A content-analytic study of the advantages and disadvantages of process modelling

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Abstract

Using data from twelve in-depth interviews with practising consultants, this paper presents a content-analytic study of the advantages and disadvantage of process modelling. Based on the interview data, we have two conclusions about the value of process modelling. First, that process modelling is useful, primarily for understanding and documenting business processes, but also for planning implementation projects. The major downside of process modelling is the risk of over analysis. Second, although vendor-supplied reference models may not be used much in implementation projects, process models themselves are still valuable for developing shared understandings of processes and planning software implementation projects.

Keywords

Process modelling, data-flow diagrams, event-driven process chain diagrams

IINTRODUCTION

Process modelling is the use of diagrams to assist people to specify, describe, understand, and document processes more effectively than they can do using text. Process modelling has been used in practice and taught in universities for years in the belief that, even if a picture is not always "worth a thousand words", graphic representations of processes are a more effective means of communicating than through text. Early process modelling methodologies included system flowcharts (sometimes called swim-lane diagrams because they show the different departments executing parts of the process in different rows or columns like lanes in a swimming pool) used by auditors to document processes as they sought to identify weaknesses in internal control (Cushing 1982). Later, in the 1980s, authors such as DeMarco (1978) and Gane and Sarson (1978) developed data flow diagrams as a simple technique for documenting processes. More recently, researchers and practitioners working with UML have developed more complex representations of process (Booch et al. 1998, Rambaugh et al. 1999). In addition, vendors such as SAP have developed process modelling languages such as event-driven process chain (EPC) diagrams (Scheer 1994, Scheer, 2000, Rosemann 2000, Roseman et al. 2001) to represent the complex processes supported by their software. Roseman et al (2003) reported on a recent survey of Australian IT practitioners concerning their use of the term "business process modelling". Based on a sample of 312 web-based survey respondents, they reported that (a) the most frequent process modelling techniques in use were data flow diagrams (146 frequent users) and system flowcharts (112 frequent users), and (b) the most frequently used modelling tool was Visio (148 frequent users).

Although pictures have been used to convey information for thousands of years, the arguments in favour of the use of process modelling are not so clear. It just seems to be assumed that process models are useful. For example, one of the early leading texts in Information Systems, Davis and Olson (1986) presents a one-page case of a high-level dataflow diagram with no more explanation of its value than: "The transformation of data is represented by data flow diagrams (see Figure 18-5)" (p.579). Hints to us that the benefits of process modelling were not as clear-cut as some authors have suggested came during a presentation on implementation of packaged enterprise application software. Although the package vendor had developed an elaborate technique for process modelling, designed to support the communication of details of processes embedded in software implementation teams, the speaker admitted to the audience that such techniques were rarely used in practice. Rather, he said, consultants tended to rely on past experiences through process knowledge they had gained from previous implementations and from screen sequences in the actual software to understand the capabilities

embedded in the software. Evidently, there were some situations where process modelling was deemed to be not useful. This led us to ask the following two simple questions:

1. *In general, what are of the advantages and disadvantages of process modelling?*
2. *When implementing packaged enterprise application software, when is process modelling useful and when is it not?*

In this paper we attempted to answer these questions by, first, examining the literature on process modelling, and second, interviewing twelve practicing consultants who use process modelling in their daily working lives. Based on the interview data, our answer to the first question above is that process modelling is useful, primarily for understanding and documenting business processes and for planning implementation projects, and that the major downside of process modelling is the risk of over analysis. Our answer to the second question is that although vendor-supplied reference models may not be used much in implementation projects, process models themselves are still valuable for developing shared understandings of processes and planning packaged software implementation projects.

WHAT ARE THE CLAIMED BENEFITS OF PROCESS MODELLING

The literature suggests that business process modelling is useful for understanding the "as-is" and "to-be" processes during software development, software implementation, and the restructuring of business processes (Phalp, 1998). Roseman et al (2003) report that the most frequent uses for process modelling in Australia were for business process documentation, workflow management, and improvement of internal processes. Similarly, Aguilar-Savén (2003), in her review of the business process modelling literature, suggests that business process models are used mainly to understand processes, make decisions about the processes, and to develop business process software. Roseman (2000) identifies four stages of systems implementation where business process modelling is most beneficial: Business Engineering, System Selection, System Implementation, and System Use and Change. Benefits in these four stages are now reviewed in turn.

Stage 1: Business Engineering

Business engineering seeks to achieve greater fit between implemented processes and organisational needs. Minkowitz (1993), Black (1998), Murgatroyd et al. (1998), Koubarakis and Plexousakis (1999), and Rosemann (2000), for instance, argue that process modelling early in the life of a project can be used to get an understanding of existing business processes, identify innovative aspects of existing processes, and act as a source of ideas for new processes. Wheatley (1998) and Rosemann et al. (2001) argue that process modelling assists with planning ahead.

Stage 2: System Selection

Minkowitz (1993), Murgatroyd et al. (1998), Koubarakis and Plexousakis (1999), Wreden (1999), Becker et al. (2000), and Rosemann (2000) argue that developing a model assists in selecting a system that best fits the needs of the organisation. Tam et al. (2001) present a framework explaining the advantages and disadvantages of data flow analysis as a tool for business process modelling for selecting the best system in to small-medium size industries. Melao et al. (2000) present a conceptual framework showing the strengths and weakness of process modelling when it is used for system selection.

Curran and Ladd (2000) go further, and claim that process models provided by software vendors can assist with package selection. For example, they say "SAP has packaged 25 years of best-business practices in many different industries in the form of a 'blueprint' called the R/3 Reference Model." (p.xxvi) …"Graphical models help users select and understand the software, visualizing how data flow through business areas and showing how various functions interact with each other." (p.xxvii)

Stage 3: System Implementation

Rosemann (2000) and Kalpic et. al. (2002) argue process modelling can help in analysing the business processes, promoting a consistent understanding, and ultimately implementing a system that is tailored to the needs of the organisation. Wreden (1999) argues that process modelling can be used to enhance core business processes by keeping people focussed on these (more important) business processes during system implementation. Tam et al. (2001) argue that data flow diagrams act as a useful reference for end-users in specifying how the processes are related in a particular function in the organisation.

Stage 4: System Use and Change

Jackman (1998) argues that process modelling is helpful for Business Process Re-engineering and Benchmarking because it gives a more concrete portrayal of the processes and their flows. Koubarakis and Plexousakis (1999), Rosemann (2000), and Rosemann et al. (2001) explain how the process modelling tools give rise to consistency and shared understanding of processes by representing processes and their flows visually. Wreden (1999) argues that process models can be used to examine the goals of the business and gain a shared understanding of organisational processes.

In summary, process modelling seems to be useful at four stages in the packaged enterprise application software acquisition and implementation process: (1) prior to packaged enterprise application software selection, (2) during software selection, using both process models developed by the vendor and the client organization (3) during implementation, and (4) post implementation. The claimed benefits are that graphical representations of processes make descriptions of process more concrete, thus enabling clearer shared understandings of both "as is" and "to be" processes, and that these shared understandings are useful for guiding software selection, implementing the software, training users how to use the software and new IT staff who need to support the software. In the remainder of the paper, we set out to test if the advantages claimed in the above summary are true in practice. The reason for doubting at least some of the claims is that after speaking to a number of packaged software implementation-project managers, it would appear that vendor-supplied process models are not often used in package selection or implementation.

METHODOLOGY

The methodology adopted for answering the research questions was to interview practicing consultants who had used process modelling as part of their job role/function.

Sample

A total of twelve people were interviewed. These people came from consultancy firms and all had had experience with process modelling. Five females and seven males were interviewed. Eight of them were consultants (Consultants 1 to 8), three were managers (Managers 1 to 3), and one being a partner (Partner 1).

Questions in the Interview Schedule

- What process modelling tools and techniques are used in your organisation?
- What does your firm perceive as being value-adding when it comes to using process modelling tools/techniques?
- In what part of a project does your firm find process modelling to be (most) useful?
- How does your firm actually arrange/configure business processes into a model?
- What is required to process model efficiently?

Data Analysis/Coding

The interviews were taped then transcribed verbatim. Each transcribed interview was about eight to twelve pages long. After transcription, data analysis was conducted was by two people (the first and second authors; the first being an information systems honours student, and the second an academic with a management background). The two coders independently read the transcripts. Initially, the first coder came up with 24 sub-themes whilst the second coder came up with 21 sub-themes; 15 of these were common to both coders. After integration, a total of 30 unique sub-themes resulted. The sub-themes were clarified by discussion between the two coders, and a sample of four transcribed interviews were recoded to determine if both coders then ascribed the similar meanings to the sub-themes. After grouping related concepts and further clarification of sub-themes, the list of sub-themes was reduced to the 12 sub-themes, and four main themes shown in Table 2. All interviews were then recoded independently by both coders, using the agreed 12 sub-themes, and each interview was scored as follows:

0 = sub-theme was not present in the interview

1 = sub-theme was present in the interview

Goodwin and Goodwin's (1985) method for calculating inter-rater reliability was used to calculate the scores in the right-hand column of Table 2. greater accuracy. Scores of 0.7 or higher are considered acceptable. By this measure, all except one theme, Flexible Template, were consistently classified by the two coders.

RESULTS

Each sub-theme in Table 1 is discussed in detail below. The average frequency of each of the sub-themes was as judged by both coders to be present in the interviews is shown in Table 1. The most valuable uses for process modelling, those mentioned most frequently by the interviewees, have the highest scores in the Average Frequency column. In other words, the two most important benefits of process modelling are *Understanding Current Business Processes* (11.5) and *Documenting Business Processes* (10.5). The biggest disadvantage of process modelling is the *Risk of Over-analysis*. (5.0). The numbers in brackets are the frequencies with which advantages and disadvantages were mentioned by the interviewees.

The four main categories of benefits and problems identified in this study emphasize that the interviewees did not look at process modelling issues from each stage of implementation like past authors have done. Rather, they were more focused on the actual benefits that can be attained and the potential drawbacks to be faced by using process modelling throughout all stages of a project. Thus, these categories do not concentrate on specific stages on implementation. Therefore, the titles of the categories in Table 1 differ from the themes found in the literature review and provide for a different perspective on the usefulness of process modelling when implementing packaged application software. To assist the reader, headings for all *benefit* sub-themes below are preceded by the letter "B". For the fourth category of sub-themes, *problems* are preceded by a "P".

Benefit Category 1 : Documentation Benefits

Documentation benefits refer to the use of process models to communicate and represent knowledge about processes more effectively than through other methods, for example, text.

B1.1 Common Language with Client

Since there is a varying skill level between the clients and users, process modelling offers a common language in which the user is able to represent information that the client can understand relatively easily. With an overall process model being developed, the business' processes are all represented in that model and hence there is one common document that all parties on a project can use to gain a better understanding of processes.

With a score of 7/12, the average frequency with which this benefit, a "common language with the client", was reported was quite high. Evidence that process modelling provides a common language is provided by the following comments from the interviewees:

"It's the common language – you have to process model everything just to prove that you understand it and to communicate it to the client" (Consultant 3)

"….the best way you'll have that creativity ummm is if everyone's speaking that common language. ….process modelling doesn't give you a competitive advantage but process modelling is the first step to having everyone in the business speaking the same language and understanding the business" (Consultant 3)

The above quotes depict just how process modelling brings all the project members onto the same level of thinking, providing a common base from which to communicate and express ideas regarding the business processes of the organisation. Thus, this benefit is a useful characteristic of process modelling.

Table 1 – Frequency with which sub-themes were mentioned

Themes and sub-themes in the interviews	Average Frequency	Inter-rater Reliability
Benefit Category 1 : Documentation Benefits		
B1.1 Common Language With Client	7.00	0.83
B1.2 Means of Documentation	10.50	0.92
B1.3 Flexible Template	6.50	0.58
Benefit Category 2 : Design Benefits		
B2.1 Understanding the Current Business Processes	11.50	0.92
B2.2 Generation of New Possibilities	6.00	0.83
B2.3 Means of Planning for the Project/Implementation	9.00	0.83
Benefit Category 3 : Use Benefits		
B3.1 Visual Representation of Processes	8.00	1.00
B3.2 Iterative Development Process	5.00	0.83
B3.3 Time Efficiency	5.50	0.92
Problem Category 1 : Potential Disadvantages		

	Themes and sub-themes in the interviews	Average Frequency	Inter-rater Reliability
P1	Possibility of Over-Analysis	5.00	1.00
P2	Possibility of Misinterpretations	3.50	0.92
P3	Possibility of Developer Bias(es)	3.00	0.83

B1.2 Means of Documentation

By formulating a business process model, all the process flows and relationships between the processes can be represented. The resultant process model(s) can be used as a reference for checking how the business processes are structured and this can help in future projects when implementing change in an organisation.

The score of 10.5/12 in Table 1 for "means of documentation" as a benefit of process modelling shows that almost all interviewees believe process modelling to be useful as a means of documentation. This is not really surprising since the process models that are developed illustrate the processes and their flows and in turn serve as a means of reference for the organisation in keeping track of how the business processes are structured. By way of example, the following quotes support this statement:

"…the Visio documents were essentially uploaded onto the knowledge warehouse system running on R/3 and ummm that was like their library going forward. Just a reference that the client could use globally" (Consultant 1)

"…by doing the process modelling at the start, you can totally document their processes…." (Consultant 2)

"…process modelling is crucial, I mean it's the only way you can accurately and systematically document processes" (Consultant 3)

These quotations show that by process modelling is useful for documentation. It provides an organized means by which to keep a record of how the business is actually functioning.

B1.3 Flexible Template

By using process modelling, consultants are able to derive templates for a variety of business processes that are common in each industry. Through their experiences on client projects, the users are able to formulate a base template for various functions that are common in businesses within a particular industry. These templates can then be used as a starting point for modelling businesses processes. As the client requirements are known and their business processes understood, these base templates can be tailored to the client's organisation. Therefore, these base process models will promote consistency in process modelling and are dynamic enough to be used for a variety of clients.

Although use of process modelling as a "flexible template" for defining processes scored an average frequency of reported benefit of 6.50/12, comments were mixed. For instance, when discussing the use of process templates, the one partner interviewed said:

"There are industry templates ummm at the mega-process level, or within the audit approach, there are high-level process ummm process maps for each industry – so the banks, telecommunications, insurance companies, superannuation, life insurance companies, those sorts of things. There are high-level process maps for those, but they're really high-level." (Partner 1).

This suggests that the templates he was discussing are at a very high-level and not very useful. Thus, the idea of using generic process models as flexible templates not being very useful could be attributed to the fact that each client does differ from one-another regardless of whether they are in the same industry. Another quote indicates this very point:

"…well you've got a client in this industry, we're going to go to the food industry and use this template. It would never be a situation like that" (Consultant 1)

A process model represents the business processes of a particular client and thus has to reflect only that clients business. Even though, the basic functioning/purpose of the client's business processes may be similar to that of their industry, they do differ so that a competitive advantage can be achieved. As a result they are looked upon as one of the leaders in their marketplace. By transferring knowledge via the flexible templates may no longer support the client's objective of sustaining competitive advantage. With templates acting as a base, other companies may gain knowledge as to how the business processes are structured. Thus, this argument could help explain the fairly low average frequency for this benefit.

Benefit Category 2 : Design Benefits

Design benefits flow from the use of process models for gaining a clear understanding of existing business processes and insights into new and more effective processes.

B2.1 Understanding the Current Business Processes

Using process modelling for understanding the current business processes is the highest ranked benefit in Table 1. This is not really unexpected, seeing that the interviewees thought process modelling to be critical in gaining a sound understanding the current processes of a business in helping formulate a plan of improvement for the future. The comment that *"....it makes you more aware of what goes on in organisations, rather than seeing it from a purely technical, you actually understand from a conceptual point of view and in detail what goes on in the organisation and how everything fits together"* (Consultant 1) shows how process modelling enables people to see how the current business processes operate and how the organisation goes about operating its daily business.

Furthermore, the remark that *"it's useful to identify what they're doing now and then it's useful so we know how to re-engineer it, then it's useful to ummm for the future because we know where we're heading, we've got a clear goal instead of making it up as we go along"* (Consultant 2) justifies the usefulness of process modelling in gaining an understanding of the current business processes. The project team members can evaluate what will need to be done to instigate change. They will not have to waste precious time and resources just going ahead with the project and then running into trouble in the latter stages due to the lack of understanding of how the organisation functioned initially.

B2.2 Generation of New Possibilities

Through process modelling, both the client and the user can discover options that may not have been otherwise thought of. Process modelling will assist in identifying a variety of ideas as opposed to simply implementing a single solution through the mapping of the business' processes. The user and the client are able to have a good overview of all the business processes and can then strive to put forward the best solution possible via uncovering new possibilities. Therefore, from such a map, areas of improvement can be investigated and how to go about achieving the improvements can be ascertained.

Compared to the previous benefit, which primarily looks at the organisation from an 'as-is' perspective, when using process modelling for the generation of new possibilities, the focus is more on a 'to-be' type analysis of what the business processes will look like and how the project team members foresee the implementation of the new business practices operating in the future. It can be said that the previous benefit of understanding the current business processes compliments this benefit since several of the interviewees made statements along the lines of the following:

"Alright, we'll break the project up into a current state and a future state analysis. Given that if you were entering an engagement and you were about to conduct a current state analysis for an organisation's processes to proceed to the future stage. Now, the future state comes within the technology implementation – that's the whole reason for doing it. Ummm..you need the process modelling and we found it very effective in both stages" (Consultant 1)

By formulating a process model, the team members have a clear comprehension of how the business is operating and where changes can be made to make the existing business processes more efficient and effective. This is especially the case when the clients do not really know what they want as indicated by the comments:

"The other good thing is ummm often the client doesn't really know what they want, so by doing the process modelling, it gives them an idea to think about what they really do want. That's actually a very good thing" (Consultant 2)

"....That's why – it makes them think of other ideas, rather than narrowing down the approach of this is what we want to do" (Consultant 1)

This just shows that when confronted with a process model that illustrates all the relevant business processes, their flows, and their relationships, people can try to derive ideas for areas of improvement.

However, the average frequency was not too great. This is probably explained by the fact that process modelling was really used to gain an understanding of the existing business processes and the future of these business processes were discussed via holding workshops with the parties working on the project, as opposed to simply constructing a process map of how the business processes will be structured after the project is completed. Bearing this in mind, there still appears to be a general consensus between the interviewees for its usefulness here since *"all that process documentation depicts the future – it'll depict what they're wanting to build, what they're building, so the new processes, it's all around that" (Manager 1)*

B2.3 Means of Planning for the Project/Implementation

On projects that change on how the organisation may operate in the future, process modelling provides a means by which the project can be optimally managed. All the business processes and their flows are displayed in the process model, and with such an overview, areas of change can be easily seen and their impact and consequently the management to achieve the desired outcome can be organized.

Using process modelling as a means of planning for the project/implementation scored 9/12 in Table 1. This was to be expected because this benefit closely coincides with benefit "B2.1Understanding the current business processes". Process modelling first assists in the understanding of the existing business processes and then helps in planning how to go about managing the project without causing too much disruption to the organisation via rashly changing the existing processes and making it difficult to conduct normal business practice. This benefit is made clear by the quotes below:

"...That's why – it makes them think of other ideas, rather than narrowing down the approach of this is what we want to do" (Consultant 1)

"...I probably would use process modelling ummm for getting an overview of the whole project and how you know..what I'm supposed to do and what others are supposed to do. So I guess to get an overview of that would be important" (Consultant 4)

By having a process model portray business processes and how they are linked to one another, a plan of how to go about implementing a system can be constructed. This enables the project manager to see how processes will be impacted and resource the project appropriately (such as the delegation issues). Therefore, process modelling can be considered a useful tool for planning.

Benefit Category 3 : Use Benefits

Use benefits are advantages that can be attained during the task of conducting process modelling – not the resultant benefit of doing process modelling. This includes efficiency flowing from use of software for drawing process models.

B3.1 Visual Representation of Processes

Process modelling provides both the client and the user with a graphical way of visualizing processes. This gives them an overview of the business processes, flows, and shows how one process affects the other.

Visualization benefits were reported by 8/12 interviewees. All the interviewees felt that a visual representation was better than text because things can be interpreted easier and in a more succinct way. There are several examples of comments made by the interviewees that show great support for visual representation being one of the useful qualities of process modelling. The following quotes have been selected for their good synopsis of the overall opinions:

> *"...from a personal point of view, very..I think most people understand things when they see things mapped out visually. So it's much better than, you know, first step, second step, third step, fourth step. I mean if you compare what the alternatives are which would be first I'd do this, then I'd do this, then I'd do this, and so on; if this happens, then I do this..I mean you can't read that, you can't see it. A process model, you can see the flow and you can understand it 10 times quicker"* (Consultant 4)
>
> *"Oh because words just don't...for a lot of people the visual...visual impact is ummm their visual skills are a lot stronger in terms of gaining an understanding of something instead of what's known as the auditory technique, which is basically read words"* (Partner 1)
>
> *"one the graphical representation make it look better. Ummm they often use swimlanes as well or they sometimes use swimlanes where they depict all the responsibilities across the top and they are very complex and confusing for an end-user to follow. Whereas, we will condense all of that into one simple flow and we will identify it at a task level of responsibility"* (Manager 1)

B3.2 Iterative Development Process

Today, process modelling documents are usually available on line. Process models can therefore be considered to be iterative in the sense that the process models are easy to modifying and update. Electronic process models thus provide a means by which both the client and the user can frequently consult the model to modify it when and where they like. By storing process models online, there is only one process model, not several different versions. This reduces confusion and argument about which is the latest model.

This was seen as being quite important both during the implementation and even afterwards:

"You need something online, historical, that the client can refer to later on past the implementation. And it needs to be something that they can modify themselves and edit because one of the big ummm problems is some ummm consultants is that they will come in and implement some fantastic modelling tool that's SO complicated and complex that the client can't use it post and growing. The idea is that the client can use it after we've left the engagement." (Consultant 1)

Therefore, by having an iterative development process, the chances of data redundancy are reduced whilst enhancing accuracy as people will be confronted with the most up-to-date process model. This was something that was valued by the interviewees: *"....a great project will have the processes in place where you always update your process models. If the process changes, you want to update the model or else you start wondering which ones right and which ones wrong and ummm that's why it's essential for people at all levels of the organisation, that the IT people and the business people understand process modelling"* (Consultant 3).

However, overall this benefit was not really seen as a major benefit of process modelling. It was mentioned as a benefit by only 5.5/12 interviewees.

B3.3 Time Efficiency

A consultant's time is their client's money, and a great deal of efficiency can be gained by using process modelling software packages. This benefit goes hand-in-hand with the visual representation sub-theme. Most interviewees believed the diagrammatical nature of process modelling to be time efficient in the sense that the diagrams were a more succinct representation of the business processes of an organisation – they were more easily understood than having to go through (large) amounts of text. This view was gained from statements such as *"..so I guess in terms of time efficiency the adding value to the client, they can actually visually see what the template is, what's the process, and these are your building blocks, and then you can actually work with them to build the process" (Consultant 1).*

People on a project try to use their time as efficiently and effectively as possible, and process modelling was seen as one way to use time optimally. This was the general consensus amongst the majority of the interviewees. For example, *"There is no way I could justify spending my time otherwise building some kind of other means for presenting to the client business processes going forward. But it also helps you think quickly" (Consultant 1)*. At the same time, it was emphasized that the models need to be explained and this can take time. Hence the average frequency of reported benefits was only 5.50/12. Problems could also arise if the model becomes large and complex, giving rise to misinterpretations (discussed below).

Problems: Potential Disadvantages

The discussion above has all been about the perceived benefits of process modelling. This section discusses the main disadvantages identified by the interviewees.

P1 Possibility of Over-Analysis

Many interviewees mentioned the risk of over-analysis with process modelling. Attempting to either depict all the current business processes of an organisation and/or how the new processes will look upon implementation, people can sometimes get too "carried away" with modelling: *"....occasionally I see clients who are, you know, focusing more on doing minor changes to process models – you can spend too much time on it, I think. You have to think of every process model as what's the audience here. You can spend too much time, you can put too much detail into them"* (Consultant 3). The outcome is a highly complex process model that is quite hard to manipulate and understand.

This "problem" received an average frequency of 5/12, which indicates that some of the interviewees saw the possibility of over-analysis as a potential drawback of process modelling. Furthermore, the interviewees may not have wanted to show themselves as spending too much time via over-analysis since they were strongly against the development of large and complex models. It is important to keep this drawback in mind, so that it can be avoided whilst concentrating on maximizing the beneficial aspects of process modelling.

P2 Possibility of Misinterpretation(s)

Because process modelling is a diagrammatical means of representing business processes, there is opportunity for miscommunication of how the processes are actually structured. This could be a problem for the initial understanding of how the business processes are structured by the user and also about how the client interprets what will actually be done.

The average frequency was rather low for this sub-theme: 3.5/12. This indicates that fewer of the interviewees thought mis-interpretations may arise out of a process model, whereas others thought the process model to be comprehensive enough to portray its true meaning via holding meetings and workshops to communicate a

consistent understanding. After all, *"I mean think of a language, I mean that's really what process modelling is. It's just a way of documenting and so we speak a common language. And I mean if someone doesn't understand that language well ummm it's a miscommunication issue like, I mean you get so many miscommunication issues. And that's the biggest issue I find with process modelling – it's not so much, I mean like we use as consultants and we can see what..we can look at SAP's process models, we can look at the ones we drew up, we can do the synthesis, we can do the analysis, we can do the design, the question is when you have it on paper, does the client understand it? And that's usually the biggest problem."* (Consultant 3). This statement shows that it may be difficult to ensure everyone is interpreting the process model the same way.

Therefore, a shared understanding of the process model is critical in implementing application software to the client's expectations. However, this is where time efficiency can be somewhat jeopardized since *"A great issue is spending time, making sure they know what it's going to look like from a format point of view ummm I guess generally the hardest thing is working out who..who in the end owns the entire process and then getting the right people involved to make sure it's an accurate representation, in that you don't leave out a certain perspective 'cause you haven't involved them"* (Consultant 5). Moreover, due to the fact that a consultant's time is a client's money, it is critical to have a unanimous understanding of the structuring of the business processes, otherwise there will be extra time wasted back-tracking to rework parts of the project, in turn forcing the project to go over time and budget.

Similar to Problem P1, this is an important problem to bear in mind when using process models.

P3 Possibility of Developer Bias(es)

When a consultants prepare process models, they tend to bring in their own world-view of how things should be done. Furthermore, since they may have industry templates to build on, not to mention their own past experience with similar projects, the consultants may lose a bit of creativity since they could have a semi-predetermined model in the back of their minds.

The reason for the lowest average frequency of this sub-theme (3/12) can be attributed to the fact that the interviewees were all classified as some sort of consultant and felt obliged to approach each project with a fresh outlook. After all, *"You don't want people thinking narrowly down one path. You want other options, other ideas, but that's even for, I mean, consultants in consulting companies…". "Because otherwise you do get people deciding 'well, this is what we're going to do and that's how to keep going forward'." (Consultant 1).*

This problem somewhat offsets benefit "B1.3 Flexible Template" since the flexible templates used as starting points by consultants do tend to bias how business processes will be represented. Therefore, *"Ummm whatever's easy and best for the situation. You don't want to just stick to process modelling and that's how process modelling should be done. You have to..you really have to be flexible in understanding well there's no point in doing this if the target audience doesn't understand it. So you have to be just aware of that when you're doing process modelling. But it has its limitations, I mean, there are times when it's best to just draw decision trees, you know what I mean? Instead of trying to model it as you would..it's just understanding when to leave..to actually leave the standard of arrows and documents and to actually put it in a format which is more understandable for that specific situation and do it more for your audience than just for yourself." (Consultant 3)*

LIMITATIONS

There were two main limitations with the study. First, only a small sample of people was interviewed for this study, and all interviewees were associated with large firms. Hence, it is difficult to generalise from this study. However, we believe the results probably apply to the use of process modelling in most large consulting firms when helping clients implement packaged enterprise application software. Second, although there is evidence, as seen in the quotes, that the interviewees were largely honest in reporting both the benefits and problems, there might still have been a degree of providing the "company view" in their responses, rather than actual events. This social desirability problem was minimised by confidential treatment of the data as well as asking more questions of actual events rather than of beliefs and opinions.

CONCLUSIONS

This study makes two contributions to the literature on process modelling. The first and main contribution is the list of advantages and disadvantages of process modelling in Table1. This list has been derived empirically, using rigorous content-analysis techniques, and provides an up-to-date summary of the benefits of process modelling in consulting practices today – at least from the point of view of consultants on teams that have helped implement packaged software.

Second, even though project leaders of packaged software implementation projects have told us that vendor-supplied reference models are little used in implementing software – which led us to question whether process models were useful – this study found that process modelling is useful in application software implementations. Although none of the interviewees mentioned using vendor-supplied reference models for software selection, they all said that process modelling helps to heighten the understanding of an organisation's business processes, and in addition, assists them in planning their implementation projects. Thus while the vendor-supplied reference models may not be used, process models themselves are still valuable in software implementation projects.

When used in packaged enterprise application software implementations, process-modelling tools and techniques allow the implementation team to document, both 'as-is" and "to-be" processes, relatively unambiguously. While by no means the only success factor (Parr et al. 1999), or even the most important success factor, clear shared understandings of "as-is" and "to-be" processes obtained through use of process models must ultimately lead to greater the chances of a successful implementations of packaged enterprise application software.

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