Conceptual Modelling in Practice – Myth or Reality?

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Abstract Conceptual modelling is thought (by academics at least) to be a key activity of Business Systems Analysis. For decades, comprehensive research has been conducted on related topics such as data modelling, process modelling, meta modelling, model quality, and the like. Related empirical studies of modelling in practice, however, have often focused on experiments, limited case studies, and interviews. Recent comprehensive data on the actual practice of modelling appears to be rare. This study attempts to fill this void by analysing the actual popularity of modelling in Australian practice. The presented results have been derived from a web-based survey that was conducted in collaboration with the Australian Computer Society (ACS) during 2002.

1 Introduction

The areas of business systems analysis, requirements analysis, and conceptual modelling are well established research directions in academic circles. Comprehensive analytical work has been conducted on topics such as data modelling, process modelling, meta modelling, model quality, and the like. A range of frameworks and categorisations of modelling techniques have been proposed (*e.g.* [3], [5]). However, they mostly lack an empirical foundation. Thus, it is difficult to provide solid statements on the importance and potential impact of related research on the actual modelling practice. Floyd [2] and Necco *et al.* [4] conducted comprehensive empirical work into the use of these techniques in practice but that work is now considerably dated. Batra and Marakas [1] attempted to address this problem of a lack of current empirical evidence however their work focused on comparing the perspectives of the academic and practitioner communities regarding the applications of conceptual data modelling. Moreover, their work is now dated. More recently, Persson and Stirna [6] noted the problem however their work was limited in that it was only an exploratory study into practice.

This research aims to provide current insights into the actual modelling practice. The underlying research question is "Do practitioners actually use conceptual modelling in practice?" The derived and more detailed questions are:

- What are the purposes of modelling?

- What are popular tools and techniques in the past, currently and in the future?
- What are the perceived success factors and major issues related to modelling?

In order to provide answers for these questions, an empirical study using a web-based questionnaire has been designed. The goal was to determine what modelling practices are being used in business, as opposed to what academics, software providers and their resellers believe should be used.

Accordingly, the paper unfolds in the following manner. The next section explains briefly the instrument and methodology used. The third section presents succinctly the detailed quantitative results. The last section attempts to categorise the most popular textual comments received regarding the benefits and problems of conceptual modelling, and to give an indication of further work planned.

2 The Instrument and Methodology

The study was conducted in the form of a web-based survey[1]. It consisted of seven pages. The *first page* explained the objectives of this study. The *second page* asked for the purpose of the modelling activities. In total, 17 purposes (e.g. database design and management, software development) were made available. The respondents were asked to evaluate the relevance of each of these purposes using a five point Likert scale ranging from 1 (not relevant) to 5 (highly relevant). The *third page* asked for the modelling techniques used by the respondent. It provided a list of in total 18 different modelling techniques ranging from data flow diagram and ER diagram to the various IDES standards up to UML. The *fourth page* was related to the modelling tools. Following the same structure as for the modelling technique, a list of 24 modelling tools was provided. A hyperlink provided a reference to the homepage of each tool provided. The *fifth page* asked participants to list major problems and issues they have experienced as well as perceived key success factors for modelling. On the *sixth page*, demographic data was collected. The *last page* allowed the participant to enter contact details if they wanted a copy of the summarised results of this study.

The instrument was piloted with 25 members of two research centres at the University of Queensland and the Queensland University of Technology as well as with a selected group of practitioners in April 2002. Minor changes were made based on the experiences within this pilot. The URL for the survey was distributed in an email from each state branch of the ACS to its members in early July 2002. A general follow-up reminder email was issued three weeks later at the end of July by each state office.

[1] The URL for the survey was http://au.mip2k.net . This site is currently closed for update.

3 Some Quantitative Results

From 674 individuals who started to fill out the survey, 370 actually completed the entire survey, which leads to a completion rate of 54.8 %. Moreover, of the 12,000 members of the ACS, 1,567 indicated in their most recent membership profiles that they were interested in conceptual modelling/business systems analysis. Accordingly, our 370 responses indicate a relevant response rate of 23.6%, which is very acceptable for a survey. Corresponding with the nature of the ACS as a professional organisation, it is not surprising that 87 % of the participants were practitioners. The remaining respondents were academics (6 %) and students (7 %). It is also not a surprise that 85 % of the participants characterised themselves as an IT service person while only 15 % referred to themselves as a business person or end user.

Sixty-eight percent of the respondents indicated that they gained their knowledge in Business Systems Analysis from University. Further answers were TAFE (6 %), ACS (3 %). Twenty-three percent indicated that they did not have any formal training in Business Systems Analysis. Forty percent of the respondents indicated that they have less than five years experience with modelling. Thirty-eight percent have between 5 and 15 years of experience. A significant proportion, 22%, has more than 15 years of experience with modelling. These figures indicate that the average expertise of the respondents is supposedly quite high.

We were concerned in obtaining information in three principle areas of conceptual modelling in Australia *viz*., what techniques are used currently in practice, what tools are used for modelling in practice, and what are the purposes for which conceptual modelling is used.

The top four most frequently used (used 5 or more times a week) *techniques* are ER diagramming, data flow diagramming, systems flowcharting, and workflow modelling. The top four infrequently used techniques currently are systems flowcharting, data flow diagramming, workflow modelling, and structure charting. It is significant to note that even though object-oriented analysis, design, and programming has been the predominant paradigm for systems development over the last decade 64 percent of respondents either did not know or did not use UML and 74 percent of respondents did not know or use object role modelling. Moreover, this current situation of non-usage appears to be set to increase into the short-term future (next 12 months) as the planned frequent use of the top four techniques is expected to drop to less than half its current usage, *viz*., ER diagramming (17 percent), data flow diagramming (15 percent), systems flowcharting (10 percent), and workflow modelling (12 percent).

While not every conceptual modelling tool available was named in the survey, the twenty-four tools were selected based on their popularity reported in prior literature. Visio (58 percent – both infrequent and frequent use) is the preferred tool of choice for business systems modelling currently. This result is not surprising as the top four most frequently used techniques are well supported by Visio (in its various versions). A long way second in use is Rational Rose (19 percent – both infrequent and frequent use) reflecting the current level of use of object-oriented analysis and design techniques. Again, at least 40 percent of respondents (approximately) do either not

know or use any of the 24 tools named in the survey – even a relatively simple tool like Flowcharter or Visio. Moreover, into the short-term future (next 12 months), the planned frequent use of the top two tools is expected to drop significantly from their current usage levels, *viz*., Visio (21 percent) and Rational Rose (8 percent).

Database design and management remains the highest average *purpose* for use of modelling techniques (3.9 out of 5). This fact links to the earlier result of ER diagramming being the most frequently used modelling technique. Moreover, software development as a purpose (3.7 out of 5) would support the high usage of data flow diagramming and ER diagramming noted earlier. Indeed, the relatively highly regarded purposes of documenting (3.7) and improving business processes (3.7), and managing workflows (3.4), would support further the relatively high usage of workflow modelling and flowcharting indicated earlier. The more specialised tasks like identifying activities for activity-based costing (2.6) and internal control purposes in auditing (2.5) appear to be relatively infrequently used purposes for modelling. This fact however may derive from the type of population that was used for the survey, *viz*., members of the Australian Computer Society.

4 Benefits/Problems of Conceptual Modelling and Further Work.

Most frequently mentioned key success factors for conceptual modelling were quality of the tool, quality of the technique, end user participation, and support of senior management. The most frequently mentioned problems for conceptual modelling were quality of the tool, quality of the technique, lack of user willingness to participate or share knowledge, lack of senior management support, and excessive time required for modelling. Future work will extend this survey to other regions., *e.g.*, Singapore, Hong Kong, United Kingdom, Spain, and Germany.

References

1 Batra, D. and Marakas, G. M. (1995) Conceptual data modelling in theory and practice. *European Journal of Information Systems*, 4(3), 185-193.

2 Floyd, C. (1986) A comparative evaluation of system development methods. In *Information Systems Design Methodologies: Improving the Practice*. North-Holland, Amsterdam, 19-37.

3 Karam, G. M. and Casselman, R. S. (1993) A cataloging framework for software development methods. *IEEE Computer*, Feb., 34-46.

4 Necco, C. R., Gordon, C. L., and Tsai, N. W. (1987) Systems analysis and design: Current practices. *MIS Quarterly*, Dec., 461-475.

5 Olle, T. W., Hagelstein, J., Macdonald, I.G., Rolland, C., Sol, H.G., van Assche, F. J. M., and Verrijn-Stuart, A.A. (1991) *Information Systems Methodologies: A Framework for Understanding*. Addison-Wesley, Wokingham.

6 Persson, A. and Stirna, J., (2001) Why Enterprise Modelling? An Explorative Study into Current Practice, *The 13th Conference on Advanced Information Systems Engineering*, Interlaken, Switzerland, 465-468.