initiatives. Furthermore, the focus groups conducted in Australia, Germany and the USA with enterprise and modeling software vendors and customers offered an insight into these issues across different countries and perspectives. As such, this research agenda will provide a valuable guidance for researchers and practitioners as it will direct their attention towards areas of high theoretical and practical relevance.

A limitation of this study is that the issues were derived solely from individuals and organisations participating in the focus groups. While the selected participants and organisations as well as the identified issues are reasonable representatives, further data collection and triangulation using a quantitative data methodology (Jick 1979) would enhance this work. To date, a web-based survey based on the consolidated issues has been developed to further explore, categorise and rank the existing issues. In the next stage of the project, the survey will collect data from the focus group participants, from which the feedback will allow prioritisation of the issues and identification of the most critical ones. Drivers of these issues will also be explored by correlating the identified issues to the demographics of the participating organisations. A survey will then be conducted with a larger mass of stakeholders involved in business process modeling to validate and refine the framework.

As the first step in an ongoing research project, the framework proposed in this paper facilitates the development and analysis of research questions. Further in-depth research is planned and will focus primarily on three areas. Firstly, on issues related to global process standardisation and in particular, on the impact of national culture on the adoption of global process standards within multi-national organisations. Secondly, to improve the communication of the models and the structure of large models into constituent models, a process model decomposition methodology will be developed and tested employing the good decomposition model. Lastly, further research will seek to develop a coordinated approach for the overall governance of process modelling projects, taking into consideration the various governance mechanisms such as involved roles and responsibilities, decision-making processes, standards and controls.

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