

BUSINESS PROCESS MODELLING

A South African Perspective to Factors Influencing Sustainable Business Process Modelling

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Soli Deo Gloria

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To my wife Takkie, who has supported me through the periods of despair, pressure and joy, all condensed into a few sleepless months.

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ABSTRACT

Business process modelling is an activity that is performed in most organisations. Some organisations are involved in business process modelling formally, others do modelling as part of projects or when making important decisions. The thinking, analysis, and understanding of how an organisation creates value for its customers; that is captured in a process model, need to be re-usable.

This study investigated factors that influence the sustainability of business process modelling in South Africa. The study focussed on aspects of the nature business process models, and the act of modelling, to identify factors that contribute to sustainable business process modelling. A series of potential factors were identified from international literature. These potential factors were presented to, and discussed with, South African process experts during structured interviews.

Analysis of the results showed that the sustainability of business process models has a lot more to do with the people involved, than with the tools, techniques or software that can be used to capture business process models. Analysis further showed that process consultants working for external consulting firms, and process custodians working for large organisations, have different opinions regarding the factors that can have the highest impact on sustainable business process modelling.

The key findings of this study are that participation by all stakeholders in the process of creating business process models, and process ownership after the initial modelling project by designated process owners, are the key factors that could have the most influence on ensuring sustainable business process modelling.

KEYWORDS

Modelling, Process modelling, Process mapping

DECLARATION

"I declare that ***"A South African perspective to factors influencing sustainable business process modelling"*** is my original work and that all the sources I have used or quoted have been indicated and acknowledged as complete references, and has not been submitted for degree purposes previously."

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Name

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Date

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Signature

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ABBREVIATIONS

ABC	Activity based costing
ARIS	Architecture of integrated information system
BPM	Business process management
BPMI	Business process management initiative
BPMN	Business process modelling notation
BPMS	Business process management system
BPR	Business process reengineering.
DMAIC	Define, measure, analyse, improve, control
EPC	Event-Driven Process Chains
ERP	Enterprise resource planning
ICOM	Input; control; output; mechanism.
ICT	Information and communication technology.
IDEF	Integrated computer-aided manufacturing DEFinition method
IT	Information technology
MRP	Materials requirement planning
OD	Organisational design
OMG	Object management group
SIPOC	Supplier; input; process; output; customer.
TQM	Total quality management
UML	Unified modelling language
UOB	Units of behaviour
VSM	Value stream mapping/map

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1. ORIENTATION

1.1. Chapter Introduction

This orientation chapter gives an overview of the broad objectives and approach of this study. It includes a description of the research problem, what the objectives of the study are, and how the study will be conducted. This chapter also includes a brief description of the rest of the chapters in this document.

1.2. Research Problem

In the following paragraphs the research problem for this study, "A South African Perspective to Factors Influencing Sustainable Business Process Modelling", is described. The research problem contains subsections that describe the problem statement, the research objectives and finally elaborating on the Importance and scope of the study.

1.2.1. Introduction to the Research Problem

From the time when mankind began working together, the effort of many needed to be directed by a few. Managing the work of others became a skill in its own right, with leadership initially enough to get the job done. But as the products of our industries became more complex and the size of our organisations grew substantially beyond what could be reasonably be managed by one individual, new layers of management were introduced. As a result, the people directing the effort became further and further removed from the actual work being performed (and the people doing the work further removed from the planning of the work).

To manage complexity, mankind started introducing rules. Simple guidelines at first, which ensure that the people exercising the effort behave in a way that is predictable to the people that direct the effort.

These rules are the glue that holds modern organisations together. They define a "way of work", and it is this way of work that enables people, money and infrastructure to combine in such a way so as to create value for customers and stakeholders.

Business processes are the glue of the corporate world and process modelling is one way of working with the glue that keeps organisations together.

1.2.2. Problem Statement

The glue that holds organisations together is, however, something that is not easy to work with. The process through which value is created for a client resides in the heads and minds of all the people involved in creating that value. In smaller groups of people, producing less complex products or services, managers can create and direct the process that creates value via observation and personal contact. In larger organisations, managers do not always understand the processes that create value. This is not strange since the division of labour that is applied in large organisations results in the creation of experts in their own right working in a small part of the larger process. Managers are experts at managing, researchers perform R&D, engineers design products, marketers sell these products, and a team of people produces it. Directing the process end-to-end requires a simple view of the whole process: a sheet of paper from which a manager can conduct the different instruments in his orchestra to play to the same symphonic tune.

A process model is a way of depicting the standard way of work in an organisation. Many fields of management science need to be applied to make an organisation successful in its aims: strategies must be crafted, organisations designed and finance secured. But without business processes, the daily operations of a firm cannot be executed efficiently and success may not follow. The business process of an organisation becomes one of the key resources that provide value.

In an ever changing world, and specifically in a changing South Africa, organisations need to adapt the way they are conducting their business. In some cases strategies may totally change, resulting in new products being sold to new customers in new markets requiring new resources to produce them. But in most instances, organisations need to adapt to new circumstances using the same people, infrastructure, and financial resources. Constant change requires business processes that are "alive"; process models that can adapt as circumstances change. Business process modelling is an activity that must be sustained for as long as circumstances may change.

Thus, external changes requires the organisation to bring about internal changes, and the one resource of an organisation that is due to change more frequently than any other is the process used to combine people, money, and infrastructure. South African companies need to document current as well as proposed future processes in order to manage this key part of their businesses. But do they? And if they do, what can be done to sustain this effort?

1.2.3. Research Objectives

The research aims to answer the following key questions:

- What is business process modelling?
- Why do organisations use business process modelling?
- Why use business processes in a sustainable manner?
- How can business process modelling be optimally applied?
- How is business process modelling viewed from a South African perspective?
- What factors are influencing the sustainable use of business processes in South Africa?

1.2.4. Importance of the Study

Money is frequently spent on process modelling projects, either directly or indirectly. Every consultancy that delivers a project has some analysis of the current situation before moving on to defining possible ways forward. In both analysis of the current scenario and stating the future, these projects make use of process models. In this way process modelling is an activity that takes place in South African organisations, directly or indirectly. The potential value from these process models may, however, not be optimally extracted.

The money spent by South African firms on process modelling annually is hard to determine. In large public organisations, consultants are involved in projects every three to four years that require some form of process modelling, be it a project to develop and implement systems or to reorganise human resource structures. A project of this nature can run to a cost of between two and eight million Rand with process modelling comprising a significant portion of the expenditure. The cost to run internally an active process division in a large organisation of 4000 employees can amount to between ten and 15 million Rand annually. Thus it can be safely assumed that the annual expenditure on process modelling projects in South Africa exceeds R100 million annually.

This research will point the users of process models in South African organisations to the key areas where value can and should be extracted from these models.

This research will also show where process modelling projects should focus in order to create process maps that can be re-used in future and in this way create a sustainable resource for the organisation.

This study is primarily aimed at the process modelling practitioners inside organisations who need to manage their own efforts and the efforts of consultancies, to deliver a sustainable tactical capability.

1.2.5. Scope of the Study

To limit the scope of this study to a manageable and coherent piece of work, some borders must be drawn around the problem statement.

Firstly, the study will be limited to modelling in service industries. The choice to focus on service industries is deliberate, as process modelling in manufacturing has a much longer and detailed history and examples of how to use process modelling to good effect are well documented. In manufacturing, the process flows are typically more clearly defined as machines and equipment are laid out on the shop floor in accordance with the process flow. Exceptions to the process are rare. In service industries, the services offered by these companies to their clients are not as formally structured, neither in the nature of the "product" nor in the steps required to deliver it. Thus the processes are often only stored in the knowledge and experience of the people who deliver the service. In service organisations, the value that can be derived from standardised and optimised processes can be argued to be significant. The question is: do these companies use process modelling to unlock this value?

Secondly, the study is not quantitative, but rather qualitative in nature. Thus the research aims to identify the factors influencing sustainable use of process models based on the opinion of international literature and South African process modelling experts.

1.3. Research Design and Analysis

1.3.1. Research Design

The method used in this study is that of the personal interview. This form of data collection has two important advantages (Cooper & Schindler, 2001); the depth and detail of information that can be gathered is significant; and the interviewer has more control over ensuring that the right information is gathered, either by adjusting language or graphically explaining some of the questions.

The main disadvantage to the personal interview is the costs incurred, both in time and finance. The interpretation of information gathered is more complex, but richer information not expected by the researcher can be uncovered.

As the number of process modelling experts in South Africa is limited, and because the study is qualitative in nature, a small number of interviews can provide reasonable insight into the status of process modelling in South Africa.

The sample size of the number of interviews totalled six.

1.3.2. Measurement Instruments

The measurement instrument in this study takes the form of a structured interview. A series of topics was prepared for the interview. These topics are directly derived from the literature survey and address the prerequisite factors, based on the literature review that must be adhered to in order to achieve sustainable business process modelling.

The topics include:

- 1) The extent to which business process modelling is performed in South Africa;
- 2) The extent to which business process models are re-used after the initial modelling has occurred;
- 3) The purpose of business process models;
- 4) The perceived success of an organisation's process modelling efforts;
- 5) Reasons for perceived success / failure of modelling efforts;
- 6) The methodology / framework used to approach process modelling projects; and
- 7) The notation standards, level of depth, and objects used to model business processes.

1.3.3. Data Analysis

Data gathered will be analysed in two ways:

- Firstly, the answers to direct questions will be used to answer the problem statement: "Is process modelling used as a sustainable resource in South African organisations?"
- Secondly, data will be analysed for common themes from answers to the open ended questions, sorted and reported.

1.3.4. Nature and Form of Results

The results from this study will take the form of a set of guidelines that is aimed specifically at improving the value from business process models by making them more sustainable.

1.4. Approach

To investigate the factors that might influence the sustainable use of business process models, the author needs to introduce some type of framework into this study. The framework presented in *Figure 1* was developed by the author as a conclusion after completion of the literature survey, but is presented here in order to provide some context to the literature review chapters that follow.

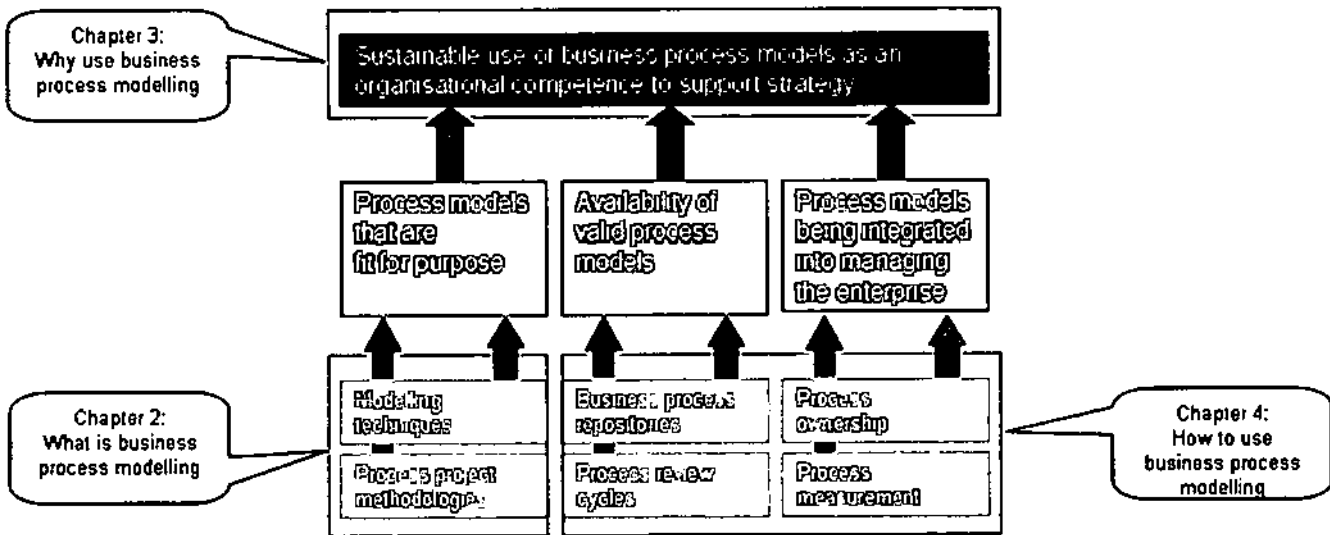


Figure 1: Chapter layout to address the concept of Sustainable business process modelling.

The framework set out above is based on a series of assumptions. Firstly the framework assumes that the sustainability of business process modelling can be directly related to the re-use of business process models. Models are not only re-used but are also incorporated into operational decision making in the organisation. Secondly that in order to re-use business process models on a continuous basis, the process models that are structurally fit for re-use, available for re-use and that the process models are part of the act of managing the organisation.

1.5. Chapter Layout

The chapters in this document are structured to first introduce, through the use of three chapters, the literature review and then three chapters on the research design, the presentation of results and lastly, a discussion and recommendation.

CHAPTER 1: Orientation

In chapter one the research problem is defined, along with the research objectives and scope of the study. An overview of the research design, the type of measurement instruments, how the data will be analysed and reported is presented. An overview is presented (the section you are currently reading) of the structure of the whole document.

CHAPTER 2: Literature review: What is business process modelling?

In this chapter the research objective "What is business Process Modelling" is addressed by looking at the history of business processes and definitions of business processes and related concepts. The essential components of a business process model and different types of process models are also discussed.

CHAPTER 3: Literature review: Why use business process modelling?

In this chapter two research objectives are discussed: "Why do organisations use business process modelling?" and "Why use business processes in a sustainable manner?".

Chapter 3 presents a discussion of the link between business process modelling and strategy.

CHAPTER 4: Literature review: How to use Business Process Modelling

In this chapter the research objective "How can business process modelling be optimally applied?" is addressed by discussing the cost of business process modelling and presenting two process improvement methodologies, The use of a process repository and some of the pitfalls in process modelling concludes the last literature review chapter.

CHAPTER 5: Research Design

In this chapter the content of the structured interview as a research instrument is developed and discussed along with some technical considerations for conducting the interview. The database used to capture comments made during interviews and the scoring of comments made are also briefly discussed.

CHAPTER 6: Results

Where the first four research objectives were discussed as literature reviews, the last two objectives are addressed by a review of the results obtained from the structured interviews. The answer to the research

question "How is business process modelling viewed from a South African perspective?", is presented as a series of comments made by process experts.

The research question "What factors are influencing the sustainable use of business processes in South Africa?" is addressed through an analysis of all comments made by process experts during the six interviews. Results are presented for the individual interviews and for sections of the discussion guideline. Finally the overall results are presented and the top seven factors influencing sustainable business process modelling are identified.

CHAPTER 7: Discussion, Conclusion and Recommendations

In this last chapter, guidelines are presented to South African companies that will lift the value and sustainability of business process modelling initiatives.

1.6. Chapter Conclusion

Processes are the glue that keeps organisations together. External changes in the environment forces companies to adapt. Using the same infrastructure and people from before, but organised differently, the glue holding everything together is changing most.

The problem statement of this study reads: "South African companies need to document current as well as proposed future processes in order to manage this key part of their businesses. But do they? And if they do, what can be done for this effort to be sustained?"

The research objectives are stated as questions that need to be answered in this study. They are:

- What is business process modelling?
- Why do organisations use business process modelling?
- Why use business processes in a sustainable manner?
- How can business process modelling be optimally applied?
- How is business process modelling viewed from a South African perspective?
- What factors are influencing the sustainable use of business processes in South Africa?

The study is designed to address the research objectives through an initial literature survey to perform an analysis of business process modelling from an international perspective, what it is and how to use it from a literature survey. The study will investigate the South African perspective of sustainable business process modelling using structured interviews with local process modelling experts.

In the next chapter, the international literature is reviewed to answer the research objective: "What is business process modelling?"

2. LITERATURE REVIEW: BUSINESS PROCESS MODELLING EXPLAINED

2.1. Chapter Introduction

Business process modelling is a subject that is not always seen in its own right. Management theories like "Business Process Reengineering"(BPR), "Total Quality Management"(TQM) and more recently "Business Process Management"(BPM) all include process modelling as one of their building blocks.

In this chapter the research objective "What is business process modelling" is addressed by looking at the history of business processes; definitions of related concepts and then discussing the essential components of a business process model. An introduction to popular notations used to model processes is also given.

In many cases the reference material is not primarily focused on process modelling, but rather on one of its applications. Conclusions are drawn and context provided by the author throughout the chapter.

2.2. Introduction to Business Process Modelling

The concept of a "business process" is one that is often used in discussions in any large organisation. Managers and workers alike realise that what they do (or in other words, the business process that they follow) ensures an income stream. Thus the business process is the essence of the survival of their company. Although most organisations do spend some time and effort to define their business processes, their approach to developing and documenting business processes may differ widely.

When asked "Why do you need to map your business processes?" different stakeholders in the organisation may site different reasons for doing so. Standardisation is about managing cost, since only one optimised process need to be managed throughout the organisation. Training material is often overlooked as a reason for documenting processes, but to achieve a single optimised process throughout all operations, organisations need to document in training material, a people friendly view of the process. Even if standardisation is not important to an organisation, successes achieved in one unit can only be repeated elsewhere if documented, therefore process modelling contributes to repeatability. Lastly, having processes documented adds to understanding current operations in the organisation. Process models can be used for detailed analysis of existing operations and creating a platform for analysing potential future scenarios.

What these reasons have in common is that business process modelling helps to bring structure into the chaos that exists in many companies.

Any company has a few basic components, namely people, processes, systems and capital and financial resources. Companies operate with these components in a sea of stakeholders, the government, the environment, customers, suppliers, owners, and shareholders. Many organisations find that coordinating these elements to achieve business objectives is an enormous challenge. The only predictable aspect of managing a business is knowing that the rate of change will increase in pace, information systems will become more complex, and competition will stiffen. Companies must act with greater agility and responsiveness than before to address the challenges brought about by change.

But how does a company face constant change? Processes and products may have changed in your organisation recently, and will have to do so again soon. The question is not how to change but rather how to keep on changing. Companies have to keep on creating countless variations of products, testing them and developing processes for them (Smith & Fingar, 2003).

Business processes are a force in recent thinking in management theory (Smith & Fingar, 2003). BPR (business process re-engineering), TQM (total quality management), Six Sigma, ABC (activity-based costing), value-chain analysis, cycle-time reduction, supply chain management, excellence, customer driven strategy and management by objectives are all recent management theories that stress the significance of the business process and its management.

New ways of improving business processes are recognised as an effective method to ensure business agility and competitive advantage. As more and more resources become commoditised, process improvement becomes an avenue companies desperately try to follow to remain competitive.

Process modelling and information technology (IT) have grown together over the last 60 years. Where IT started with data stored on large magnetic tapes and progressed through to an age where information and even "knowledge" are part of our every day existence, so too did process models quickly move from very simple paper-based depictions to IT-based solutions that can even create applications.

Process modelling is currently an important part of two major fields of study: a) management theory and strategy; and b) in application development. It is ironic that many sources refer to the "business vs. IT divide" where, in actual fact, business process models are a point of departure for both fields of study.

There are, however, differences in the approaches taken to business process modelling depending on whether it is approached from the business or from the IT side. Business modelling focus on descriptions of "what" and "who"; the aim is to ensure that responsibility is assigned to a person who can do the job. From the IT side, process modelling is typically performed at a much lower level. The interaction between a person and an elevator is modelled as the person enters the elevator, closes the door, and chooses a floor.

Enterprise resource planning (ERP) systems brought business modelling and IT modelling of processes into the same realm and, currently, similar notations and approaches can be used to model processes at a level where it makes sense to business leaders and the developers of IT systems.

In the last two years IT has taken the lead again and is using applications and systems in combination with processes. IT have coined the convergence of IT systems and process modelling "business process management" (BPM), and BPM experts are close to a point where IT systems can be changed "on the fly" as processes are adapted.

As business process modelling is the starting point for many different outcomes, it stands to reason that several approaches and methodologies have been developed to create and use business process models. In Figure 2, an aspect of processes modelling that is generally used irrespective of the methodology or purpose can be seen; that is, the notion of processes having some form of decomposition or "levelling". Terminologies for the different levels are diverse. In EPC diagrams, a function is a fairly low level of process whereas, in the minds of many South African business leaders, a function is one of the support processes on a Porter Value chain. "Activity", "process", "Level 1 or 2 or 3 process", "sub-process", "task", "state" and "function" are some of the terms used. Then the adjectives "core", "support", "value adding" and "enabling" can add further confusion to these terms. According to Hay (2003), the use of terms is not consistent, and besides using them interchangeably, "different authors define the terms slightly differently."

At higher levels of process, reference models and strategy mapping are more frequently used. In the middle, process re-engineering and high-impact change methodologies flourish and at the lowest levels of process, small-scale but frequent changes are made to keep processes slowly but constantly improving (Six Sigma, IT automation projects etc.).

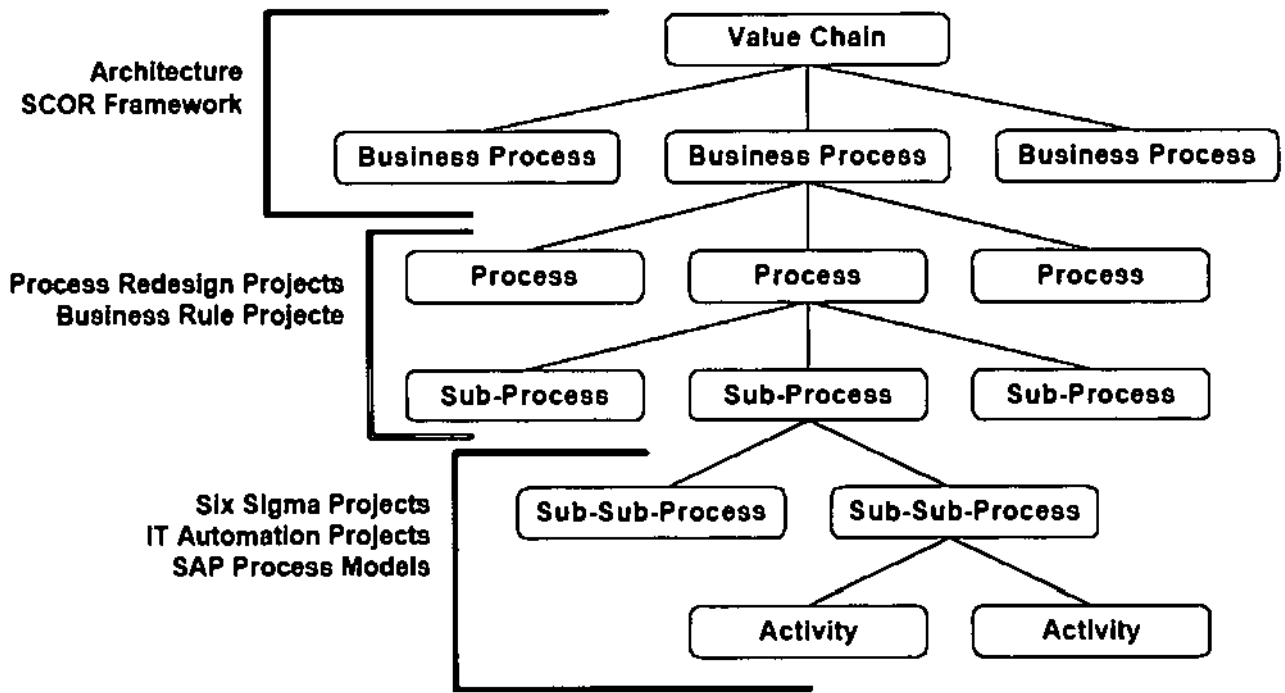


Figure 2: Process reference models and project approaches. (Harmon, 2005)

With so many different methods and methodologies available, why discuss sustainable business process modelling in South Africa? Simply because process modelling is so obvious, many managers may overlook it. To standardise several IT systems across different business units requires a process model, but the structure of the model, the information captured in the model, and the methods used to do the modelling can either lead to an acceptable process map for the IT standardisation project, or to an expensive modelling exercise with no clear goals (as the system to be implemented will prescribe the new process any way). The structure and method used in modelling model could potentially lead to a valid process model, stored and used as a source of knowledge and a strategic resource of the organisation. But we have to know the "W" 's of process modelling: why, what, who, when and where.

Process models are the best way to organise information regarding the organisation of a business. Process models place emphasis on why the company does things and models show how different actions relate to one another to produce results. Processes integrate the client, the business and even its IT department (Harmon, 2005). Process modelling is the method for understanding and managing the glue that keeps organisations together.

2.3. What is Business Process Modelling?

"Business process modelling is an activity performed by business analysts within a company. Analysts use modelling tools to depict both the current state of an enterprise and the desired future state. The activity of modelling a business process usually predicates a need to change processes or identify issues to be corrected. This transformation may or may not require IT involvement, although that is common driver for the need to model a business process." (Wikipedia, 2006a)

From the initial definition from an open source (Wikipedia), a few comments that will place the concept "business process modelling" into context are:

- There is very little difference between a "process model" and a "business process model". Initially process modelling started out as only "process" and not "business process" models.
- Business process modelling is sometimes referred to under the acronym "BPM". BPM is however more frequently used when referring to "business process management". BPM is an IT-related discipline that refers to the technology and activities to manage business processes imbedded into human and IT systems.
- "Modelling" refers to the creation of models, thus the concept not only includes the models themselves, but also the methodologies used to create them.

A second definition of a "business process" gives more insight into "business process modelling":

"Formally a business process is an organised group of activities that work together to create a result of value to customers. All activities in a business process must work together; they must be aligned for the common purpose of serving customer needs. All activities in a business process should be guided by a design that specifies which activities are to be done when and by whom." (Hammer, 2002: 27)

From the definition provided by Hammer we can highlight some of the other important points of business process modelling:

- The process is organised and parts of the process work together. Time, sequence, handover and responsibility are key aspects of business process modelling.
- Business Process Modelling is part of the effort of serving customer needs.
- Process modelling itself should also be guided by a plan.

The author's view on any model is that the model must remain a representation of something else. When a process model needs to describe in so much detail every aspect of the object or process it is representing, the model itself becomes more and more like the process. A model airplane on the corner of your desk is simply a model. It provides a representation of the visual aspects of the airplane it represents. When the model we are referring to is a 1/5th size, petrol-engined, radio-controlled aircraft with long-range fuel tanks, this is not a

model anymore. It is an airplane in its own right. It represents itself and only resembles externally the real aircraft it is a "model" of.

2.3.1. The History of Processes

In an article describing the history of Business Process Management, Lusk (2005) traces the origins of process modelling. The following section is based on her article, unless otherwise indicated.

Process modelling only became necessary in one form or another after the start of the industrial revolution from 1750 onwards. During this time labour was divided and jobs became specialised. The interest in mapping processes attributes started in the field of statistics. From 1911, one of the first influential writers on business processes, Taylor, focused on manufacturing tasks and time/motion studies, which were measured statistically. The division of labour was the success of industry up to that time, and every improvement that could be made at the level of the individual shop floor worker had high rewards. To maximise profits, companies focused on training workers to follow very specific procedures. Endurance and a high level of skill in a limited focus area were emphasised. To manage the work, organisation structures were hierarchically broken down. Responsibilities and very mechanistic controls rolled down the organisation in a similar hierarchical way.

Later during the 20th century, the work of mathematicians and statisticians led to the first real indications of process models that included a "flow". One of the first systematic approaches to map processes was flow diagramming that was developed by Goldstein and von Neumann in 1946 (Rosemann, 2006a).

After the Second World War, producing large volumes of goods and services with speed, placed more emphasis on machines than human labour. Reducing the number of defects from large factories and new technologies drove process development in these times, especially in Japan. As quality improved in Japan, companies in the US and other parts of the world were also required to invest in quality management systems. Statistical process control was a way to optimise processes.

Computer systems became available for companies, and their use were immediately focused to planning the production in factories. Materials requirement planning (MRP) systems required process models to be effectively used. The period from 1970 through to the end of the 1980s saw the development of information technology (IT) that could be practically applied. In this same period the focus of process moved from manufacturing sectors to other fields of business.

The second wave of process orientation covered the late 1980s to the early 1990s. To increase revenue companies looked at one another and adopted best practices. Focus moved from total quality management (TQM) to the compliance to international quality standards like ISO 9000.

The third wave began in the mid 1990s and continues today. Where new technologies drove process changes in the first and second waves, technology now is available to processes as an enabler. Organisations are today linking themselves into supply chains where a process, and the information generated by the process, is centre to all management activity. The company is seen more and more as a system, and even as a component of a larger system of a total supply chain. The need is now not to model processes within an organisation, but to model processes across organisations. In IT, applications moved from "thick" to "thin". Thus, having a system physically installed on a desk where the work is performed is not required anymore. A thin client inter- or intranet-based application can be used in conjunction with mobile computing and wireless networks. Thus the applications that support processes can be rolled out to wherever, whenever, fast.

With applications becoming "thinner", new systems were developed that could take information from legacy systems and present them to users on "thin" platforms. This is the area of technology where the current drive towards "business process management" (BPM) has its origins. Business processes defined between thin client applications and large sources of data, can give rise to systems that change as the process changes.

In order to define new systems in the BPM world, process maps are still required, but this time on a very detailed basis, detailed to the extent that new applications can be developed automatically from the process models.

In Table 1 (Lusk, Paley & Spanyol, 2005) the different technologies and techniques referred to in the history of processes are depicted as "three waves" of process evolution.

Table 1: The three waves of process evolution. (Lusk, Paley & Spanyi, 2005)

Phase	Time	Focus	Business	Technology	Tools/Enablers
Industrial Age	1750 – 1950s	- Specialisation of labour - Task productivity - Cost reduction	- Functional hierarchies - Command and control - Assembly line	- Mechanisation - Standardisation - Record keeping	- Scientific management - PCDA improvement cycle - Financial modelling
Information age					
1 st wave - Process improvement	70's – 80's	- Quality management - Continuous flow - Task efficiency	- Multi-Industry enterprises - Line of business organisation - Mergers and Acquisitions	- Computerised automation - Management information Systems - MRP	- TQM - Statistical process control - Process improvement methods
2 nd wave - Process reengineering	1990's	- Process innovation - Best practices - Better, faster, cheaper - Continual transformation	- Flat organisation - End-to-end processes - Value propositions – speed to market, customer intimacy, operational excellence	- Enterprise Architecture - ERP - CRM - Supply Chain Management	- Activity Based Costing - Six Sigma - Buy vs. build - Process redesign/reengineering methods
3 rd wave - Business Process Management	2000+	- Assessment, adaptability and agility 24x7 global business - Continual transformation	- Networked organisation - Hyper competition - Market growth driven - Process effectiveness over resource efficiency - Organisational effectiveness over operational efficiency.	- Enterprise Application Integration - Service Oriented Architectures - Performance Management Software - BPM Systems	- Balanced scorecard - Self service and personalisation - Outsourcing, Co-sourcing, In-sourcing - BPM Methods

Process modelling has come a long way and at present the future of process modelling will be influenced by the newest trends in three key areas that have influenced process over the past decades: namely the world of management theories, quality and operational control, and IT.

Figure 3 presents some of the more recent technologies and management theories that are influencing process modelling today.

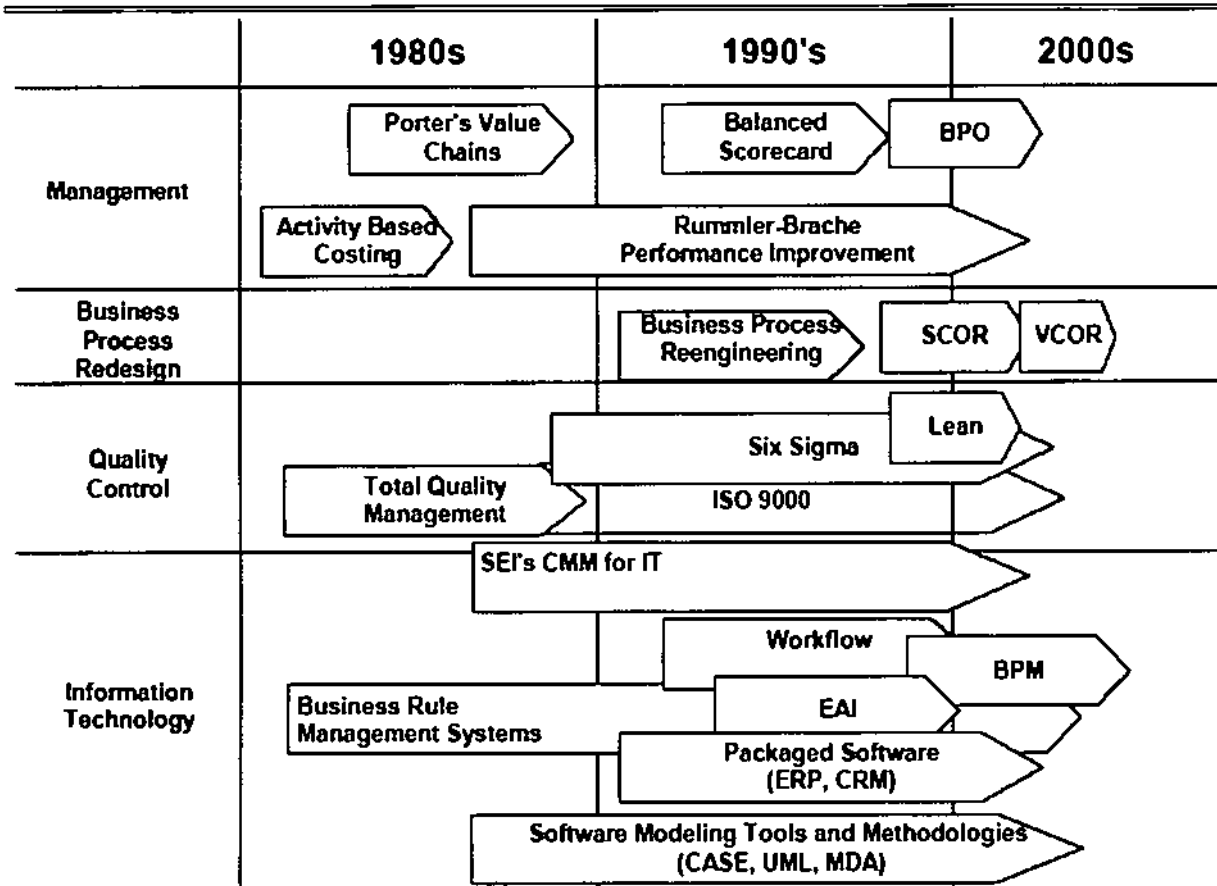


Figure 3: Technologies in use today (Harmon, 2005)

2.3.2. Definitions

2.3.2.1. Business Process

Most of the definitions of a "business process" include some aspects of the following:

- The notion that there is a set of activities or tasks included in the process;
- The notion that people (and sometimes machines) are involved as resources that actually perform the activities;
- The notion that information is required, is generated or needs to flow;
- The notion that the activities themselves are in a sequence;
- The notion that the sequence of activities can differ depending on business rules; and
- The notion that the activities must adhere to a form of governance.

The majority of definitions only centre on the core aspects of a process: the fact that tasks have to be executed in a sequence by a responsible person. When information, governance and mechanisms other than people are added, the definition becomes rather that of a process model.

Soliman (1998: 810) states: *"Accordingly a business process can be seen as a series of steps (activities) in an overall opportunity to delivery (OtoD) chain"*. Here it is interesting to note that the definition implies that there must be some type of trigger (the opportunity) and then a corresponding result (the delivery of the product or service). The steps in between are then regarded as the process activities.

Fingar and Smith (2003: 47) base their definition on that of Tom Davenport as: *"Simply a structured, measured set of activities designed to produce a specified output for a particular customer or market. It implies a strong emphasis upon how work is done within an enterprise, in contrast to a product focus's emphasis on what. A process is thus a specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs: a structure for action."* This definition repeats the requirement of known inputs and outputs and also stresses that the reason for the existence of business processes are to create outputs for a particular customer or market.

An important definition of business process is that developed by the "Object Management Group" (2003: 22). This organisation included the following definition in the request for proposal for the development of a new modelling notation and application development language:

"A business process consists of one or more related activities that together respond to a business requirement for action. A process defines the results to be achieved, the context of the activities, the relationships between the activities, and the interactions with other processes and resources. Activities are units of work that typically commit when completed, i.e., they are recoverable at the point of completion."

Van der Aalst, Medeiros and Weijters (2006) mention up to five different forms in which process models may present themselves:

- Reference models;
- Workflow models;
- Business process or simulation models;
- Interface or service descriptions; and
- Process models discovered using process mining techniques.

Hammer (2002: 27) defines a business process as *"an organised group of related activities that work together to create a result of value to customers"*. He places emphasis on the fact that a process must include activities that are both organised and executed together with the purpose of the organisation being the delivery of value to customers.

A set of sequential tasks performed by a process team, led by a process owner, that transforms inputs from suppliers into useful outputs for customers

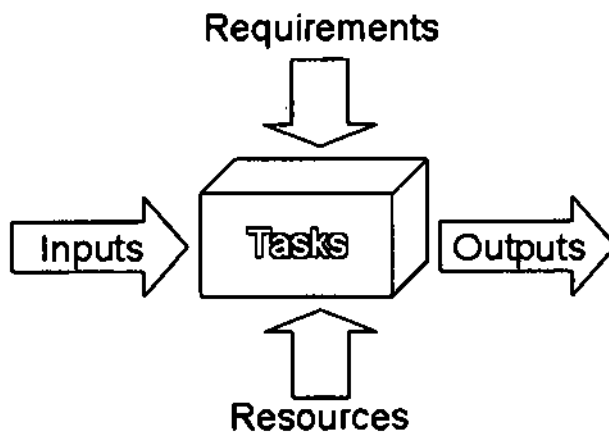


Figure 4: What is a business process? (Garretson, 2005)

Figure 4 above shows a simple depiction of what most sources see as a business process. Inputs arrive from a supplier, they are transformed inside the process to the specification of a set of requirements, using available resources; and then the process generates an output for customers.

The list of potential attributes of a process is diverse, as can be seen from all the definitions above. In some cases the concepts associated with a business process are, according to the author, overlapping in their meaning. It is possible that the "outcome" in one definition, is the same as the "output", and similar to the "creating value for a customer" in another definition. The large number of notations and process modelling methodologies is a result of the incongruence in the definition of a business process.

2.3.2.2. Process Modelling

Business process modelling is frequently referred to simply as "process mapping". According to Biazzo (2002: 42): *"Process mapping consists of constructing a model that shows the relationships between the activities, people, data, and objects involved in the production of a specified output"*.

Soliman (1998: 811) defines process modelling by stating the steps it involves:

- 1) Identification of products and services and their related processes with the starting and finishing points of processes being identified in this step;
- 2) Data gathering and preparation; and
- 3) Transforming the data into visual representation in order to identify bottlenecks, wasted activities, delays, and duplication of efforts.

These two definitions of business process modelling show that modelling is much more than simply putting information onto a picture. Process modelling requires analysis of the information to be modelled. Every concept encountered during mapping must be classified as one of the basic objects that are allowed in the modelling method. Process modelling requires relationships between objects that can be showed as flows or as other types of relationships, but the important notion is that every concept added to a process model must have some relationship to another. When modelling according to rules, the process modeller sometimes has to ask questions in order to satisfy the rules of modelling, but in doing so new knowledge can be discovered. The structure of a process model and the classification required to correctly depict it, is a large part of the analysis required to optimise processes.

The relatively simple action of process modelling is immensely valuable to create understanding of business processes. People actively involved with modelling understand the business much better after completion of a process modelling project.

2.3.2.3. Process Management

Hammer (2002: 26) defines "process management" as *"a structured approach to performance improvement that centres on the disciplined design and careful execution of a company's end-to-end business processes"*.

2.3.2.4. Modelling Technique

Biazzo (2002) explains that a modelling technique comprises of syntax, rules and semantics. Syntax is the set of symbols that can be used in a model. Rules refer to the way in which we can combine the symbols and semantics relates to the meaning that is attributed to every symbol (and the combination of symbols).

A modelling technique is often referred to as a "modelling language".

2.3.2.5. Workflow

A concept frequently mentioned in any discussion of the automation of business processes is that of "workflow". Kiepuszewski (2003) describes workflow as the automation of a business process during which the necessary documents, information or tasks are passed from one participant to another according to a set of predefined rules. Thus, workflow relates to a type of technology that automates business process in part or in total.

2.3.2.6. Methodology

Harmon (2006) defines a business process methodology as a formal description of a procedure that can be followed to redesign a business process. This procedure is sometimes referred to as a "framework".

2.3.3. The Essential Components of a Business Process Model

In an integrated process model, many processes are modelled together. This allows processes to be documented end-to-end. The difference then between a simple depiction of a single process on a piece of paper and an integrated process model containing several processes with re-usable associative objects is that a process model can be used to analyse the information, whereas a single piece of paper (or even a book full of them) can only document the process. In order for the process to be analysed, a process model is required.

In an integrated process model, most of the components besides the activities also become objects that need to be managed. These objects will include people (organisations), inputs/outputs, events/outcomes and data. Some interesting objects that we have not explicitly seen in the definitions of a business process above are documents, goals, business rules and principles.

A business process model needs to coordinate the different activities that create value for a client. Some of the characteristics of a process that the process model needs to contend with are (Smith & Fingar, 2003):

- Processes are typically large and complex;
- Processes are dynamic and will respond to changes in markets and client needs;
- Processes flow across organisational boundaries within a company, processes may even flow across the boundary of the company to suppliers and/or clients;
- Some processes are performed in less than an hour, others may require several years;
- Some processes are automated, whereas others are not;
- Processes may support information for both organisations and systems.

Where process models document IT processes "*process models may therefore comprise network models, object models, control flows, message flows, business rules, metrics, exceptions, transformations and assignments.*" (Smith & Fingar, 2003: 47-48)

The fundamental characteristics of a process are often those that are not obvious. The most important thing to know about a process is not necessarily how to handle 97% of the triggers, but how to handle those 3% of cases that are outside the norm. What a process model needs to encapsulate is the business rules, what to do in an exception, where the feedback loops are, and how the processes in the model are coordinated.

Process models that need to address all the characteristics of processes tend to be very complex. A business process model has two drivers of complexity (Rosemann, 2006a), one relates to the complexity of modelling and the other to the process itself. Modelling complexity refers to the rules that are applied to the modelling environment and includes methodology, tool and modelling guidelines. Process complexity refers to the complexity of the process itself. When aiming for lower levels of complexity in models, process modellers need to choose whether to simplify the modelling or whether to omit some of the process complexity.

As the process model is only a model and not the process itself, it can be argued that some levels of complexity of the real process can be omitted, but the approach chosen to minimising complexity obviously depends on the purpose of the model. Detail irrelevant to the purpose of the model can be omitted without any loss in value.

In the following sections, the essential components of a business process model are discussed. The essential components include a meta model, or a model of the model itself; the notion that processes are typically classified in process levels; that different views are available in such models; and that a notation is required to visually view process information. The importance of a well structured process model lies in the fact that it *"must be able to provide a bridge between IT capabilities and business requirements"* (Rosemann, 2006a: 250)

2.3.3.1. Meta Model

Choi, Kim and Kim (2005: 184) describes a meta model as *"the model of the model"*. This model defines the essential elements that can be used in a model, the syntax used to refer to the elements, and the way in which they relate to one another. A meta model is conceptual, and is not dependent on the technology used to map processes, and as such it is the meta model that can be used to map the different elements of different methodologies onto one another.

In a meta model, three aspects are important; the object types that will be used in the model; the attributes of those object types; and the relationships that exist between these objects. As such, a meta model can be represented in a similar form as an entity relationship diagram. Figure 5 shows object types, the attributes describing every object type and the associations that exist between them.

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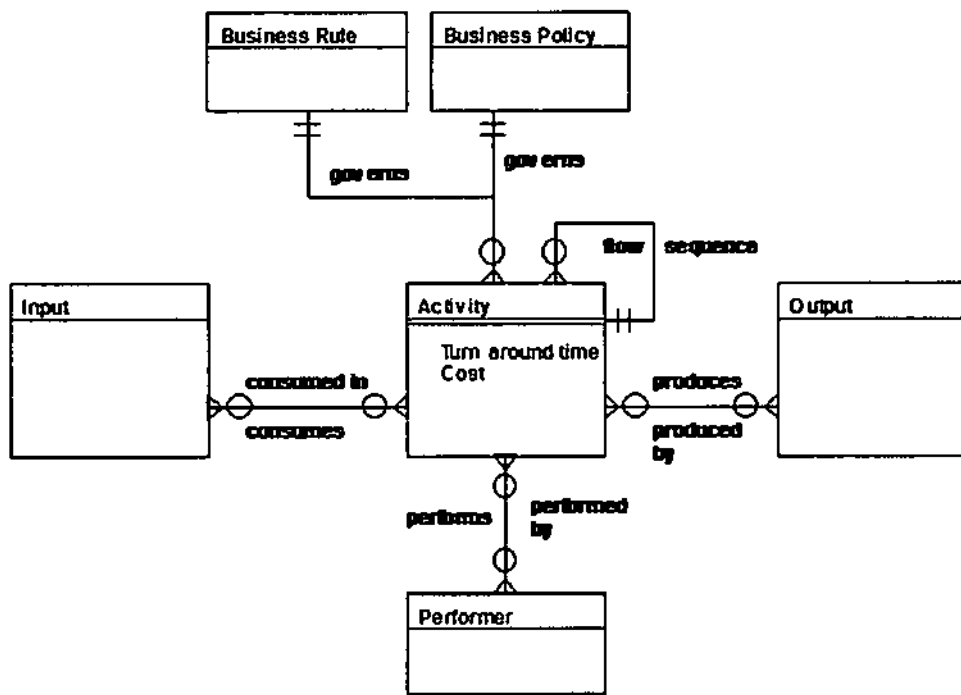


Figure 6 : Meta model for simple process model (Khadye, 2006)

The meta in Figure 6 is the author's interpretation of the definition of a process model as described by Khadye (2006). According to his definition, a series of activities performed by a single performer or a group of performers that produces outputs by consuming inputs is a business process. The process model should include activity flow (with interdependencies and inter relationships), information flow (the inputs and outputs) and business rules that determine the flow of the business process. The model should indicate the performer (either a person, a group of persons or a system) as well as the activity turnaround time and activity cost.

The different parts of the meta model in Figure 6 have specific purposes: the activity flow, information flow, business rules and performers are necessary if the process will be used as input to a workflow engine. For simulation purposes the activity turn around time and cost is useful.

Please note that the information flow in the meta model is not captured per se, but rather derived from the interaction between inputs and outputs between activities. In this model only one relationship is defined between activities. Interdependencies and inter-relationships between processes may require more associations to represent them than simply a sequence relationship.

A key part of meta model is rules regarding the naming convention of objects. An example is the naming of a process or activity, which according to Burlton (2005), should be described as a verb-noun statement where the "object of transformation is described by the noun".

2.3.3.2. Classification of Processes (Taxonomy)

A taxonomy is a way of classifying things (Wikipedia, 2006c). In processes, these taxonomies are sometimes referred to as reference models. A reference model or taxonomy is a framework into which everything can fit into a single place only. A good example of a taxonomy or a reference model is that of Carolus Linnaeus who took the living world and divided it into three kingdoms, he then divided the kingdoms into classes and the classes into orders, orders into genera and a genera into species (Wikipedia, 2006b). In a similar fashion, a process reference model is used to find a single place for an activity. A taxonomy is always hierarchical in its nature, with the higher levels more conceptual and the lowest level of the taxonomy represented by items that can be physically manifested.

In value stream mapping (VSM), processes are categorised as either value adding, non-value adding, or necessary but non-value adding (Hines & Rich, 1997).

Hay (2003) refers to higher levels of process as functions, but at lower levels it becomes specific processes rather than functions, and the lower levels of process imply a sequence. Hay mentions four ways in which a function stating "what" can be broken down into lower levels of process:

- Decomposition, where large functions are broken into smaller ones;
- Sequence, where the steps required to perform a function defines smaller decompositions;
- Organisation where the function is broken down by who performs a part of the function; or
- A function can be broken down by type.

A decomposition hierarchy (usually with an unhealthy dose of organisational influence) is the main method for determining different levels in a process model. Every level of breakdown should include between five and nine functions (Hay, 2003).

In process modelling toolsets, the levels of processes can be depicted in process hierarchies. Up to 5 levels of abstraction are common practice.

The levels of processes correspond to the type of view used to depict that level of process. At higher levels in a process hierarchy, the processes are unconstrained, meaning that the description of the process only includes "what" is being done. High level processes are ideally suited for a hierarchical view (functional perspective). Intermediate levels of processes are well suited to behaviour views since only the "what" and "when" aspects are known. At lower levels, more detail is associated to the processes and the model is then constrained by who, how, how much, where and when. "Who" relates to the organisations involved; "how" to the systems and governance guidelines; "how much" to the volumes associated to either the events that trigger the process or

to the process volumes documented on the process; "where" relates to locations; and "when" to time. This level of processes is typically depicted as organisational swim lane diagrams.

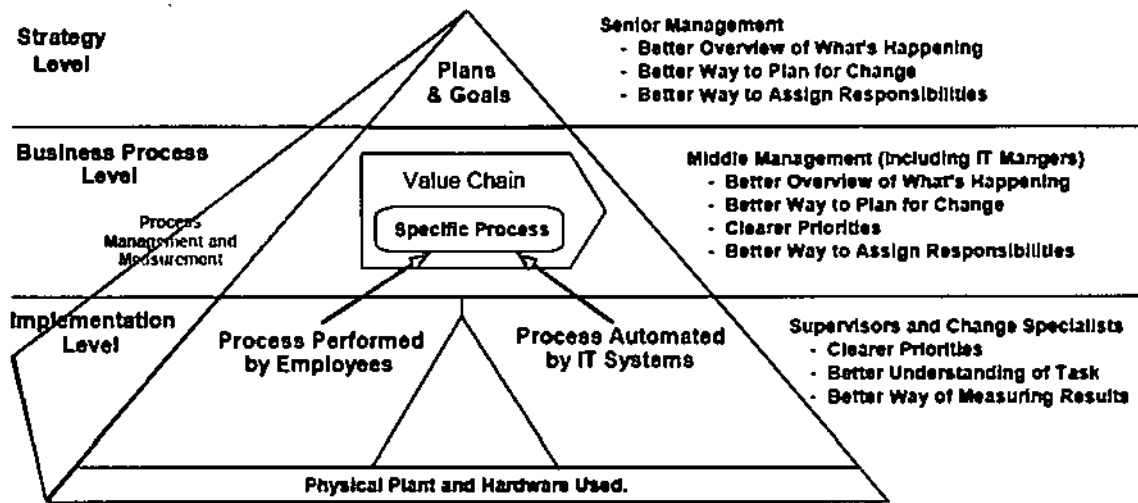


Figure 7: The BPTrends Pyramid (Harmon, 2005)

Whatever the different "levels" in a process model are called, most of them can be represented as a pyramid, similar to that of Harmon depicted in Figure 7 above.

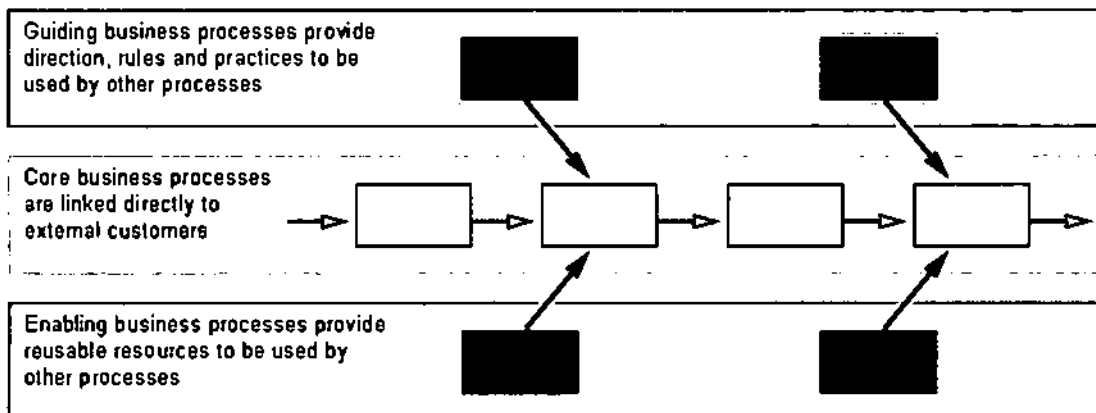


Figure 8: Every Process Must Contribute to Core Value Creation (Burlton, 2005)

In Figure 8 above, one of the classifications of processes can be seen. Here Burlton (2005) distinguishes between core, guiding and enabling processes. In value chains, a distinction is typically made between "primary" (or "core") and "support" processes.

2.3.3.3. Views

According to Biazzo (2002), there are four common perspectives to a process model:

- A functional perspective. This represents aspects "what" processes are included in the scope of the model.
- Behavioural perspective. This perspective relates to "how" and "when" the elements as defined in the functional perspective interact with one another.
- Organisational perspective. This view shows "who" is involved in activities and "where".
- Informational perspective. This view includes the information entities involved in a process.

In the ARIS framework (Architecture of Integrated Information System) the following views are mentioned (Ferdian, 2001): A *data view* that contains events and statuses; A *function view* that contains the description of activities being performed and the relationships between them; An *organisation view* showing the relationship between users, organisational units and processes; and a *resource view* depicting the information technology involved in processes.

The different perspectives or views in a process model are typically represented using different types of diagrams. The functional perspective can be shown as a hierarchy, where different levels of processes are used to define the "what" into more and more detail. Hay (2003) describes a "function hierarchy" as a hierarchy that starts at the top with the company's mission, which is then broken down into six to eight primary functions that can be further broken down into component functions and processes.

The behavioural perspectives that combines the "how" and "when" views are typically shown as unconstrained process flow diagrams. Only the processes and their sequence are showed. The aim of this view is to understand the behaviour of the system and not to define the mechanisms involved in it.

Organisational perspective is shown in views where the process flow is constrained by organisations and systems involved in the process flow. Some modelling tools support a type of diagram where the organisations are showed as swim lanes, either vertical or horizontal (Khadye, 2006).

The organisational view is closely linked to what Biazzo (2002: 46) refers to as a process map: *"The map must clearly show what a system does, what controls it, what it acts on, what means it uses to perform its functions and, what it produces"*.

The last view is that of the information entities that are involved in a process. The relationship between processes and the information it acts on can be shown in more than one format. Data flow diagrams (Hay, 2003) have processes as boxes and the data flows between processes as lines. This type of diagram is also

used to show data stores. An alternative view is that of a process to information entity matrix showing what activities create, retrieve, update or delete information entities.

In Figure 9 the author presents an example of each of the four primary views found in process models.

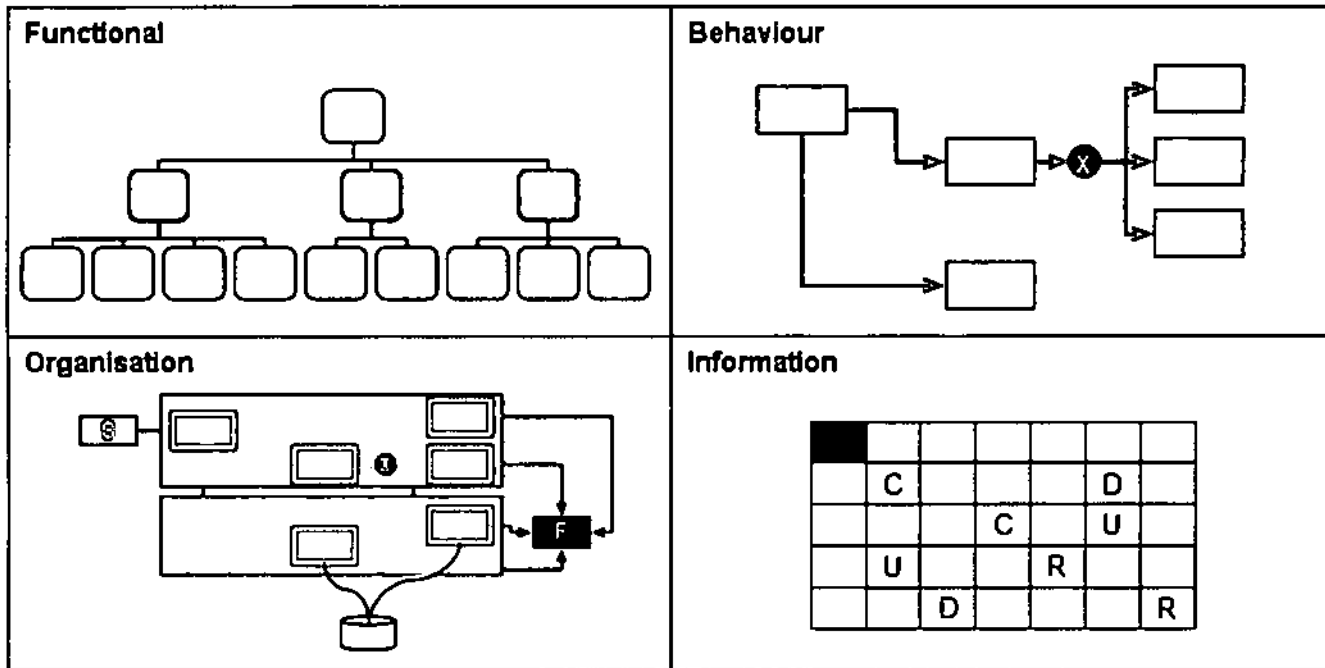


Figure 9: Four basic views of a process model (compiled by the author)

2.3.3.4. Notation

A notation is a special set of symbols or characters that is used to represent something. The letters of the (Roman) alphabet and musical notes are examples of notations we are all familiar with. In process modelling several notations are in use. These all depict more or less the same basic essential components of a process model, but use different symbols for it. The ideal would be a single, simple notation that is common to all purposes, but sadly this is not the case as different notations have been developed for different uses over time. A single standard is yet to emerge.

According to Biazzo (2002), there are two parts to any model mapping technique (or notation), the first of which is the syntax used in the methodology. This relates to the types of symbols that can be used and the rules that govern the use of every symbol. In the second place there is a definition associated to every symbol. This is known as the semantics of the model mapping technique.

The more complex the meta model of a modelling methodology, the more intricate the notation required to depict it. Process modelling notations have the following basic constructs that can be used as part of the notation:

- 1.) **Shapes.** Different shapes can be used to depict different object types. Typically the name of the object is included as text inside the shape. In some notations the process shape can contain a combination of textual information. Not only can the name of the process, but also the responsible person/system and a reference number be included. A further addition to a basic shape is to add a graphic to the inside. Thus a round shape can have more than one meaning, depending on the graphic inside of it.
- 2.) **Connectors.** To indicate flows, either in time or of information, lines are typically drawn between shapes. Text may be added to the line. Lines can also have different end-points to depict the exact type of relationship between the shapes it links together.
- 3.) **Rules, flow constructs, connecting elements.** Lines can be joined or split to indicate a business rule or a form of flow logic. In many methodologies a small shape used as part of the line indicates the logic that applies at the point of joining or split.
- 4.) **Diagram areas.** Large shapes used as backdrop to other shapes and lines. An example of such a diagram area is a swim lane.

Another aspect of a notation is the conventions regarding the relative placement of shapes, lines and connecting elements to one another. The "rules" of the notation may state that one object type represented by a particular shape will always be diagrammed along the bottom of the diagram, and that swim lanes will always be horizontal. Diagramming convention includes the number of shapes that may be placed on a diagram, the way to show lines that cross one another and the method used to annotate the diagram with additional information.

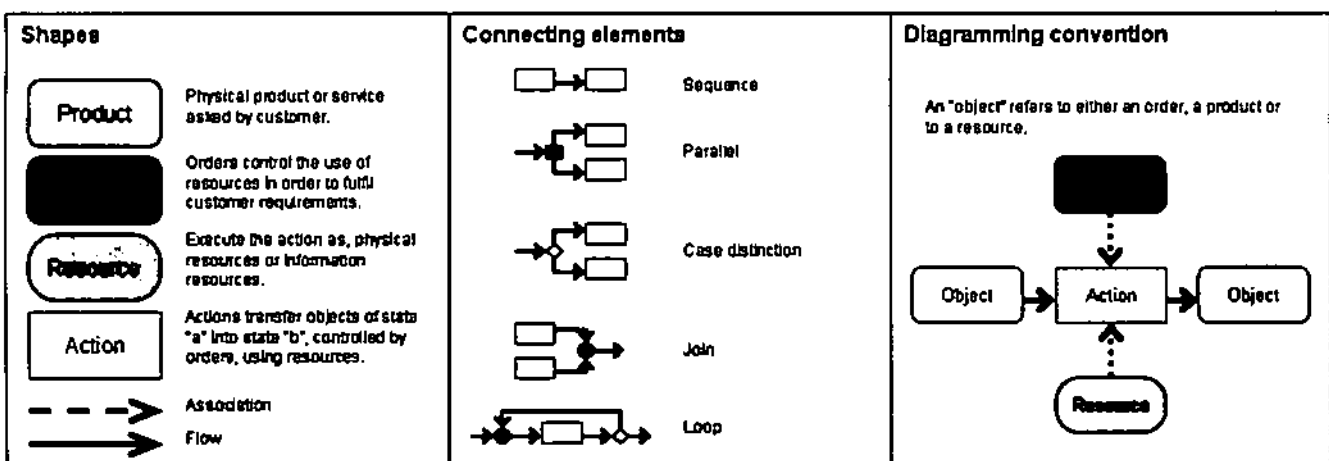


Figure 10: Integrated enterprise modelling (Jochem, 2002: 327)

In Figure 10 above the notation for "enterprise modelling" is shown (Jochem, 2002: 327). Enterprise modelling can be used as a technique to analyse business processes, or in support of business process reengineering (BPR). This notation is very simple and a minimum number of object types, connecting lines and connecting elements are involved.

In contrast to the simple notation used in enterprise modelling, BPMN (business process modelling notation) (White, 2004) uses far more symbols and rules. The basic elements of the BPMN notation are flow objects, connecting objects, swim lanes and artefacts.

Flow objects include an event which can either be used as a cause (trigger) or an impact (result) and can be flow, intermediate or end events. Activities which are the actual work that is performed and gateways which are decision points are the remaining two types of flow objects.

Connecting objects include sequence flows, message flows and associations. A sequence flow depicts the order in which activities will be performed in a process. Sequence flows cannot cross pools or lanes, whilst message flows are used to connect activities in different pools or lanes. A Message Flow is used to show the flow of messages between two separate process participants (business entities or business roles) that send and receive them. An association does not show a flow direction but is used to associate data, text, and other artefacts with flow objects.

Two types of swim lanes are defined. A Pool represents a participant in a process. A Lane is a sub-partition within a pool and will extend the entire length of the pool.

Artefacts include data objects, groupings and annotations. Data objects are used to show data required or produced by an activity. A grouping can be used for documentation or analysis purposes, but does not affect the sequence flow and annotations are a mechanism for a modeller to provide additional text information.

In Figure 11 and Figure 12 it can be seen that the BPMN notation uses a rich set of symbols, but applies them in a clean simple manner.

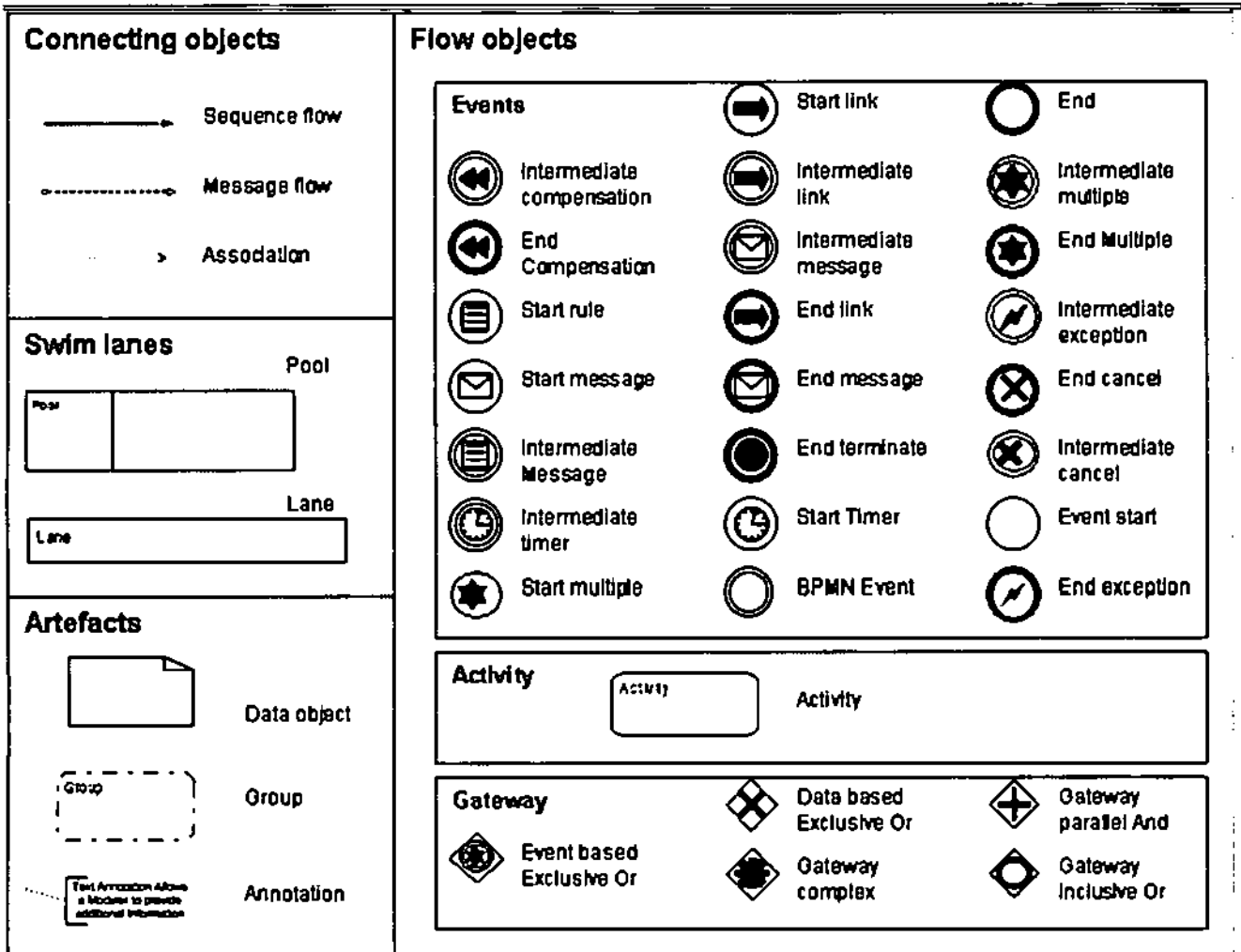


Figure 11: BPMN Notation (Casewise, 2006)

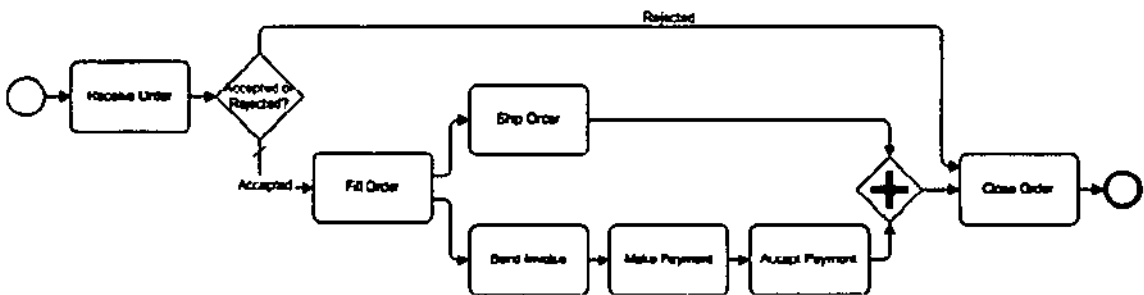


Figure 12: Normal BPMN Flow (White, 2005)

2.3.4. Types of Models

2.3.4.1. UML Activity Diagram

The UML set of standards was developed as a "unified modelling language" (UML). A UML activity diagram is a combination of data flow diagrams and process flow charts (Hay, 2003). The UML notation is a rich set of diagrams that is aimed at data modelling, but includes the activity diagram, which is primarily concerned with activities and actions. An action is the lowest level of breakdown; "atomic" in the sense that no partial completion of an action is possible. An activity can be broken down into more than one action.

According to Ambler (2006) UML activity diagrams are in many ways the object-oriented equivalent of flow charts and data-flow diagrams (DFDs). An activity diagram can be used to depict complex business rules, business processes, software processes or a single use case.

The following guidelines for the creation of a UML activity diagram were derived from the guidelines provided by Hay (2003) and Ambler (2006).

Five different shapes are used in UML activity diagrams: activities, organisations, starting points, ending points and information objects. Activities are represented by a rounded rectangle. Organisations (also referred to as "actors") are represented as vertical swim lanes. A starting point is shown as a solid circle and an end point as a bounded circle. Information objects (also known as "entities") are shown as compound rectangles.

Logical flow operators control the flow of work through a UML activity diagram. Decision points are shown as diamonds indicating that a flow needs to choose between different options. Guards are the textual statements on the lines following a decision point. The statement is encapsulated by square brackets and describes the condition under which the flow should be followed. A flow branch (fork) / join is a thick horizontal line that indicates all flows flowing into or from the line must occur at the same time.

Two types of connectors are used in UML activity diagrams. Data flows are shown as dashed arrows and material flows are shown as fixed arrows.

In Figure 13 included below is an example of an UML activity diagram.

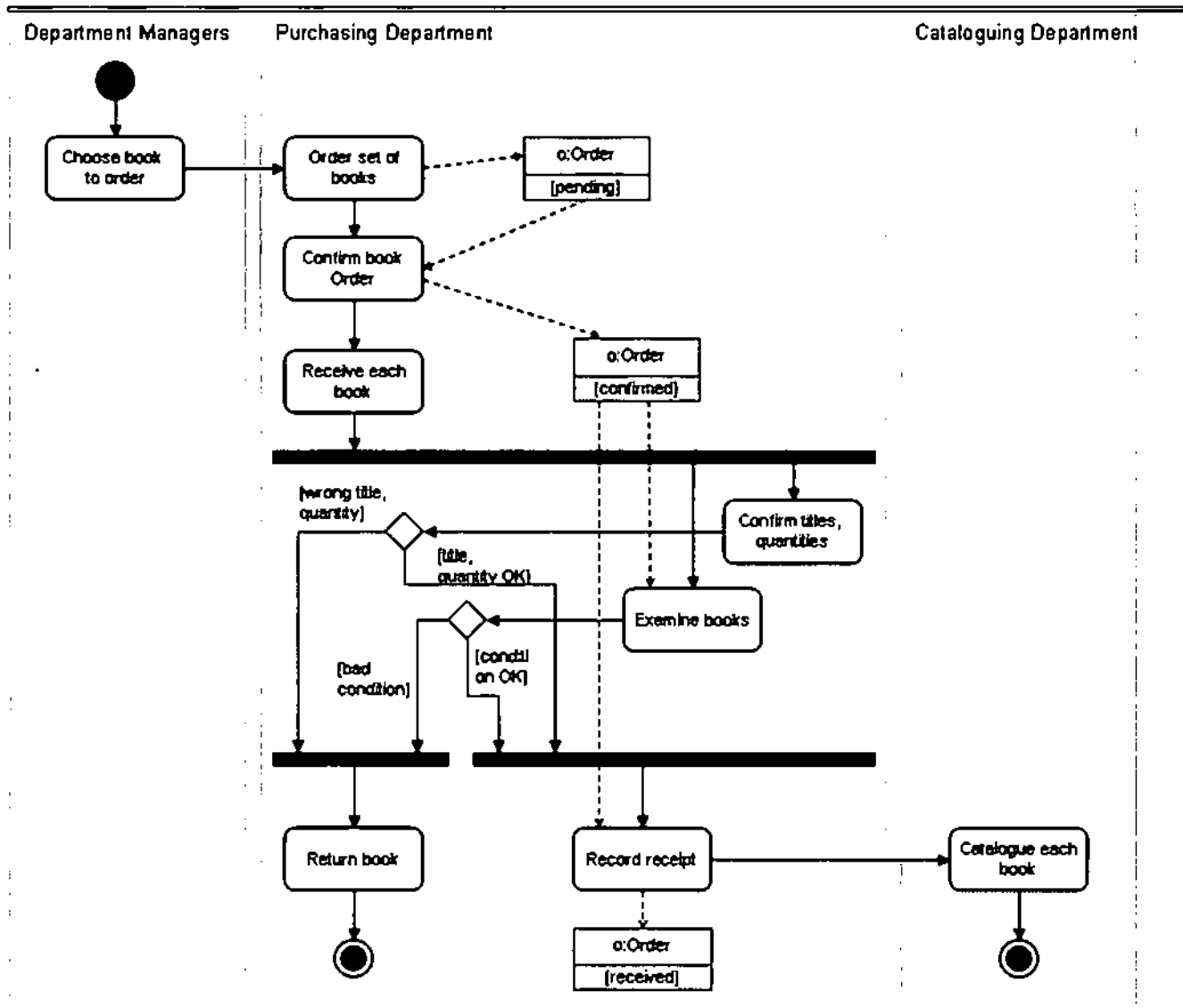


Figure 13: UML Activity Diagram (Hay, 2003)

2.3.4.2. SIPOC

The SIPOC diagramming technique of process modelling is applied in Six Sigma and BPR projects. SIPOC is an acronym: S=Supplier, I=Inputs, P=Process, O=Output and C=Customer (Khadye, 2006).

SIPOC diagrams are widely used for high-level process mapping and fit in with the thought processes to complete a "value stream map". Monroe (2006) describes a methodology (VSAM) to capture information into spreadsheets that correspond to the objects appearing on a SIPOC diagram. This information is used to analyse the value added by a process.

Hammer (2002) views a SIPOC diagram as a necessary starting point for six sigma projects, as this type of approach "provides an analytical framework for identifying the specific actions causing the observed problem".

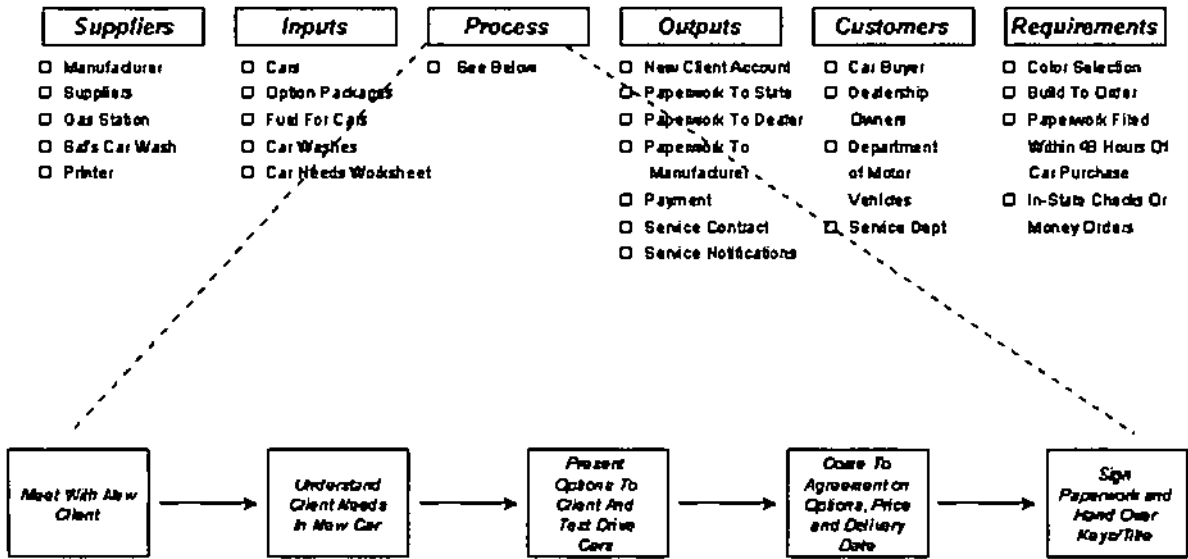
In Table 2 the author presents the types of information gathered to complete a SIPOC diagram. Note that the majority of the information gathered relates to either the process itself or to the organisations who are supplier to or customer of the process. A SIPOC diagram is an example of both behavioural and organisational views. In Figure 14 an example is presented of a SIPOC diagram.

Table 2: Data Associated with SIPOC analysis (Monroe, 2006)

Supplier	Supplier name	
	What is supplied	
	Material (M)	
	Information (I)	
	Service (S)	
	Delivery frequency	
	Transport Mode	
	Annual value	
Inputs	What is supplied	
	Material (M)	
	Information (I)	
	Service (S)	
	To process step #	
Process	Process step #	
	Operation description	
	Movement/storage activities	
	Inspection activities	
	Operation cycle time	
	Setup time	
	Available time	
	Throughput yield	
	Capacity per day	
	Number of operators	
	Move / store time	
	Move distance	
Outputs	What we supply	
	Average daily demand	
	Takt time	
Customer	Customer name	
	What we supply	
	Material (M)	
	Information (I)	
	Service (S)	
	Frequency	
	Transport mode	
	Average daily demand	
	Annual value	

SIPOC Diagram

Fictitious Car Dealer Example



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Figure 14: Example of a SIPOC diagram (Simon, 2006)

2.3.4.3. Event-driven Process Chain (EPC) Diagrams

Event-driven process chain (EPC) diagrams have been developed within the ARIS (Architecture of Integrated Information System) framework (Ferdian, 2001).

Event-driven process chain diagrams are a method used in enterprise resource planning (ERP) systems like SAP to describe typical business processes in organisations (Dehnert & van der Aalst, 2004). (SAP is the name of a well known ERP system.) In most ERP systems a process reference model is available. EPC diagrams (documented in the ARIS toolset) are used to depict reference processes in SAP. As such, the EPC diagram is widely used and accepted in practice.

Any unique processes in an organisation will require a new process in the ERP system. To develop the system functionality, the unique process is mapped against the reference processes in order to be incorporated into the ERP system. An EPC diagram is a type of diagram that allows different role players to discuss and communicate their understanding of a process. An EPC diagram is informal in the sense that it provides a pattern for accepted process executions (Dehnert & van der Aalst, 2004). Executions that will not lead to the desired process outcomes are not defined explicitly; those will be executions that do not fit the pattern as stated.

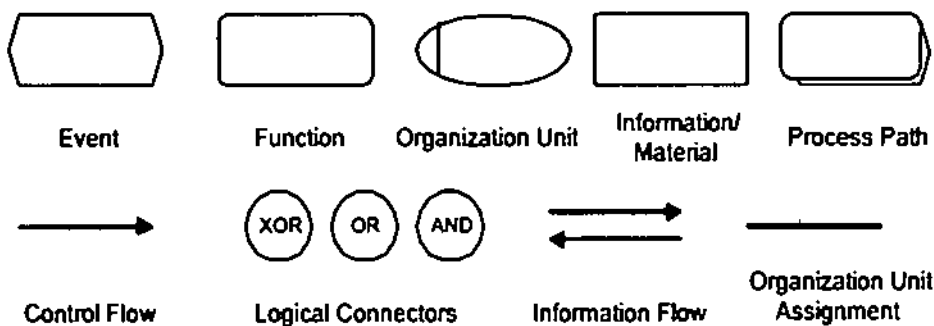


Figure 15: Notation used in Event-driven Process chains (Ferdian, 2001)

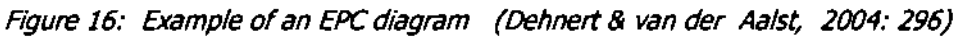
The elements of notation used in an EPC diagram are shown in Figure 15. The description of these elements according to (Ferdian, 2001) are:

- Events are showed as a hexagon. It represents the circumstances which will start a process and the state after a process has been completed.
- Function. Functions in EPC diagrams are the "activities" or "process steps" of other notations. A function describes the transformation from an initial state to a resulting state.
- Organisations are represented as an oval and can be associated to functions.
- Objects. Objects can either represent information, material or resources and are depicted as a rectangle.

- Process Path. This shape (a function rounded rectangle on top of an event hexagon) is used to aid navigation as it represents adjoining EPC diagrams.
- Logical operators.
 - o Branch/Merge. Where only one of a series of possible options are valid (either incoming (merge) or outgoing (branch)) an XOR is used.
 - o Fork/Join. When all the options are valid an AND is used.
 - o OR. In EPC diagrams this relates to one or more valid options.
- Flows/lines. Two types of flows and one association are used:
 - o Control flow. This is indicated by a dashed arrow and depicts the sequence between events and processes.
 - o Information flow. This is represented as an arrow.
 - o Organisation unit assignment. The association between a function and an organisation is depicted as a line with no arrowheads.

Ferdian (2001) also described EPC diagramming rules. A diagram must begin and end with an event and functions must be preceded and succeeded by events. This implies that every second shape in an EPC flow will be an event and every other a function. Process paths are shown prior to the start event and after the end event and represents adjoining EPS diagrams where the current process comes from or need to move on to. logical operators are used to control the flow logic of the process diagram. Logical operators (AND, OR and XOR) can be used in between events and functions as long as the function followed by event pattern is maintained. Events are always passive and can therefore not be the source of an XOR or OR split. All branched operators should be closed by the corresponding logical operator that opened it, thus XOR closed by XOR and OR by OR and AND with AND.

In Figure 16 an example of an EPC diagram is presented that shows the elements of an EPC diagram. Please note how every function is followed by an event.



2.3.4.4. Value Stream Mapping

Value stream maps are aimed at improving processes. They focus on an improvement in the productivity of the process by identifying and eliminating wasteful processes. (Hines & Rich, 1997) A key difference between value stream maps and value chains is that the value stream maps focus only on the activities that add value, and not on support activities.

The three types of processes are distinguished in value stream maps: non-value adding activities (NVA); necessary but non value adding activities (NNVA); and value adding activities (VA).

The use of value stream mapping is more focussed towards productivity improvement in manufacturing organisations, but the concepts of value and non-value adding processes can be applied in service organisations as well.

In manufacturing organisations seven sources of waste can be listed (Hines & Rich, 1997): over production; waiting; transport; inappropriate processing; unnecessary inventory; unnecessary motion; and defects. In service organisations the concept of "waste" is not that applicable, but the notion of a single diagram showing the whole process flow "end-to-end" is very valid in service organisations.

In Figure 17 an example of a value stream map is presented. Note how the example depicts a service industry process and does so end to end.

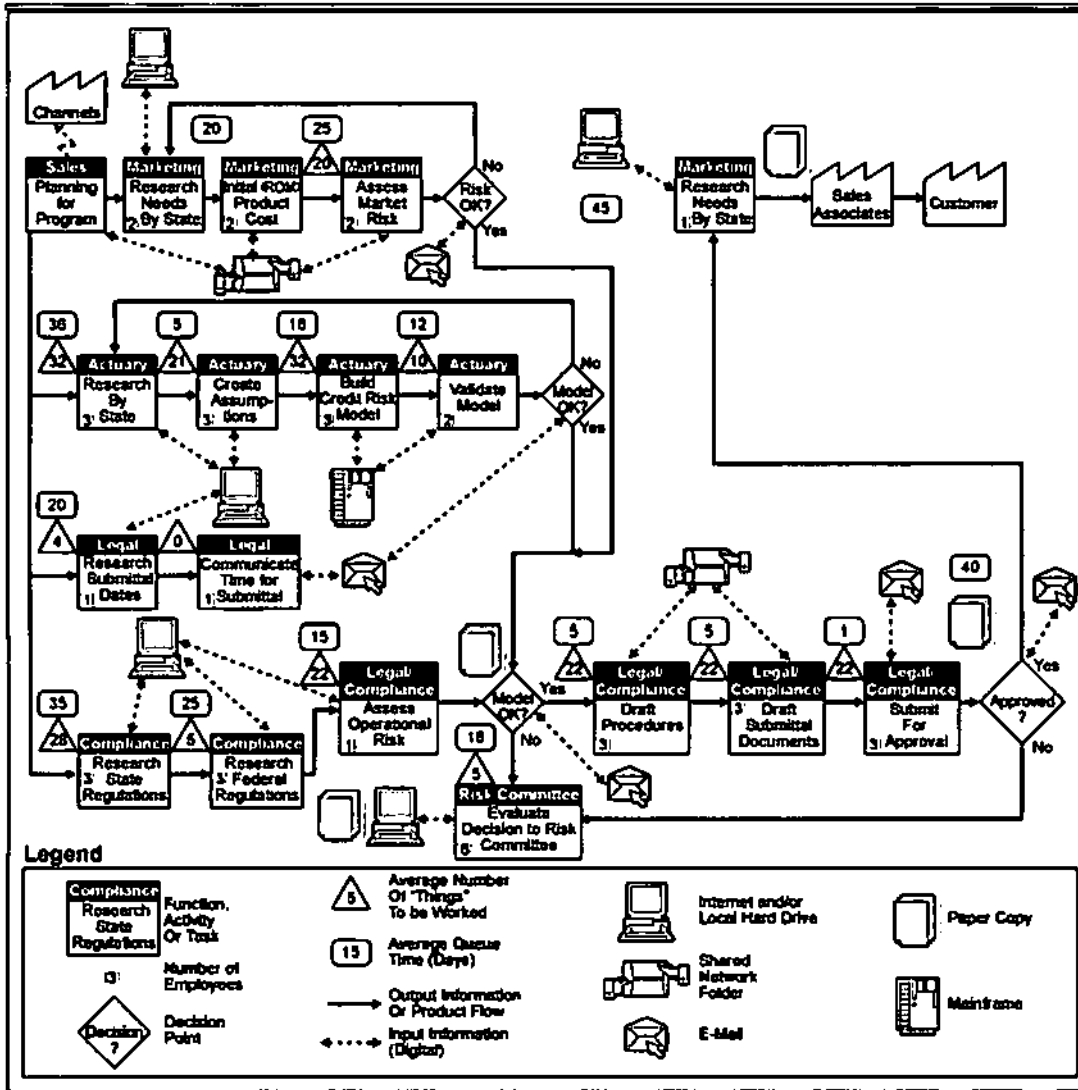


Figure 17: Example of a value stream map (McInerney, 2006)

Value stream mapping is a technique that involves far more than just the analysis of process diagrams. Seven valuable techniques that can be used as part of value stream mapping, according to (Hines & Rich, 1997), are: process activity mapping; supply chain response matrix; production variety funnel; quality filter mapping; demand amplification mapping; decision point analysis; and physical structure volume value.

Most of the tools in value stream mapping involve the calculation of distance, time and inventory between workstations in order to identify sources of waste. To ease the calculation of formulas, value stream maps are often mapped in MS Excel and the formulas and process blocks are all embedded on a worksheet. This type of sheet shows in most instances and "end-to-end" view, a concept that is important to managers in both manufacturing and service industries.

In Figure 18 the value stream map is created in MS Excel. This allows time based calculations to be performed on the process map itself.

IDEF0 is a method that aims to be independent of any modelling software but still ensure that models depicted using this methodology are generic (anything can be described), precise (to make the models useful), conceptual (to ensure functional requirements are specified rather than the technological implementation), and flexible (to ensure the models can be used at several stages of a project).

In an IDEF0 diagram a rectangle is used to show an activity/process. The four sides of the rectangle are used to connect four different types of elements to an activity (see Figure 19):

- All the inputs to the process are connected from the left. Inputs typically relate to data or material that will be transformed by the process.
- All the outputs of the process are depicted on the right. An output is the result of the process being executed; thus it can either be transformed data or material.
- Mechanisms are connected to the bottom of the activity rectangle and represent the physical means by which the process is performed, either human, or any technological resource that can be used in the process (that is not transformed by the process).
- From the top are all the controls that need to be adhered to (or must be present) in order for the activity to be performed.

The inputs, controls, outputs and mechanisms are often called the ICOMs (Hanrahan, 2006).

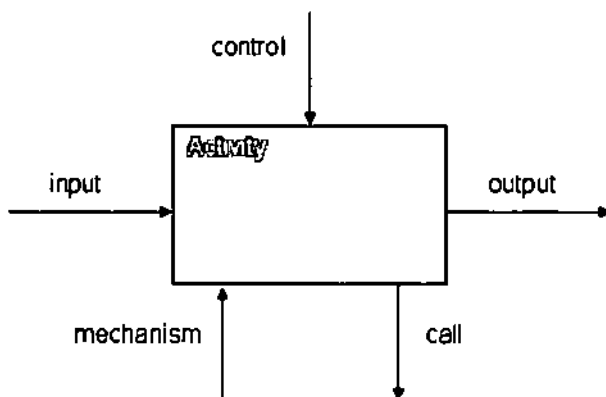


Figure 19: An IDEF0 activity box (Hay, 2003)

Hay (2003) also refers to the use of a "call" as the fifth type of flow to be associated with an activity in an IDEF0 diagram. The IDEF0 standard (NIST, 1993) refers to the "call" as a special instance of a mechanism and is used to refer to an existing diagram in the same model; thus, it is not necessary to decompose the activity box into a new diagram but, rather, an existing diagram is "called".

Level of decomposition is a concept, as in any other modelling technique, that applies to IDEF0. In IDEF0 the first level is called the "Context" diagram and is labelled "A-0" (Hay, 2003). On this diagram the whole scope of the modelling project is depicted as a single box with high-level inputs, outputs, controls and mechanisms being shown for the whole of the project.

The decomposition of this single context activity on "A-0" is then functionally broken down into a lower level diagram "A0" where the context is now shown as between three to six functional boxes. On subsequent decompositions, every one of the functional boxes on the "A-0" diagram will be decomposed into between three and six lower level functions. Please review Figure 20 that shows an "A-0" diagram being broken down into three lower levels of abstraction.

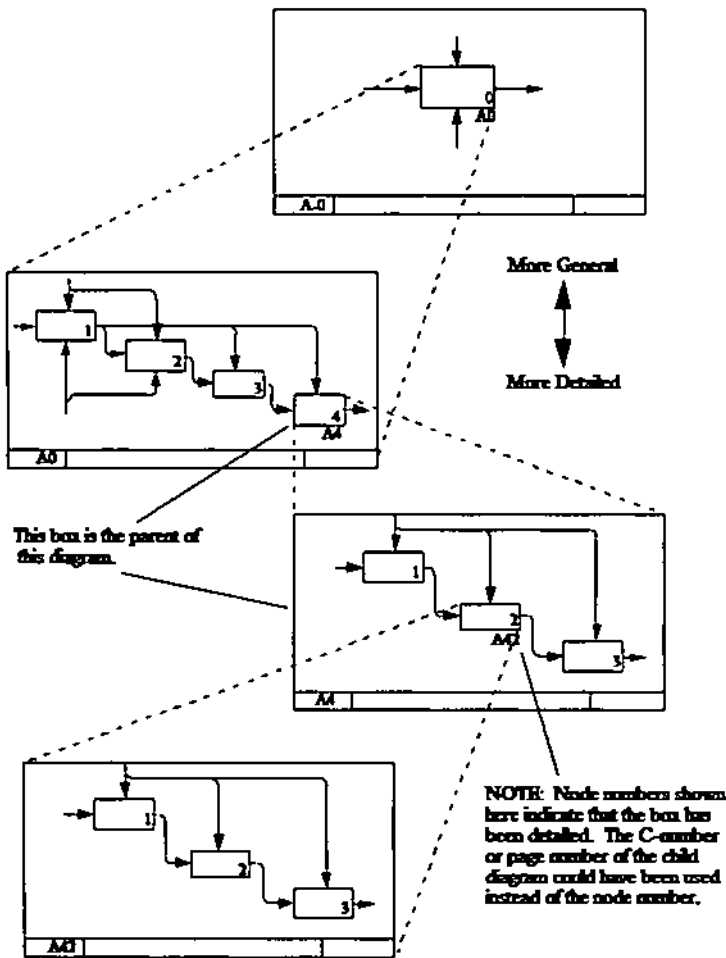


Figure 20: IDEF0 Decomposition structure (NIST, 1993)

IDEF0 has been developed as a methodology that can be used irrespective of any specific supporting modelling tool. As such, a full IDEF0 process model can be developed in a paper-based environment. To cater for the requirements of a potential paper-based environment and to make referencing easier, IDEF0 prescribes a specific numbering convention for activities. This "decomposition" number is also used to give a name to a diagram depicting a particular process.

A few important notes on the activities and connectors used in IDEF0:

Flows on one level of an IDEF0 must be repeated on a lower-level IDEF0 diagram (decomposition). Thus, if an input appeared into the activity "A1" on the "A0" diagram, that same input must also appear on the "A1" diagram and flow as an input into one of the activities "A11", "A12", "A13", "A14", "A15" or "A16".

IDEF0 diagrams contain not only data flows, but also the flow of material and control (Hay, 2003).

It is important to note that the relationship in activities in an IDEF0 diagram does not show sequence but shows constraints. The left to right ordering is based on the output of one diagram serving as a control on another (Hay, 2003) and not that the one activity is necessarily sequenced one before the other.

Every activity box must have at least one input and one output (Hay, 2003) and are named as an active verb noun phrase.

Connectors may only flow horizontally or vertically, must have rounded corners, and should link the frame of the diagram with one (or more) of the activities in the diagram.

Connectors indicating ICOMs may fork or join. This construct can be used when one concept is broken down into two decomposed concepts, or it can be used to indicate that the concept needs to be applied to two different activities within the diagram.

2.3.4.5.2. IDEF3

The IDEF3 method is a descriptive method. Thus its primary aim is not to define the "what" of the process but rather to elaborate on the "how" of the process (Hanrahan, 2006). To achieve the description of the "how", IDEF3 has two sets of diagrams: one is process centric, giving more detail on the sequence of the processes, and the other is data centric, giving a closer view of the changes that a data element undergoes and the processes that transform it from one state to another.

The process and data centric diagrams of IDEF3 uses different notational standards as can be seen from Figure 21.

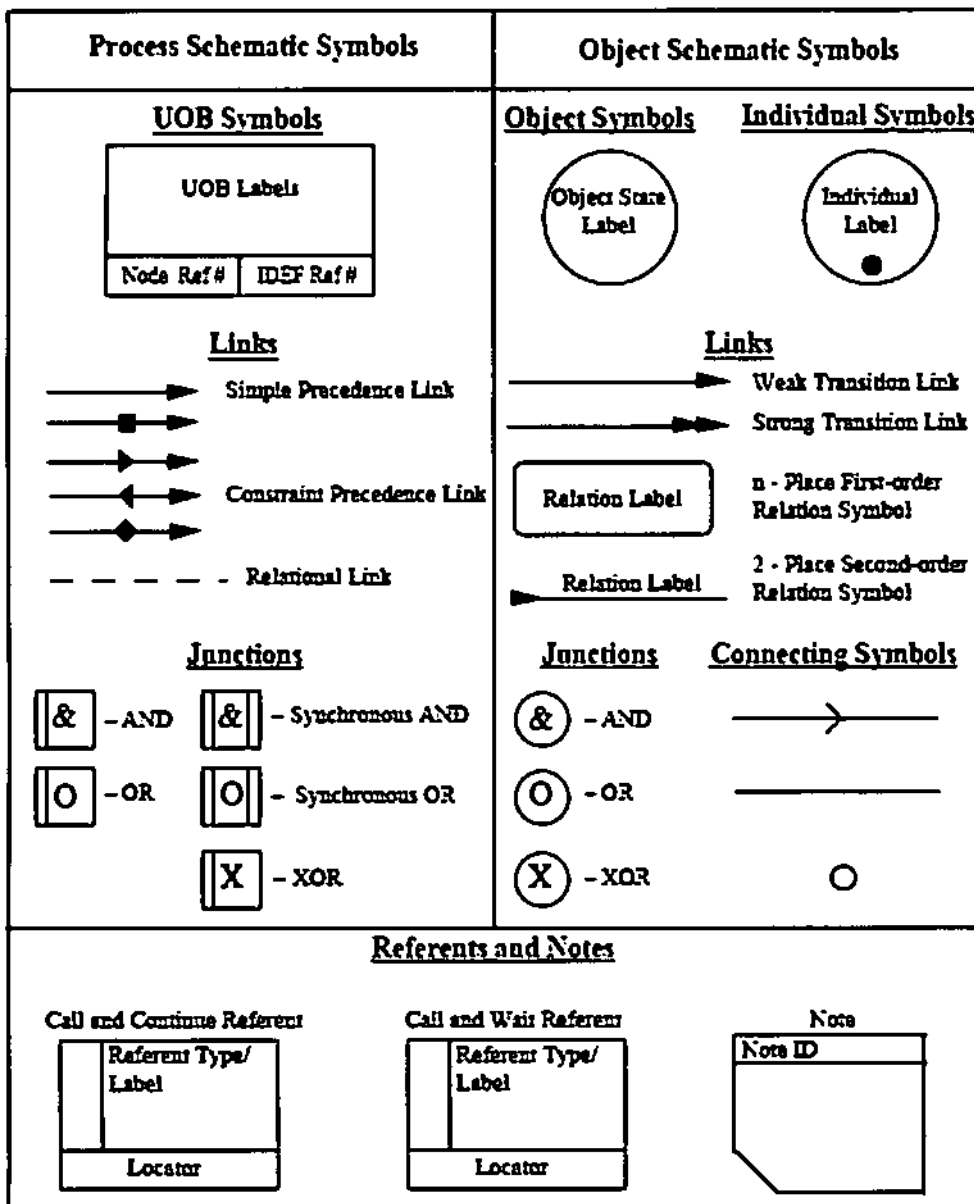


Figure 21: Symbols used for IDEF3 diagrams (Mayer, Menzel et al, 1995)

In (Mayer, Menzel *et al*, 1995) the authors define and explain the difference between a model and a description. IDEF3 is intended to be a method used to generate descriptions and not models. A model is a generalised example of an idealised state. Thus an IDEF3 model can be prescriptive in its depiction of way things can or should be done. A description, on the other hand, is a document that states how a person with a particular viewpoint experiences the organisation or system that performs a process. In this description it may be possible that some aspects are totally ignored as they do not seem relevant to the person who provided the description. A description thus provides detail on how a system is performing, but cannot in all circumstances, be used to define what a system should be doing.

In IDEF3 process schematics, the activities are represented by boxes. The term activity is used by the author as an approximation since the IDEF3 methodology refers to these as "Units of behaviour" or a UOB. (Mayer, Menzel *et al*, 1995). This unit of behaviour has a naming convention similar to that of a process, an activity or a function (depending on the method one might be referring to) in that it must have a verb to indicate what is happening and a noun to indicate the object which is involved (or is being transformed). The UOB is numbered with a decomposition number very similar to what is used in IDEF0. This numbering convention is used to relate different levels of the process description to one another and to cross reference.

The arrows in the process schematic indicate the sequence of the "units of behaviour", and "junctions" are used to indicate the logic when the sequence flow splits into parallel options. Figure 22 depicts a simple IDEF3 diagrams based on the process centric notation.

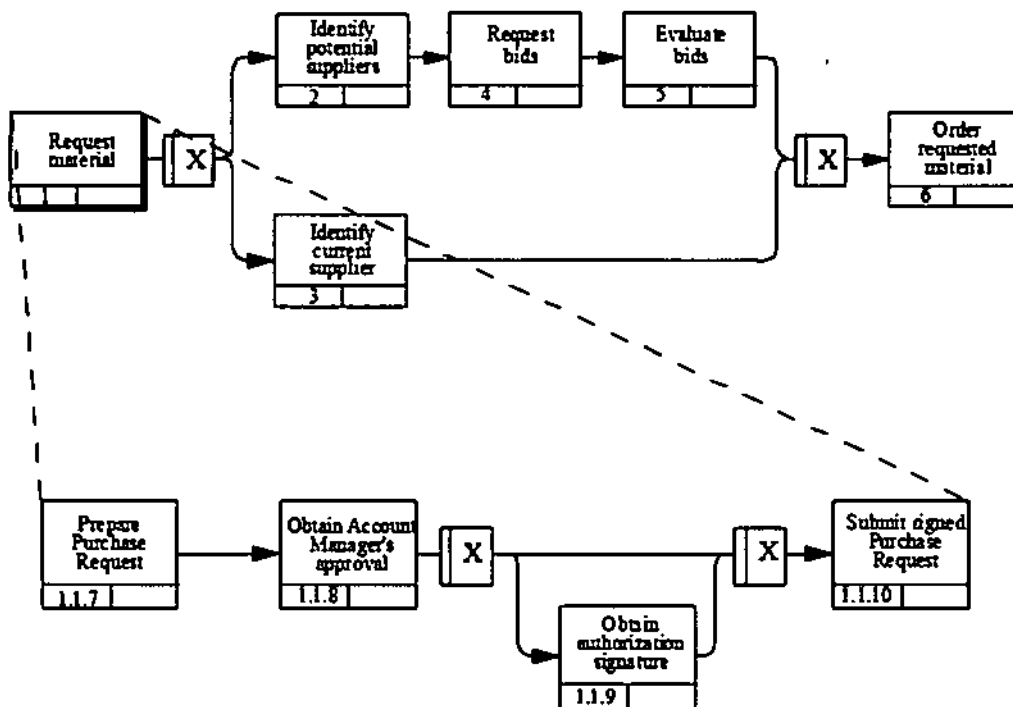


Figure 22: IDEF3 Process Schematic (Mayer, Menzel *et al*, 1995)

In the data centric schematics of IDEF3, the possible states of data are shown as circles (refer to Figure 23). Every arc (arrow) from one circle is a transition from one state to another (Mayer, Menzel *et al*, 1995). UOBs can be attached to these state transitions to indicate the activity that will transform a data object from one state to another. XOR, OR and AND logic also applies to the transitions of data.

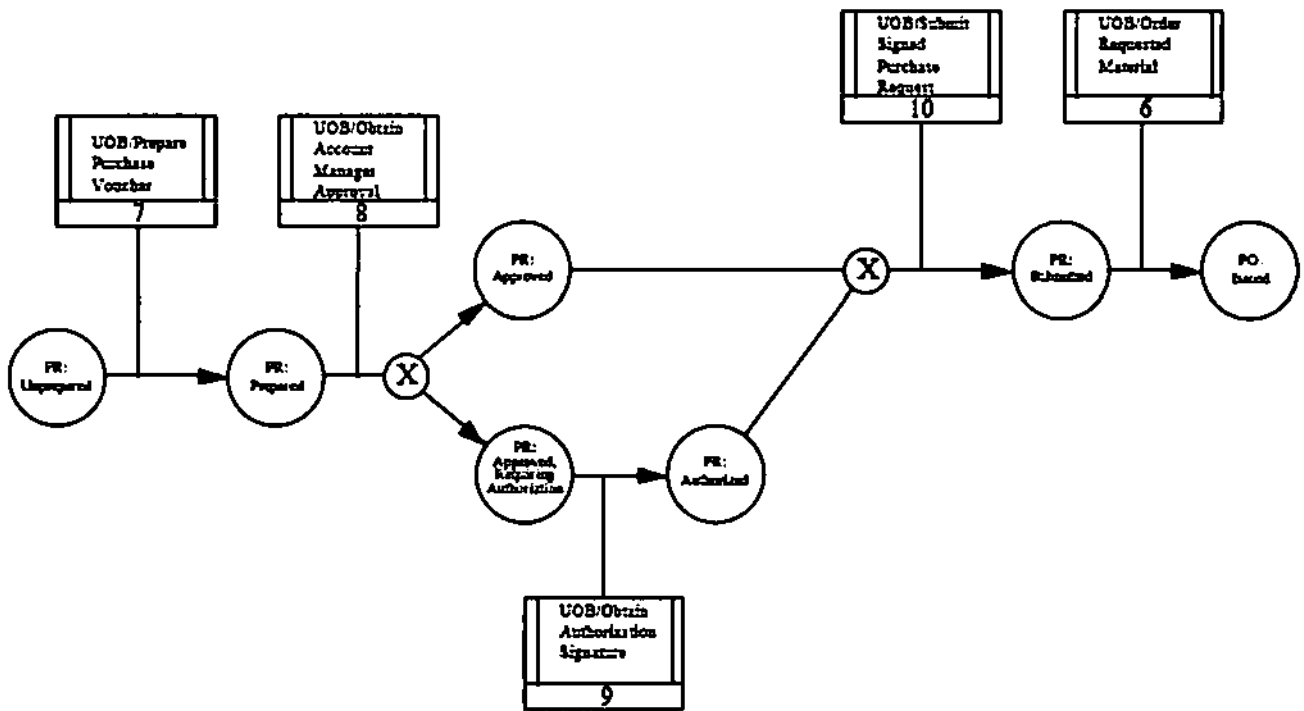


Figure 23: IDEF3 Data Transition Schematic (Mayer, Menzel *et al*, 1995)

2.3.4.6. Flowcharts

The flow charting technique is the most basic of process descriptions. It simply states a sequence of activities from start to end along with their relationships (Khadye, 2006). Figure 24 depicts a very simple flow chart.

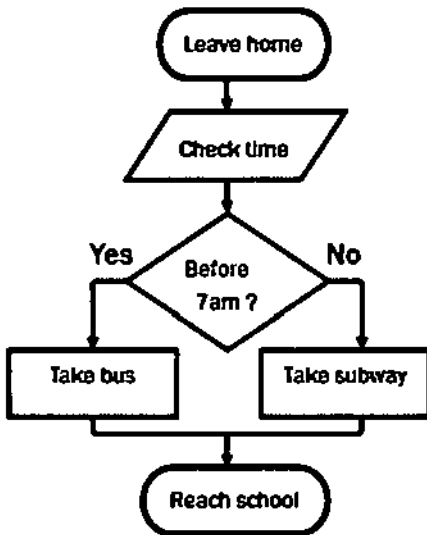


Figure 24: Simple flow chart (Lau & Chan, 2006)

The International Institute for Business Analysts state in their "Body of Knowledge" document (International Institute of Business Analysts, 2005) that the process for generating a flow chart usually includes four steps. The first is to decide the boundaries of the flow chart and then the details of the diagram can be determined, typically the activities and the flows between them. Step three is to physically compile the diagrams and in step four textual descriptions for some of the shapes that require more detail are prepared.

The notation and logic of flow charts are embedded in many software products that are available on almost any computer. The Microsoft Office suite has embedded into all their products the option to "insert > picture > auto shape > flowchart". Figure 25 depicts the standard MS Office flow charting shapes. In Microsoft Visio there is a dedicated flowchart stencil. Thus the average computer user (in a Windows/Microsoft environment) can relate to the symbols used in a flow chart. According to (Lau & Chan, 2006) the basic shapes of a flow chart have been documented in an international ISO standard (ISO 5807) and an American one (ANSI X3.6-1970).

Shape	Type and description
	Terminator: A start or end of a process.
	Process: A step in the process.
	Predefined Process: Another process that may be known or understood but isn't detailed in the chart.
	Decision: A point at which you must make a decision in the process.
	Connector: Cross-references or leads to another process within the chart.
	Data: Any kind of input or output, such as receiving or dispersing information.
	Document: Anything that is produced for people to read, such as a printout.
	Delay: A wait in the process.
	Preparation: A preparatory step.

Figure 25: Microsoft Office notation for flow charts (Microsoft, 2006)

The ISO standard for flowcharting is very simple and uses only four basic symbols (Hernandez, 2006) (HCI, 2006):

- Ovals that indicate start and stop points;
- Rectangles that indicate processes or activities;
- Diamonds that are used to depict decisions; and
- Arrows that indicate the flow between activities.

In Microsoft Office applications (Microsoft, 2006), the following have been added:

- Predefined processes to reference other diagrams or processes out of scope;
- Connectors as a small circle used to end an arrow and restart it somewhere else on the diagram;
- Data and documents as inputs and outputs of activities; and
- Delays and preparation used to show the concepts that are important for manufacturing flow charts.

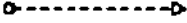
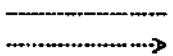
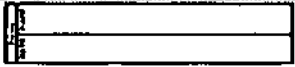
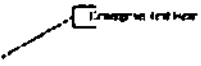
In some cases a flow chart becomes too big to be depicted on a single page. In these circumstances an "Off page connector" is used to indicate that a flow is continued on another page (Hansen, 2005).

2.3.4.7. BPMN (Business Process Modelling Notation)

The business process modelling notation has been developed by the Business Process Management Initiative (BPMI.org) (Khadye, 2006). According to the Object Management Group (Object Management Group, 2006) who have since taken over the BPMI and the BPMN standard, this standard will "provide businesses with the capability of understanding their internal business procedures in a graphical notation and will give organisations the capability to communicate these procedures in a standard manner".

The full set of BPMN symbols has been included in an earlier discussion as an example of what a notation is (Figure 11: BPMN Notation (Casewise, 2006)). The definitions of every element of the BPMN notation are provided in Table 3.

Table 3: The BPMN Notation (Object Management Group, 2006)

Element	Description	Notation
Event	An event is something that "happens" during the course of a business process. These events affect the flow of the process and usually have a cause (trigger) or an impact (result). Events are circles with open centres to allow internal markers to differentiate different triggers or results. There are three types of Events, based on when they affect the flow: Start, Intermediate, and End.	
Activity	An activity is a generic term for work that company performs. An activity can be atomic or non-atomic (compound). The types of activities that are a part of a Process Model are: Process, Sub-Process, and Task. Tasks and Sub-Processes are rounded rectangles. Processes are either unbounded or contained within a Pool.	
Gateway	A Gateway is used to control the divergence and convergence of Sequence Flow. Thus, it will determine branching, forking, merging, and joining of paths. Internal Markers will indicate the type of behaviour control.	
Sequence Flow	A Sequence Flow is used to show the order that activities will be performed in a Process.	
Message Flow	A Message Flow is used to show the flow of messages between two participants that are prepared to send and receive them. In BPMN, two separate Pools in the Diagram will represent the two participants (e.g., business entities or business roles).	
Association	An Association is used to associate information with Flow Objects. Text and graphical non-Flow Objects can be associated with the Flow Objects.	
Pool	A Pool represents a Participant in a Process. It is also acts as a "swimlane" and a graphical container for partitioning a set of activities from other Pools, usually in the context of B2B situations.	
Lane	A Lane is a sub-partition within a Pool and will extend the entire length of the Pool, either vertically or horizontally. Lanes are used to organize and categorize activities.	
Data Object	Data Objects are considered Artifacts because they do not have any direct effect on the Sequence Flow or Message Flow of the Process, but they do provide information about what activities require to be performed and/or what they produce.	
Group (a box around a group of objects for documentation purposes)	A grouping of activities that does not affect the Sequence Flow. The grouping can be used for documentation or analysis purposes. Groups can also be used to identify the activities of a distributed transaction that is shown across Pools.	
Text Annotation (attached with an Association)	Text Annotations are a mechanism for a modeler to provide additional information for the reader of a BPMN Diagram.	

2.4. Chapter Summary

In this chapter the author introduced the concept of a "business process" and that of a "business process model".

In its essence, a business process is an activity performed by or within an organisation where the activity is performed for a reason, whether that reason is found in strategy or can be directly related to a client need. A process cannot be performed without some input that will be transformed into a valuable output; the input to a process may be physical material or in the form of information. To transform the input, resources are required. Resources are items that must be there to complete the process, but will still be there after the process has been completed. Typically, machines and human resources can be seen as resources (or mechanisms) to a process. Processes require a form of control to direct them, whether the form of control is labelled as "governance" or "business rule" or "process logic" depends on the modelling language. Lastly, the activities that make up a process need to have some sequence in which they are executed. This sequence will move the process from its trigger (event) to its outcome (or result).

A process model is a depiction of business processes, typically more than one, in a consistent logical model. In a process model, references are made from one process diagram to another and this is achieved through sharing objects on one diagram with those that appear on another.

Notation and methodologies for process models depend on the purpose for the model. Process models developed with the aim of the eventual development of business applications are more suited to "UML" or "BPMN", whereas "IDEFO", "Value Stream Maps" and "Event Process Chains" are more suited to modelling for the sake of understanding the business process in order to improve it.

All process modelling notations and methodologies share the idea of a "meta model" that describes the objects used in the process model. Although slight differences exist, it is possible to map the constructs used in different notations to one another. All process models also share the notion of decomposition of high-level to low-level processes across different levels of abstraction.

The next chapter addresses from the literature two research objectives:

- "Why do organisations use business processes?"
- "Why use business processes in a sustainable manner?"

3. LITERATURE REVIEW: WHY USE BUSINESS PROCESS MODELLING?

3.1. Chapter Introduction

This chapter addresses the research objectives: "Why do organisations use business processes?" and "Why use business processes in a sustainable manner?".

Understanding the reasons why an activity is performed is even more important than knowing how it is done. In this chapter some of the reasons for business process modelling are investigated, including the benefits of process modelling and the link between business processes and strategy.

This chapter looks at the reasons for sustainable process mapping and the concepts that contribute to successful process modelling. Included is the notion of process maturity frameworks. As companies start investing in business processes as a capability, the needs and goals may move through different phases. Two maturity models are presented to explain the phases companies may encounter on the road to ultimately integrating processes modelling and management seamlessly into their operations.

The concept of process ownership is discussed. Process owners are people who can take responsibility for some of the processes, making sure that the processes are executed to plan and are optimised and updated as circumstances may require. Process ownership is one of the pre-requisites for business process management (BPM). A brief introduction is given to this new management approach.

The chapter ends off with a framework to predict modelling success, based on a study conducted in Australia. This study identified eight factors that influence "successful" process modelling. Although successful process modelling projects do not guarantee the sustainable use of process models, good modelling projects are a prerequisite for creating process models that are worthwhile for re-use.

3.2. Why do Organisations use Business Process Modelling?

There are many methods available to managers of businesses to achieve higher levels of performance. According to Hammer (2002), most of the contemporary approaches to improving performance are all based on business processes as an underlying common theme, whether the approach centres on the deployment of new technology or require some form of performance measurement system.

Gartner, a leading IT research group (Hill, Sinur *et al*, 2006), states that process models are required so that business and IT management can understand business processes and, through the visualisation and potential

simulation within a process model, management can suggest improvements. Another use of process models is in adhering to the documentation requirements of international standards (like ISO 9000). Process models form a basis for collaboration between people responsible for different parts of the process.

In a presentation, Harmon (2005) states that business process modelling (and management) can make a company more efficient and productive by improving existing processes.

Dehnert and van der Aalst (2004: 290) give some reasons for the use of business processes when in an article that distinguishes between business processes descriptions (or then a business process diagram/map) and workflow specifications. The objective of a process description is to provide a good basis for communication among people from different areas. It can be used to train new employees and in BPR projects to identify areas for improving the current processes.

A South African writer, Pieterse (2004), states that business process modelling (or "mapping") has several benefits. Modelling assists in the alignment of business requirements with IT systems. Process maps that show organisational involvement have an impact on how people in the organisation view their own involvement in the process and allow them to question their value in the whole process, or the number of handovers between different organisational units.

The process of doing process modelling, stimulates some thought on the process and the rigour required to map according to the process modelling methodology is the first analysis of the process and a valuable first step in the review of the process. Thus, the process of mapping a process model is the first step towards changing the paradigm in which people operate.

In conclusion a process model is used to:

- Be descriptive
 - o The process model depicts what happens during the execution of a process; and
 - o The model takes the view of an external observer who can view the process in its entirety, a view from where options to improve the process are more visible
- Be prescriptive
 - o In TO BE models the process models show how process can be or should be; and
 - o In prescriptive process models rules are defined that will achieve the desired process performance.
- Be explanatory
 - o Process models can go a long way in not only describing how a process is executed, but also describe WHY a process is performed.
 - o Complete process models show not only the normal process route, but can also explain what will happen if something goes wrong in the process.

3.2.1. *Change as a Driver of Business Process Modelling*

Smith and Finger (2003: 131) states that *"change is everywhere"*. Change can occur in small pockets or on a grand scale, either gradual or radical. Processes need to constantly adapt to this change.

According to Harmon (2005) some of the reasons for change in the enterprise are:

- The stiffening of global competition;
- More sophisticated client demands;
- Pressure to increase margins and profit;
- New technology;
- New markets;
- The need to gain a new competitive advantage;
- Changes in ownership, either mergers or acquisitions;
- The impact of organisational trends towards outsourcing; and
- Shorter product lifecycles.

All of these sources of change have some or another impact on the processes within an organisation.

3.2.2. *Why do we Model?*

Rosemann (2006a) states that process modelling is a common approach to get visibility of existing processes and future process scenarios in improvement projects. Rosemann also states that process modelling has been criticised for being over engineered, expensive and without sufficient value. With the value of processes poised against the dangers of over doing modelling, the challenge is to find the right level of modelling required to achieve the process mapping goals.

Process modelling is becoming more important (Becker, Rosemann & von Uthmann, 2000). It is important for software development but also for many other purposes. The quality of process modelling is important as different users will evaluate the models from different perspectives. Complexity in process modelling is not only driven by the number of potential users, but also by the number of different techniques and modelling tools available.

There are three basic uses of process models in organisations:

- To understand. By modelling, the modeller needs to understand the process in order to depict it accurately. This level of understanding is not even achieved by the people managing parts of the process.

- To learn. Process models give the opportunity to experiment and learn. Decisions can be based on simulations from process models, or different models can be created for every potential scenario available to the organisation. Analysis of process models lead to a higher level of understanding.
- To manage. Process models can be a way to direct the operations. Process models can be used as training material, as operating procedures and also as the yardstick against which performance is measured.

In the following sections literature to support the usage of process models is cited.

According to Biazzo (2002) process models offer useful, inexpensive depictions of a process. Models can help significantly to improve or re-design processes. The usefulness of process models is one reason for their widespread use.

Biazzo (2002) states that one of reasons for creating process models is to analyse complex systems that involve machine, human, and object interactions.

Tuggle and Goldfinger (2004) explain the value of process mapping from the field of knowledge management; which concerns itself with the identifying, capturing, storing, reusing, and distribution of key intellectual assets of an organisation. Process maps are valuable for extracting information about the organisation. From the knowledge revealed the firm can learn how to better train its employees, serve its clients, design business processes, fine tune its strategies and derive guidelines to manage its employees.

Pieterse (2006) believes that processes models aid in getting "business people to relate to processes", especially where more than one scenario might be involved for essentially the same process. Pieterse (2006) developed a method called "scenario mapping" where the processes are placed in rows and the scenarios in columns. Given the scenario, the mapping will indicate the process (or the version of the process) that will be involved in that particular scenario. Scenarios may differ in both the performance indicators and the expected service levels, so it is not exactly the same process that is followed under each scenario.

Soliman (1998) highlights the value of processes mapping in providing both understanding and focus: "The most important and fundamental elements of business process re-engineering is process understanding (mapping). Through process mapping it is easier to determine where and how to improve the process". Process mapping can improve the focus of the process to add value to the customer of that process (Soliman, 1998). Value is added via the ability of process mapping to first identify and then assist in the elimination of non-value adding activities. By removing non-value adding activities the process complexity can also be reduced.

3.2.3. *Linking Strategy with Business Processes*

A reason why organisations use business processes is given by Varghese (2004). He states that customer loyalty is a result of value that has been delivered to a client, and that delivery of value is created by business processes. Sustained success in competitive markets requires a company to continuously improve its delivery of value and, therefore, the business processes that create this value.

According to Burton and Penotti (2003), a critical question for every business leader is how to organise in order to execute strategy. What is the right combination of structure, skills and mechanisms to create value for customers? Process maps provide the ability to understand and improve process performance. To determine the correct combination of resources typically demands for a list of processes to be identified and then for a process map to be developed for each. On the process map the inputs, outputs, customers and suppliers are indicated. However, the true value does not come from the processes themselves, but rather from the interconnections between them. A business is not a simple collection of processes, but an integrated system of processes.

Burton and Penotti (2003) states that the competitive advantage that can be gained from processes is not derived from the effective execution of single processes, but from the linkages and interdependencies that are managed between the processes. Thus it is important to analyse the overall system of processes (or "process architecture") before analysing individual process detail.

Business processes and the expectations of stakeholders are linked since stakeholder outcome can only be created via the processes of the organisation. According to Braganza and Lambert (2000) a change in stakeholder expectation means that the processes have to change accordingly. Sudden shifts in stakeholder expectations, strategy or even the external environment may require that some of an organisation's business processes have to change.

3.3. Why use Processes in a Sustainable Manner?

According to Smith and Fingar (2003), companies need more than accurate process maps in order to get full value from process models. Companies need a way to get the processes creatively implemented in practice. Creative implementation of processes requires a systematic approach to the analysis of business processes and reviewing the possible impact of a new process design. At any given point in time, the organisation must be in a position to respond to the "invisible hands of the market".

Smith and Fingar (2003) continue that change in the organisation should be a science - something that can be predicted and not guessed - so that when a change in process is introduced, the organisation knows that this change to the process will actually support the strategy of the organisation and it will not disrupt other operational processes.

In order to get the full value of process modelling there is a requirement to have "a permanent business change library" (Smith & Fingar, 2003) to enable ongoing transformation and innovation. Businesses need to have sustainable process modelling, managing what it has and creating new valuable process maps that can be integrated and re-used with the content already made visible.

Smith and Fingar (2003:74) state that *"processes are the business"*, or in other words, processes are a core part of the intellectual property of the business. As important as it is to keep the business profitable and sustainable, it is equally important to keep a process updated, operational and effective. A method to ensure that a process remains updated is through managing the process life cycle. Lifecycle management can vary from simple to complex solutions, on the simpler side simply keeping version control every time a process is redesigned and deployed, or as complex as managing baselines in the design of the process and manage the implementation of the process as a project through several phases. (Smith & Fingar, 2003)

Managers realise that their everyday activities are more valuable when they fit into the strategic objectives of the organisation. Process modelling also has its place in the support of strategy. In a 1996 article, Porter asks the question "What is strategy?" (Porter, 1996). He came to some interesting conclusions.

Firstly that taking on a strategic position is easily copied by competitors and does not give a sustainable competitive advantage, to consistently outperform rivals, a company need to establish a difference that can be preserved. Improving their operations is necessary for organisations to stay in the race, but operational improvements do not translate into gains in profitability. A difference that cannot be copied from one organisation to another is the way in which it combines its activities. *"Overall competitive advantage or disadvantage results from all a company's activities, not only a few"* (Porter, 1996: 62). *"Competitive strategy*

is about being different. It means deliberately choosing a different set of activities to deliver a unique mix a value"(Porter, 1996: 64).

Porter describes how the activities a company chooses to perform creates a strategic position that is hard to imitate. The reason why imitation is difficult is in the way that the activities feed from one another. With every choice of activity, other activities become more viable as they can feed off the benefits of the activities already chosen, but others become less viable. In deciding what to do, it is as important to decide what not to do. The choice of activities can contribute to strategy in three methods of "fit" (Porter, 1996: 71-72):

- Simple consistency, every activity is aligned with the overall strategy;
- Reinforcing fit, the choice generate spin offs that play out favourable for other activities; and
- Optimisation of effort, due to the choice of activities the total effort required can be reduced. Typically this optimisation revolves around the coordination of information exchange across activities and minimising wasted effort.

Although Porter did not once mention the phrase "business process model", it is hard to imagine how to choose between all the activities that can be performed without a process model, as *"organisational structure, systems, and processes need to be strategy specific"*(Porter, 1996: 74). Although Porter is elaborating under the theme of "strategy", his message also speaks of "sustainability". Putting together a unique combination of activities (business processes) is a sure way to ensure a competitive advantage (sustainability).

3.3.1. Process Maturity

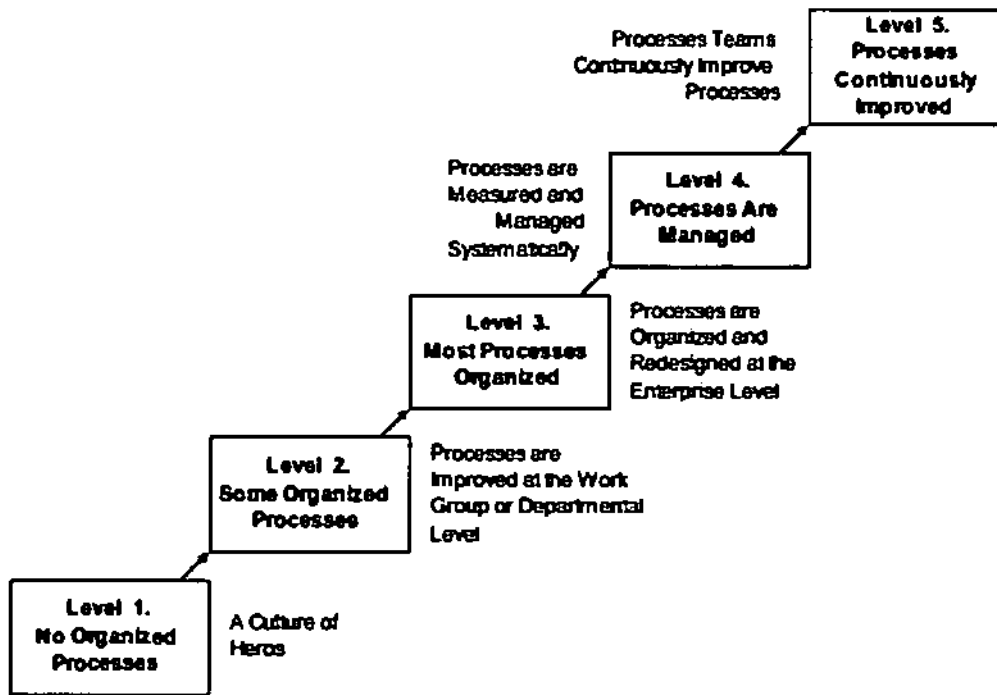


Figure 26: SEI's CMMI Model (Harmon, 2006)

Harmon (2006) describes the levels of the capability maturity model, depicted in Figure 26 above, as follow:

- Level 1: At this level processes are not defined. Skilled individual members of the organisation have the process in their heads and results are achieved through the effort of individuals.
- Level 2: At level 2 organisations spend some effort to document processes. Within departments core processes are documented.
- Level 3: At this level of maturity organisations combine the departmental processes into a larger taxonomy of processes. Processes are formally documented in consistent ways and fit into a reference model. The reference model and the value chain of process models in organisations at level 3 correspond to one another. A level 3 organisation will focus attention to where processes that are delivering value to the organisation are not well aligned.
- Level 4: At this level organisations have their processes defined and are managing process performance on a day-to-day basis based on measurements from the process as it is executed.
- Level 5: At this level organisations are not only managing well defined processes everyday, but are also continuously improving them.

A method other than the capability maturity model to describe the levels of process maturity is the "process maturity continuum" mentioned by Varghese (2004: 19) from the work of G.A. Pall (The Process Centred Enterprise, Saint Lucie Press, 1999). This model has six level of maturity as can be seen in Figure 27.

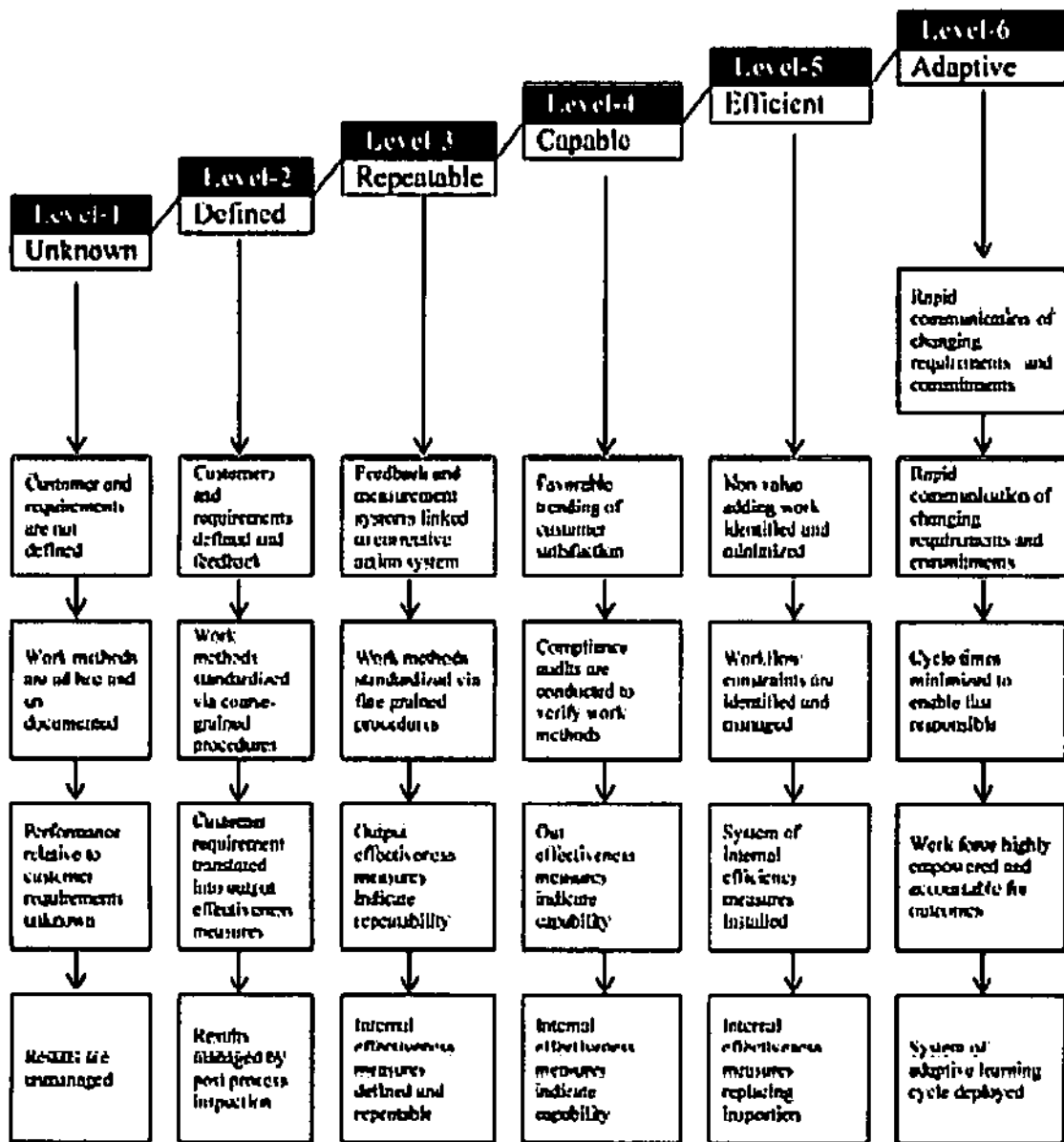


Figure 27: The process maturity continuum (Varghese, 2004: 17)

3.3.2. Process Owners as a Method to Increase Sustainability

According to Hammer (2002) the process owner has the following responsibilities:

- He/she needs to ensure that all the employees involved in a process have a good understanding of the process and are properly trained.
- He/she needs to ensure that the required resources are available to the process and that the process design is followed.
- It is his/her responsibility to make changes to the process in case of a minor problem, or to lead the effort in a total re-design if required.
- It is also his/her responsibility to ensure peak performance of a business process. (Hammer, 2002)
- The process owner is a senior person with end to end responsibility (Hammer & Stanton, 1999) who acts in a permanent role.
- The process owner is responsible for allocating a budget to areas within the process (Hammer & Stanton, 1999).

The addition of process owners introduces new dynamics to organisational politics and interrelationships, as it splits the control over work from control over people doing the work. Having process owners in permanent positions is important because without them the organisation will return to its old functional structure where the people and the work are functionally managed via a hierarchy (Hammer & Stanton, 1999). As a process owner does not have direct authority over people, he/she has to exercise influence in order to get things done.

Hammer feels that high-profile appointments as process owners send the message that processes are being taken seriously. He, however, also mentions that in the companies in which he has implemented radical structural change to make sure that the organisation becomes process driven, typically a quarter to half of the senior executives have resigned.

Varghese (2004) adds to the concept of a process owner by stating what a process owner is not. The process owner is not concerned with managing of departmental tasks. The process owner is not involved in the daily performance of work. Functional managers need to manage the work, whereas the process owner is concerned with the capability of the process. Hammer differs from Varghese regarding who should have authority over "work". Hammer feels that even "work" is under the control of the process owner (Hammer & Stanton, 1999), it is only control over the workers that is excluded.

Garretson (2005) describes the nature and responsibilities of a process owner in the company "Boeing Integrated Defence Systems". Many of the people assigned as process owners were executive management. Not all process owners were qualified as managers, but all had superior knowledge on the subject matter. Some owned more than one process. Process owners in Boeing are responsible for documenting the process,

ensuring customers and suppliers are involved, ensuring that the procedures relating to the process are adhered to and lastly to ensure process performance.

When business owners are appointed for processes, one of the key issues in large organisations is related to having a standardised process all across the enterprise, the alternative to a standard process would be to allow business units to have their own versions of the process each with their own process owner. According to Hammer and Stanton (1999) the benefits of a single standardised process are:

- Lower overheads, as there is only one process owner, one set of training manuals, and a single management information system;
- The enterprise has only one representative to its customers and suppliers of that process; and
- Having one process means that people can be moved from one unit to another without any re-training, which allows greater flexibility in the deployment of people.

The reason why different processes would be allowed in one organisation relates to the need of different customers to be served in different ways.

3.3.3. Business Process Management as a Method to Increase Sustainability

Hammer (2002: 26) defines business process management as *"a structured approach to performance improvement that centres on the disciplined design and careful execution of a company's end to end business processes."* Business process management (often referred to by the acronym BPM) is a management philosophy. It has taken over the reigns from business process re-engineering (BPR) as the preferred approach to improve business performance.

BPM aims to manage a process through its life cycle that begins at birth and moves on to a period of maturity and eventually of decline. Currently the lifecycles of most processes are getting shorter (Harmon, 2004).

But why manage business processes in an integrated manner?

Varghese (2004: 20) states that process improvement must be seen as a management system and not as a *"series of disconnected projects that simply pick low hanging fruit"*.

A reason why companies can change to managing processes across the enterprise lies in the notion expressed by Hammer (2002) that functionally organised companies do perform all the activities required to perform end-to-end processes, but that in a functional organisation these functions are working with different objectives in mind and are largely unaware of the efforts of other units. Working in functional silos leads to conflict and sub-optimisation between the units.

Lastly, Hammer (2002) states that process management has as a benefit the alignment of all stakeholders around a shared customer-orientated goal.

The steps to implement business process management according to Hammer (2002) are:

- Identify company wide high-level processes, typically 5 to 10;
- Make people throughout the company aware of the processes and how their own work fits in;.
- Create and deploy measures of end-to end process performance, derived from customer and shareholder needs and assess current process performance and set targets;
- Designate process owners, senior managers with end-to-end authority for a process, responsible for ensuring consistently high performance. (The process owner establishes the process design and ensures that the design is followed obtains resources that the process required and intervenes as needed to improve the process.);
- Select two or three processes for redesign and improvement and implement new designs in a staggered fashion; and
- Over time align the company's management systems with the new prominence of its processes.

3.3.4. Modelling Success

How to manage business processes in an organisation is of strategic importance, but in order to manage the processes, one has to know what they are, thus the act of mapping business processes must also be successful. Bandara, Gable and Rosemann (2005: 347-360) conducted a study on the success factors related to successful business process modelling. The following section is solely based on their work as this was the first attempt, to their knowledge, of determining what the factors are for successful business process modelling.

To understand what success factors in modelling business processes are, the question is again raised "What are business processes used for?" Bandara et al (2005) list the following uses:

- Model-based identification of process weaknesses;
- Adapting best practices;
- Design new business processes (where the models are used to communicate and document the new process); and
- To be used as training material.

From the uses listed above, process modelling have the following benefits (Bandara, Gable & Rosemann, 2005):

- Documentation benefits that relate to having a means to communicate that is flexible and common between different stakeholders in a process;

- Design benefits that stem from the ability to analyse business process models, current processes can be truly understood and new possibilities identified. Visualisation of a new process aides in implementation project planning.
- Then there are use benefits to process models. The fact is that process understanding and activities including new application development are iterative in nature, thus the first version of the model is used to develop a better second iteration.

In the study conducted by Bandara, Gable & Rosemann (2005), they initially developed an "a priori" model from literature and then tested this model in several interviews with stakeholders in three large Australian organisations that have embarked on nine modelling projects between them. Depicted in Figure 28 below is the final model that was developed after testing the "a priori" with stakeholders. The exact definitions of the factors can be viewed in Table 4.

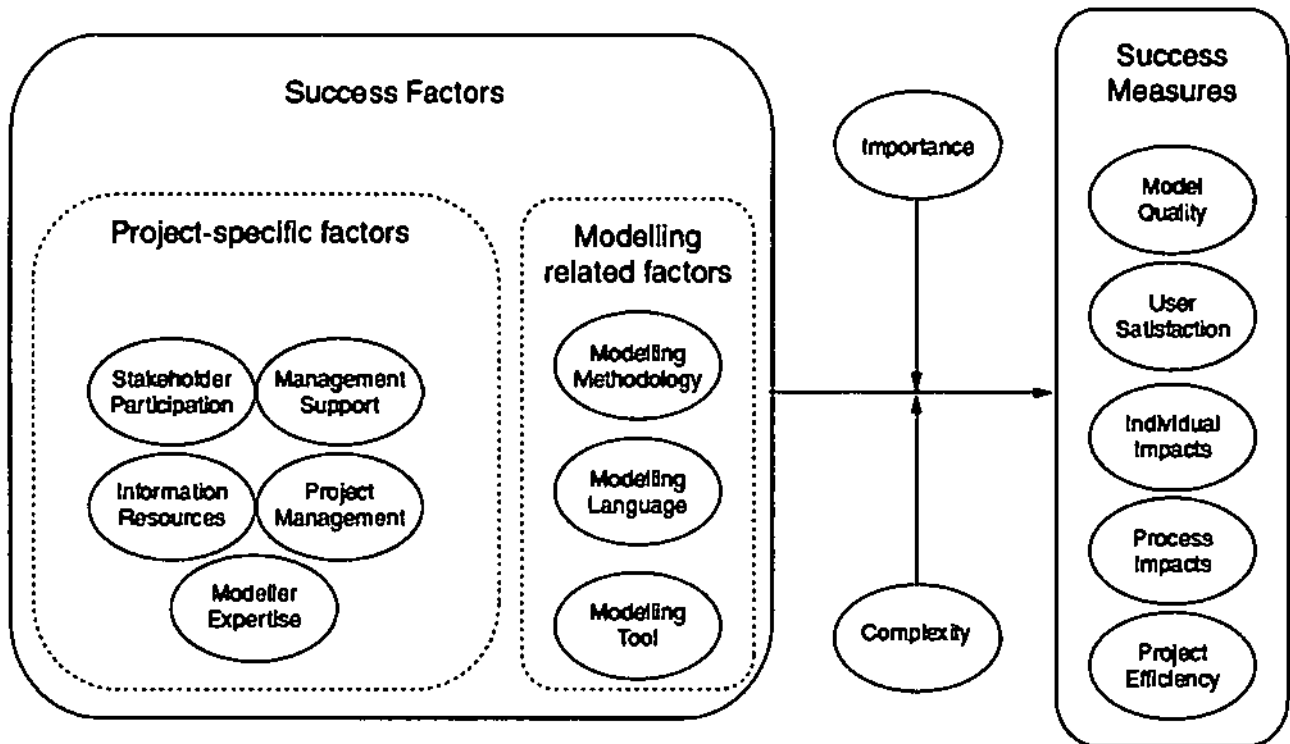


Figure 28: Re-specified process modelling success model. (Bandara, Gable & Rosemann, 2005: 357)

Table 4: Definitions of concepts in successful process modelling model (Bandara, Gable & Rosemann, 2005: 347-360)

Concept		Definition
Success factors	Project specific	Stakeholder participation
		The level of input stakeholders give to the creation, approval and maintenance of the process models.
		Management support
		This reflects the level of commitment by senior management towards the process modelling project in terms of their involvement, willingness to allocate resources and provide vision and leadership.
		Information resources
		The availability of sources of information that can inform the modelling project.
	Modelling related	Project management
		The management of the project, how well it was planned, scope defined and milestones managed.
		Modeller expertise
		The level of experience of modelling team members in both conceptual and process modelling.
Success measures	Modelling related	Modelling methodology
		A set of instructions that guides the process of modelling
		Modelling language
		This is the modelling technique used, the grammar and the syntactic rules used to model.
		Modelling tool
		A software products that supports the creation, storage and publication of process models.
		Model quality
		The extent to which the desirable attributes of the model have been mapped and can be used in an efficient way.
		User satisfaction
		The extent to which users of the model believe that the modelling effort achieved it's objectives.
		Individual impacts
		How the process modelling project influenced the stakeholders of the process.
		Process impacts
		The effect that the modelling effort had on the actual performance of the process.
		Project efficiency
		The process modelling project's ability to maximise the obtained outcomes in relation to the invested resources.

3.4. Chapter Summary

So why do we model business processes? Process models can be used to be descriptive, prescriptive or explanatory. Descriptive models are stating how business is conducted and is used to describe the end to end view of a process. The mere act of mapping and placing a process onto a piece of paper creates understanding and appreciation of the process to all involved. Descriptive models provide understanding and focus and allow business people to relate to process models.

Prescriptive process models direct how activities should be executed. Process models can be used as a baseline for managing the performance of people and as training material. The explanatory uses of process models are typically explaining why activities are conducted. Explanatory models reveal knowledge about the organisation, and this knowledge can be used to improve the organisations activities. Explanatory models can explain how strategy will be implemented.

The benefits of any endeavour must outweigh the costs. The benefits of process modelling lies in process improvement, gaining a competitive advantage and understanding the business. By modelling, the current time and cost involved to produce products and services valued by customers can be reduced. Then the activities of the organisation can be combined in such a way that leads to a position that is hard for a competitor to duplicate, thus, gaining a competitive advantage. Understanding business activities leads to a capability to manage business activities. Thus avoiding costly experiments or mistakes, proposed changes to the way a business operates can be tested at very little cost in a process model.

The sustainable use of business processes is driven from the fact that change can happen at any point in time. Spending time and effort to understand process impact before making decisions has significant impact, may delay the decisions and lessen the agility of the organisation. For management to be able to make well informed decisions in a short timeframe, updated knowledge of the processes must be constantly available.

To ensure processes are updated and available, the responsibility for managing processes must be assigned. Process ownership that crosses traditional organisational boundaries is an excellent way to ensure that somebody is looking after the process on behalf of the organisation. Not merely maintaining its status as accurately documented at any time, but also that the process is performing the way it should.

In this chapter the factors that ensure success in process modelling projects have also been identified. They are: stakeholder participation, management support, information resources, project management, modeller expertise, modelling methodology, modelling language and the modelling tool.

In the next chapter some of the methodologies that can be used to apply process modelling are discussed. This addresses the research question "How can business process modelling be optimally applied?" The chapter includes discussions on the cost of business processes, improvement approaches including Six Sigma, reference models and meaningful process improvement. In the last section the pitfalls of process modelling is discussed, where it can go wrong and how to avoid it going wrong.

4. LITERATURE REVIEW: HOW TO USE BUSINESS PROCESS MODELLING

4.1. Chapter Introduction

In this chapter some of the methodologies that can be used to apply process modelling are discussed. This chapter addresses the research question "How can business process modelling be optimally applied?" The chapter includes a discussion of the points of departure for a modelling project. The decisions that should be made at the very beginning of any modelling endeavour are described.

Then a section is included that provides insights on the cost of the business processes themselves and on the cost involved in modelling business processes. Modelling itself can be guided by improvement approaches including Six Sigma, meaningful process improvement, and the use of process reference models. Process reference models are often very prominent as it is marketed by its founding organisations. This section includes discussions on both the SCOR and VCOR process reference models.

Lastly the pitfalls of process modelling is discussed, where it can go wrong and how to avoid it going wrong. A detailed description of pitfalls in process modelling listing 22 things to avoid is presented.

4.2. Points of Departure for any Modelling Project

Recker (2006) proposes that the following five questions need to be answered prior to starting a process modelling project:

- Question 1: Decide on a modelling strategy.

Do you start with a process architecture, a helicopter view top down approach, or a start with the automated and manual tasks bottom up approach? There is even the notion of starting inside out, thus first defining the core processes and thereafter the support ones. The problem is where to start. When starting bottom up, or inside out, one tends to drown in detail. When starting top down, considerable time may be spent defining the big picture that turns out to be quite different when you reach lower-level processes later. Mixing strategies, however, will be counterproductive, therefore decide at project initiation where to start mapping processes.

- Question 2: Modelling management

When business process modelling needs to be managed across the whole enterprise, with several different teams made up of strong individuals, the question that comes to the fore is how to manage all of this? The

issues raised are the consistent use of terminology, modelling conventions and model governance and ownership. The options available are either to have a centralised process management or to decentralise it.

The advantages of having a centralised modelling management are: a) consistency across modelling projects; b) high syntactical quality of models; and c) clearly defined ownership and model governance. The disadvantages lie in the complexity, as different organisational units all have slight variations on the same process and that the needs and requirement of different modelling initiatives are all different. There are boundaries as to what centralised management of modelling efforts can achieve.

The advantages of decentralised modelling are that the actual modelling effort is much easier, a lot quicker and usually cheaper. The downside lies in the complexity of communication across teams, the consistency of models and how to apply modelling governance.

Thus a decision is required up front between fast and cheap modelling, vs. more expensive and difficult modelling that may result in higher-quality output for potential re-use. This is a question of balancing the economies of scale in modelling effort vs. value.

- Question 3: Decide on a modelling technique.

There are a few basic techniques and then an endless list of variations on these. Different techniques have typically evolved from different purposes. Some are ideal for software development, but are hard to understand by business people, while those that effectively act as a collaboration of different business stakeholders are not well enough defined for IT professionals to work with. The questions are: "What is the purpose of developing business process models?", and "Is there the potential that the use of the business processes may change over time?" Recent efforts in the business process modelling and business process management communities have been to define a single modelling standard to suit all needs. According to Recker, the BPMN notation is gaining acceptance worldwide. What Recker does not discuss in his article is to have different techniques for different purposes. This possibility needs some further investigation.

- Question 4: Decide on a modelling tool

Although there are a host of process modelling applications available, many process modelling initiatives are still relying on brown paper exercises or a diagramming tool like MS Visio to map processes. A good process modelling tool can provide some or all of the following functionality:

- process simulation
- analysis of process data
- reporting
- performance management
- the ability to execute business processes
- process model lifecycle management
- user administration

- release management and version control
- repository management of potentially thousands of process models

A close correlation is also found between certain process modelling tools and the modelling technique or methodology they support. The choice of a modelling tool, therefore, requires some careful thought and choosing is complex in that licensing options, cost and software support also play a part in the decision.

-Question 5: Deciding on a reference model

Most companies strive for best practice. To achieve best practice they typically look at the way other companies in similar industries are viewing their processes. Reference process models have been documented and are available in several industries. These include ITIL (Information Technology Infrastructure Library) the eTOM (for the telecommunication industry) and SCOR (for supply chain management). But when reviewing the statement of Porter (1996: 62) that a competitive advantage lies in the unique combination of activities an organisation combines when delivering value, the notion of a reference model seems counter productive. Reference models are dangerous as many of them do not necessarily depict best practice, but rather common practice. Recker (2006: 4), however, states that *"it is about finding the right level of adoption and compliance"*. The advantages of having a reference model, i.e. that it aides the modelling effort and communication through the provision of a consistent template that is complete, can still be attained, but the content of the reference model should be adapted to the specific environment.

4.3. The Cost of Business Processes

"What is the cost of business processes?" and; "What is the cost of business process modelling?". When answering these two questions related to cost and to business processes, the important difference lies in which costs can be avoided and which can not. Obviously, the mere fact that companies spend money on their business processes is something that we can not escape from. In order to produce value for customers some expenses, whether direct or indirect, have to be incurred. Spending money on process modelling on the other hand is optional; one may choose not to do so. But as with so many other forms of planning, spending a little up front may save a lot later.

Rosemann (2006a) is particularly critical of companies that approach large (and expensive!) ERP implementations with the simplest of drawing tools. According to Rosemann the early phases of business process design do cost money, but it is these actions in the early phases that have the highest impact on the total costs and benefits of the business processes once they are implemented.

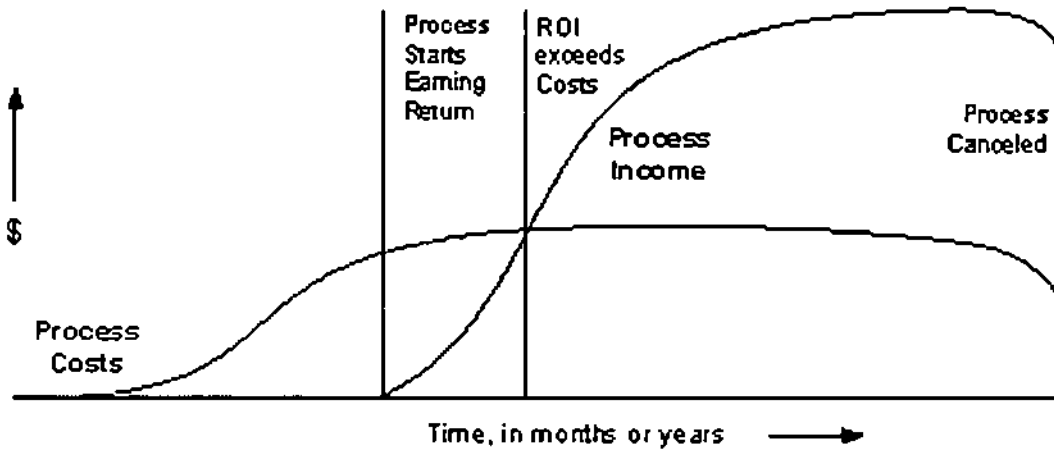


Figure 29: Business process life cycle cost (Harmon, 2004)

Harmon (2004) mentions that one of the problems of the cost of business processes is that no one takes full responsibility for it. As processes span organisational boundaries, most managers are only interested in the part of the process that has expenditure in his/her business unit. Harmon argues that the total life cycle cost should be evaluated. The life cycle of a process includes phases of birth; maturity and decline (refer to Figure 29). Harmon (2004) describes four methods that can be applied to minimise process life cycle cost:

- Move the income stream to be closer to the start of the project. The sooner profit can be made, the higher the eventual return on the investment. This implies that one starts to "sell" the products from the process earlier, potentially even before the process fully is implemented.
- Reduce the ongoing costs of the process
- Increase the margins/price of the process outputs
- Extend the life of the process beyond the normal phase of decline.

The importance of process modelling to manage process life cycle cost is relevant to strategies one and four as mentioned by Harmon. In order to "sell" the produce of a process prior to the full implementation thereof, a valid process model must exist to analyse the risks involved in such an approach. To extend the life of a process implies that small changes are made to the process in order to prolong it's life, initially modelled to test the possibility of extending process life in a valid and accurate business process model.

4.4. The Cost of Modelling

Executing business processes is the capability that allows the creation of value for customers, but when thinking of improving a process, the whole initiative should also be valuable. Process improvement projects consume significant investment of time and money in order to identify and implement improvements. Varghese (2004) states that process improvement can only be valuable if the cost to achieve the improvement is less than the improvement itself. Before embarking on a process improvement project, it is required to assess if the improvement project is the most appropriate value creating strategy. It may make more sense to not make any changes to a process, or even to outsource it.

As with any endeavour in an organisation, process modelling comes at a cost. This cost is primarily related to the resources involved in the mapping and analysis activities. According to Soliman (1998), the costs associated with the modelling effort can be related to the number of levels in the process model.

A level is an abstraction of the real process where only concepts that address the same level of detail are depicted. The highest level of abstraction, typically that of a value chain or a process reference model, has some value, but as more levels of detail are added, the model becomes richer and a closer representation of reality. With additional layers of detail, however, increasing cost is sure to follow and at some point additional levels of process will not provide any useful information.

The other end of the cost scale should, however, also be brought into consideration. Systems (human or IT) developed from process maps that were not modelled to lower levels of abstraction require higher levels of skill to interpret and execute. The more detailed the process, the lower the skill level required to execute a process. Processes not mapped to lower levels of detail also tend to have a higher defect cost.

Soliman calculated the total cost of a process for every level of detail that can be added in order to identify the level of process mapping that minimises total cost. This study concluded that four levels of detail are the most cost effective.

Opponents of process modelling argue that the value derived from process modelling does not outweigh the cost involved in an over-engineered and time-consuming activity (Rosemann, 2006a). The challenge is thus to find the appropriate level of process mapping to suit the underlying purpose.

4.5. Process Modelling in Combination with an Improvement Approach

4.5.1. Six Sigma

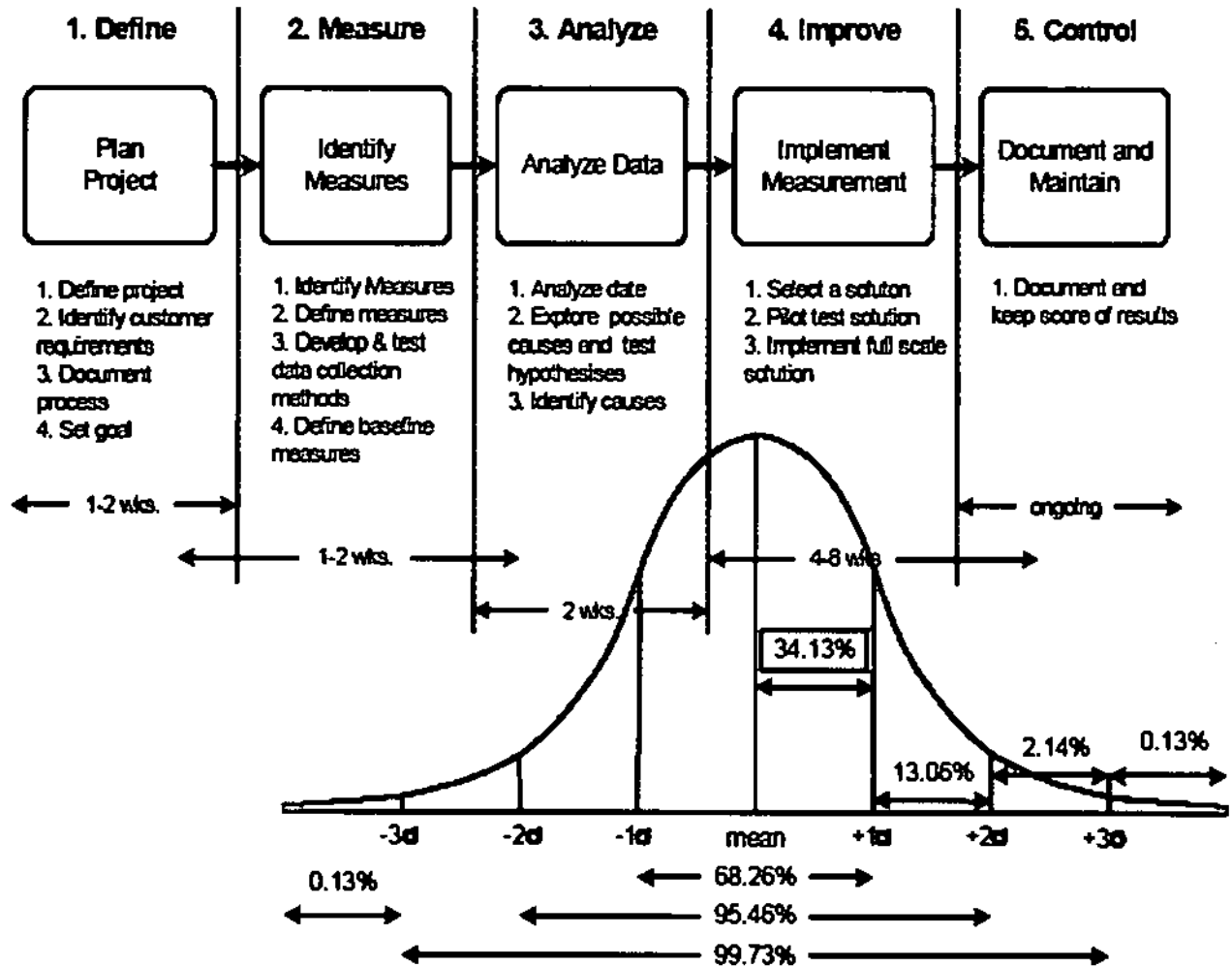


Figure 30: Six Sigma and BPM (Harmon, 2005)

Hammer (2002) expressed the limitations of Six Sigma in an article that calls for Six Sigma to be included as one approach used in a wider business process management context. Technically, Six Sigma is a statistical concept, meaning less than 3.4 defects for every million opportunities. The name of this approach mimics the nature of the most of the tools and methods under its umbrella: statistical analysis of business processes. As Six Sigma is based on statistics, it is useful in optimising processes, but it cannot solve root cause problems. Six Sigma assumes that, fundamentally, the existing process is sound and that small adjustments can optimise the process to be more efficient. Six Sigma is efficient in tracking down activities in a process that are wasteful, but do not give clues as to a way to totally re-design the process.

In Figure 30 the DMAIC (define, measure, analyse, improve control) methodology for improvement and the statistical nature of Six Sigma is depicted.

According to Hammer (2002) companies that have invested heavily in Six Sigma initially had a very good return on their investment as the low-hanging fruit was successfully delivered as successful projects, but in the long term:

- Most Six Sigma projects are narrow in their focus and can only create results on small-scale processes;
- Six Sigma is not well aligned to organisational strategy; and
- Six Sigma did not question the organisations basic assumptions or organisational structure.

Like most other methodologies, Six Sigma is project based. The strength of Six Sigma lies in the discipline it provides (Hammer, 2002).

4.5.2. Meaningful Process Improvement

The "process paradox" is a problem related to the value of improvement projects. The paradox lies in the fact that process improvement does not always result in any business improvement. Companies who have invested heavily in Six Sigma for example have experienced significant business reversals (Hammer, 2002).

Varghese (2004) believes that process improvement cannot be directly linked to financial results if the process that is being improved does not have direct impact on the economic value created by the company. The question, then is, how does one select the processes worthy of improvement?

Varghese proposes three questions will lead to the answer:

- What are the processes?
- Which processes are the most important to the organisation?
- How well are these processes performing?

Only after answering these three questions, will a manager be in the position to decide which processes to improve.

Varghese (2004) proposes an improvement approach called "meaningful process improvement" that consists of four phases. It is important to note that the first two phases of this approach need to be completed only once. This implies that a sustainable base of process models (a process portfolio) will be created and that future decisions can then be based on work already completed.

- **Phase 1** starts with identifying the value creation streams. What are the interactions with our clients that create value for the organisation, what are our products and services and what processes create these products and services? Then an inventory of processes (high level at first) is created. Typically, this inventory starts off with the notion of a "value-creating stream" or a "value chain".

The processes in this stream are documented to include the following attributes:

- Name (stated as a verb noun construct);
- Purpose (primary products produced and value adding transformations);
- Process boundaries (the interfaces between the process and either its suppliers or its customers); and
- Interdependencies with other processes.

Additional attributes that can be mapped as the portfolio evolves include:

- Name of the process owner;
- Performance goals, operational metrics and feedback mechanisms; and
- Actual performance metrics.

Included in the activities of Phase 1 of Varghese's approach is the requirement to determine the relevancy of the portfolio of processes. The relevance of processes can be mapped as a matrix (Varghese, 2004: 16). On the one axis are the primary steps of creating value (value creating stream). On the other axis is a notion of the level of support a process has to the value creation in the organisation. Processes can either be:

- Value creating (thus directly adding value to the customer);
- Value enabling (not adding value directly but essential to be in place as value creating processes cannot function without the enablers); and
- Supporting (processes that support the apparatus of the enterprise).
-

When looking at processes on these two dimensions, managers can make an objective decision as to the areas where process improvement can contribute to business value. An example of a value creating process matrix is presented in Figure 31.

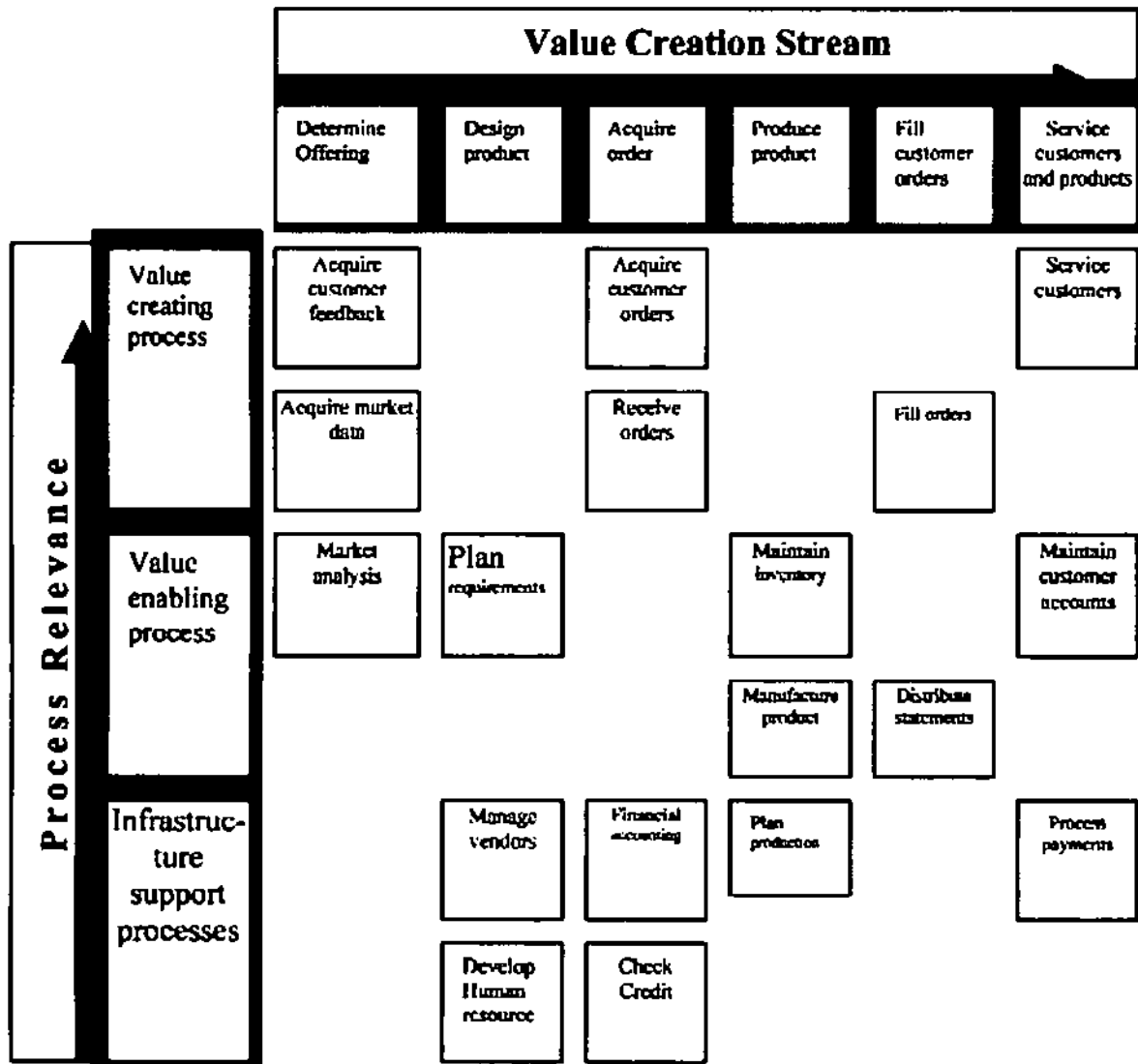


Figure 31: Value creation process matrix (Varghese, 2004: 15)

- **Phase 2** of Varghese's four phase approach, targets a specific process. Processes that are high in relevance, but low in performance should be prioritised and allocated to a process owner. The first two phases establish a meaningful process improvement framework; the next two phases are concerned with the delivery of value from this framework.
- **Phase 3.** Ongoing oversight and alignment. In this phase Varghese suggests that organisational structures and systems are then fitted around the business processes. Changes to the structure are in line with Porter's notion (1996) of putting together a specific set of interrelated activities in order to achieve a competitive advantage. Making changes to organisational structures and systems are difficult, and Varghese does not specify how to achieve these changes other than saying strong leadership and support from senior management are required (Varghese, 2004).

- **Phase 4 - Manage/improve processes.** In this phase, Varghese describes steps for process management:
 - Monitor process performance
 - Determine improvement needs
 - Launch and manage interventions. Which can take the form of three classes of interventions:
 - o Problem solving > Root cause analysis
 - o Continuous process improvement > standardisation, variation reduction, waste reduction
 - o Process innovation > Reengineering
 - Institutionalise gains

In phase 4 Varghese uses two tools, the "process maturity continuum" (Varghese, 2004: 17) (also described in Figure 27) and the "process improvement reference guide" (Varghese, 2004: 18) (included as Figure 32). What these two tools provide in combination is the right choice of approach to process improvement given the level of process maturity.

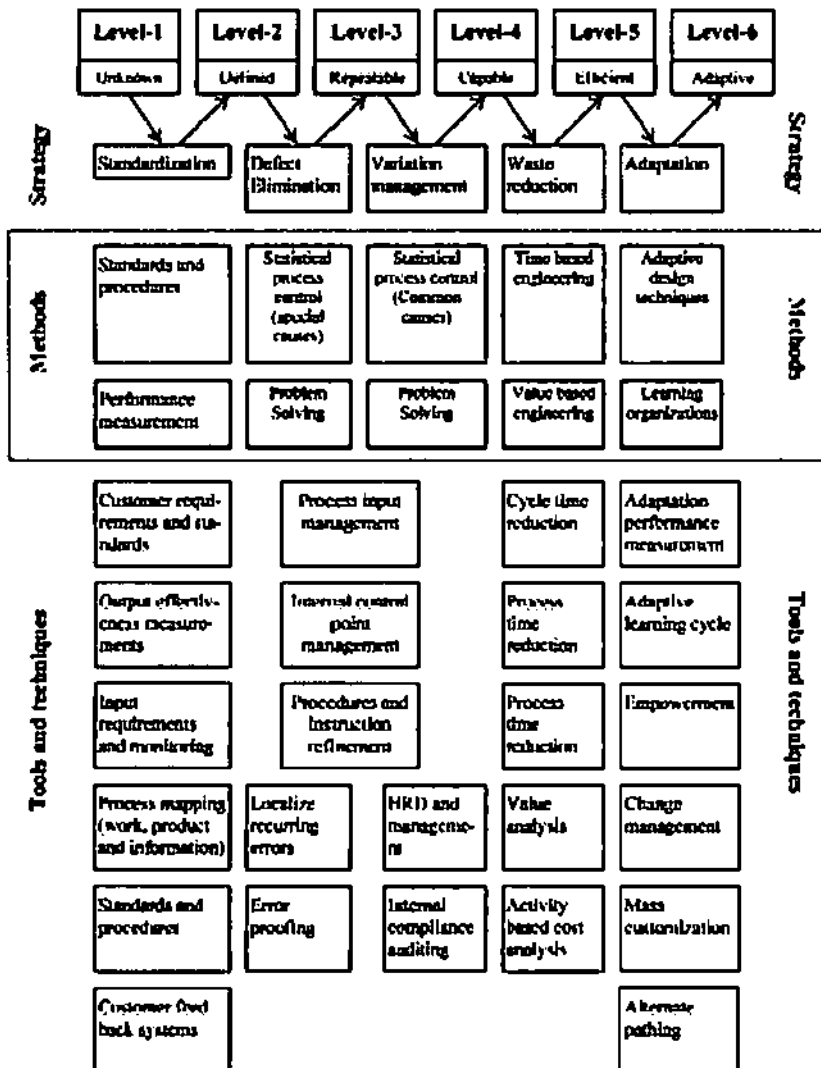


Figure 32: The process improvement reference guide (Varghese, 2004: 18)

4.5.3. Reference Models

A process reference model contains a standard description of processes and it provides a framework of relationships among those processes (Supply Chain Council, 2006). Several reference models are available for businesses as a starting point for a process repository. Below follow some of the easily accessible reference models.

4.5.3.1. The Value Chain Operations Reference Model (VCOR)

Value Chain

The horizontal chain with interdependent processes that generates benefits and value to the end user.

Strategic Processes

The Top Level of the model encompasses all the high level processes in Value Chains are applied for gaining competitive advantages.

Tactical Processes

The Second level of the model contains processes decomposed from the Strategy Level supporting the implementation of strategic goals through tactical decisions and configurations

Operational Processes

The third level of the model represents decomposed Tactical Level processes establishing links between enterprise specific activities in the value chain.

Activities

A decomposition of VCOR operational processes, each activity is specific to an enterprise that may or may not be shared among partners.

Actions

Individual work instruction items. Cannot be decomposed



Figure 33: VCOR hierarchy (Value Chain Group, 2006)

The Value Chain Operations Reference model (VCOR) is a model that provides three levels of process information in a hierarchical structure (Value Chain Group, 2006). The first level is the "strategic" level, or in other words, a high-level value chain representation of processes either being "plan", "govern" or "execute". The second level is the "tactical" level, which has some processes that have been abstracted from the strategic level. The third or "operational" level contains processes similar to actual activities being executed in organisations. The fourth and fifth levels of detail are not included in the VCOR reference model, and it is supposed that these levels will be completed by organisations themselves.

But why use a reference model like VCOR? The Value Chain Group (2006) claims that a reference model like VCOR is beneficial in the collaboration between different partners in a single value chain. Owing to the similar syntax in use in more than one organisation in the value chain for a type of goods, concepts are communicated very efficiently and subsequently VCOR can then assist in coordination between partners to achieve better information and material flow. The Value Chain Group even mentions the ability to respond to new customer demands and higher profitability.

The Value Chain Operations Reference model is an example of a process model that has not yet been exploded into the lowest levels of detail. Three levels of process information are available in the VCOR reference model. This is in line with the suggestion by Soliman (1998) that 4 levels of mapping is the most cost effective. It also allows the company who invests in such a reference model to still define their own unique set of business processes on the fourth level, but when communicating processes with partners in the value chain, the concepts are still very familiar. A reference model with three levels also creates more than ample potential parents under which a particular level 4 process in an organisation can be placed.

The VCOR model has some attributes and relationships for the information contained in it. A parent child hierarchical relationship exists between processes on different levels and every process has attributes that include: description; input; output; metric; and practice. Inputs and outputs have sources and destinations; they can also be classified as either relating to money, material, resources or information. The metrics in the VCOR model can be specified with a unit of measure and even calculated based on a formula and other metrics.

Figure 34 depicts a view of the electronic format in which the VCOR is available. The electronic nature of the reference model allows easy cross referencing between parts of the model.

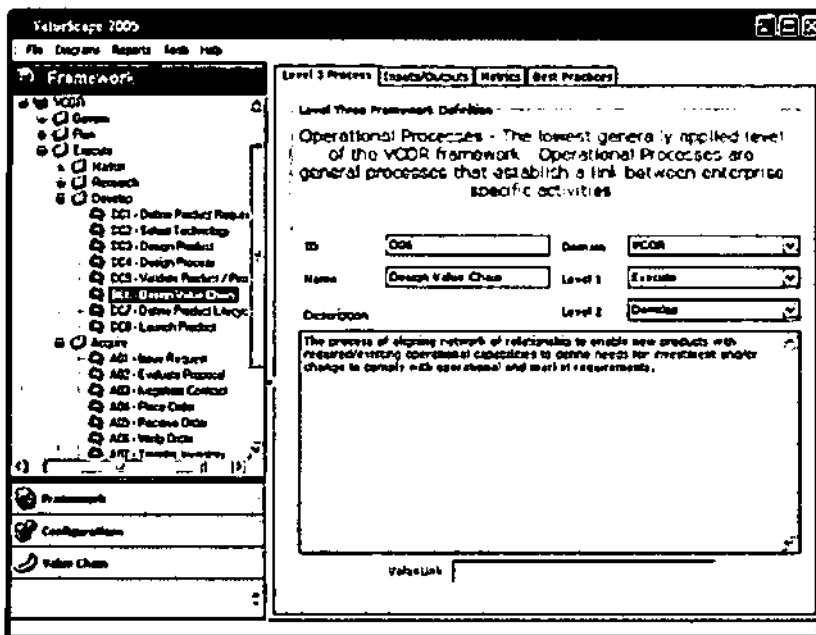


Figure 34: VCOR model in electronic format (Value Chain Group, 2006)

4.5.3.2. The Supply Chain Operations Reference Model (SCOR)

The "Supply-Chain Operations Reference model" or SCOR is a process reference model that is aimed specifically at the type of processes found in the logistics and supply-chain industries. Like VCOR it also has three levels of processes mapped, but has different names for the levels (process types, process categories and decompose processes) (Supply Chain Council, 2006). The SCOR reference model relates all management processes back to either plan, source, make, deliver or return. The 5 core processes of SCOR are depicted in Figure 35.

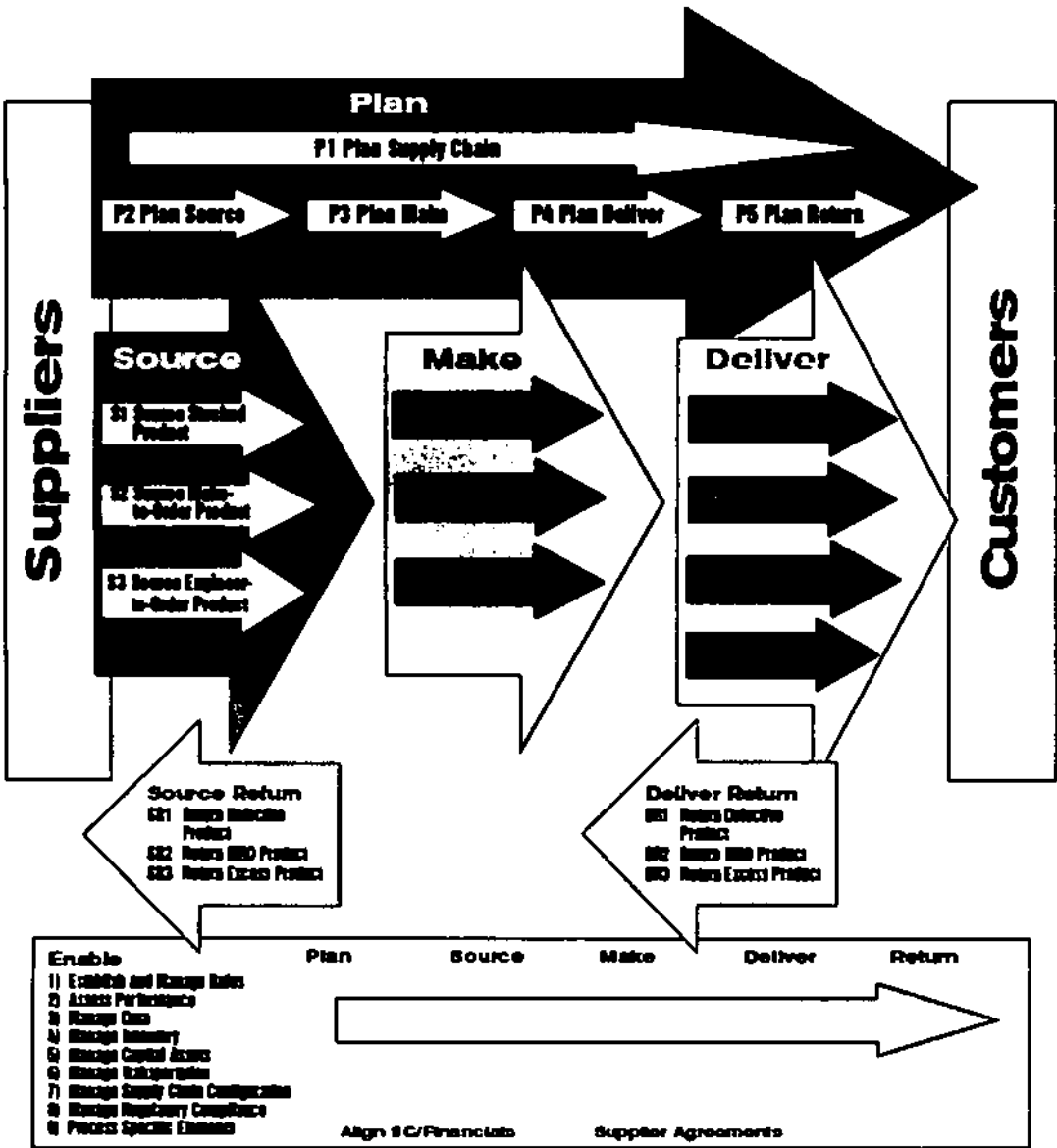


Figure 35: SCOR Reference model (Supply Chain Council, 2006)

In Figure 36 it is clear how the hierarchical representations of reference processes are used in practice. Every process on a higher-level representation is decomposed into its own diagram where all the objects that it is made up of are represented.

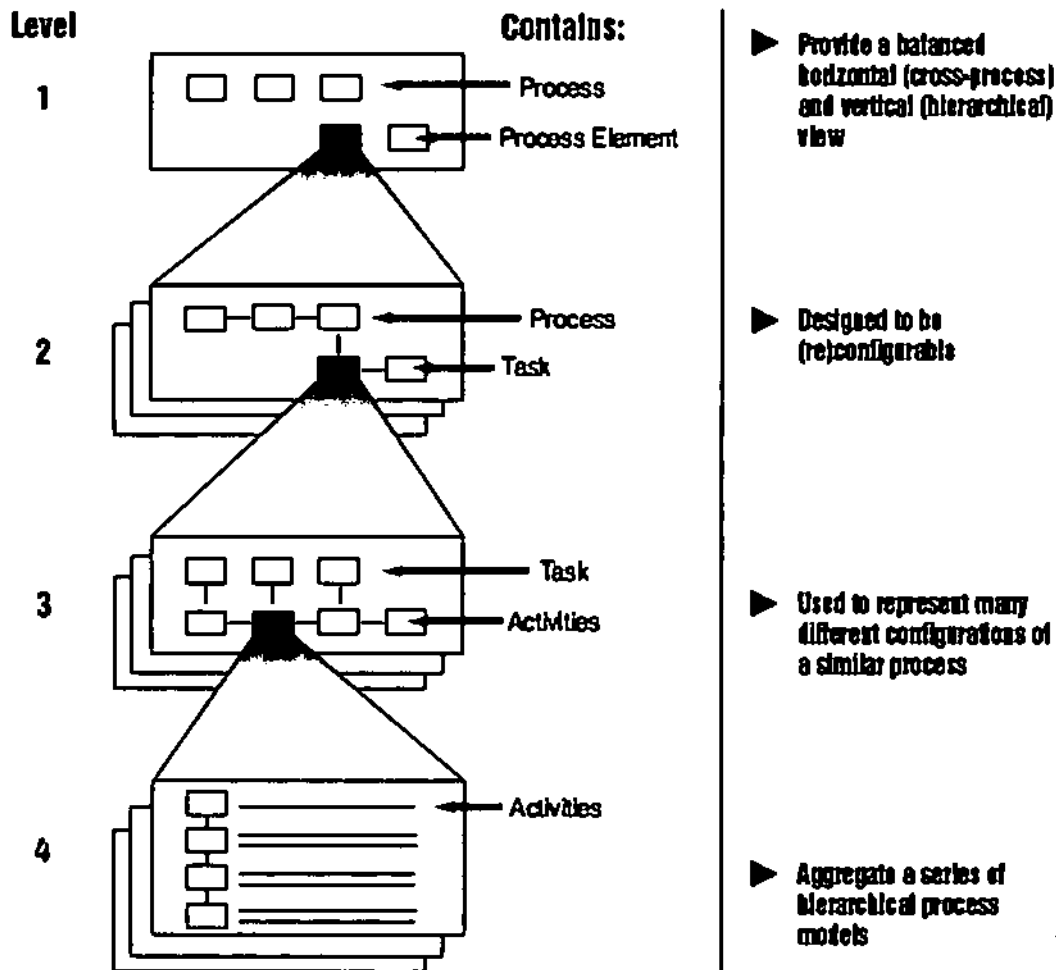


Figure 36: SCOR levels (Supply Chain Council, 2006)

4.5.4. Older Business Process Modelling Methodologies Compared

Several (project) methodologies exist for process modelling. Although Business Process Re-engineering (BPR) as a management approach is not that prominent in recent times, the principles used in BPR projects are still valid for today's process modelling projects. BPR was (and still is) typically associated with large-scale change in an organisation, as typically is the case with the introduction of an ERP system into an organisation. In Table 5 Biazzo (2002: 47) lists three "business improvement" methodologies and compares the different steps and stages with one another.

Table 5: Stages in Business Process Improvement Methodologies (Biazzo, 2002: 47)

COBRA	BPR project stage activity framework	BPI best practice
Stage 1 – Establish the approach and goal setting. Strategy determined and management involved	Stage 1 – Envision Get management commitment, establish IT levers and select the process.	1. Get the CEO to personally drive BPI
		2. Analyse top level processes and set priority
Stage 2 - Opportunity seeking Identify opportunities, prioritize and select team.	Stage 2- Initiative Inform stakeholders, organise team, define requirements and set performance goals.	3. Train staff in methodology and form improvement teams
Stage 3 – Process Analysis Existing processes modelled, effective processes proposed and change capacity assessed.	Stage 3 – Diagnose Document and analyse existing processes.	4. Develop root definition of redesigned process
		5. Map and analyse the AS-IS
Stage 4 – Process redesign New processes, transformed organisation, implementation strategy and IT levers defined.	Stage 4 – Redesign Define and analyse new process and IT, detailed design of process and design HR structure.	6. Develop the TO-BE model
		7. Compare AS-IS and TO-BE processes and identify the required changes
		8. Test the required changes with affected staff for feasibility and desirability.
Stage 5 – Implementation of change New ways of working, learning and attitudes. New systems implemented.	Stage 5 – Reconstruct Implement IT, train new users and move over to new processes.	9. Develop action plans
		10. Train staff in the new process
		11. Roll out the new process. Make sure it is stable.
Stage 6 – Performance monitoring Benchmark cultural change, business performance and technology effectiveness.	Stage 5 - Evaluator Evaluate process performance and link to Continuous Improvement.	12. Implement Continuous Improvement based process management.
		13. Regularly assess processes.
		14. Redesign a process when it no longer meets the requirements.

The methodologies listed in table XX share, in a different number of steps, the same basic fundamentals. A project begins with a phase where the framework for process improvement is established. Then from this framework, processes are identified for improvement and analysed in detail. The detailed analysis always requires some form of process modelling. Then a new design is developed, either as an incremental change on what has been in existence before or, as in the case of classic BPR, with a whole new design starting with a blank page. Then follows a stage of implementation or changeover and thereafter a stage of continuous management and monitoring of the process in order to pick up new opportunities for process improvement. Biazzo points out (2002) the importance of process mapping in all of the techniques in Table 5. Some form of process model, however different in representation and syntax, is required to depict in any methodology, both the current and the future states of the process.

4.6. Measuring Processes

Varghese (2004) suggests the following three dimensions of process performance measurement:

- Effectiveness, which is a measure of how well the process is delivering on customer expectations;
- Efficiency which is the ratio of input vs. output; and
- Adaptability which is the ability of the process to handle change.

Rosemann (2006b) places the requirements for process measurement as an essential success factor in the process modelling effort. The parameters that are to be improved through a process modelling intervention must be defined. These parameters must be measured before the intervention and then also after the new process has been implemented. Without measurement there can be no claim of success for a process modelling project.

4.7. Using a Process Repository

"The company found, in the course of installing an SAP system, that it lacked a consistent way to document all its process designs and share that information throughout its organisation." (Carr, 1999: 25)

Gartner (Hill, Sinur *et al*, 2006) states that the important elements of a process model are the events that start a process, the sequence of activities, and rules in between these activities all working together to reach a result. These elements of a business process model can support simulation if the model includes the availability of resources, the cost of resources, and the time required to execute processes. Gartner sees business process modelling tools (or business process analysis tools) as tools that provide a shared environment that can be used to capture process models. Once captured, the tools can assist in the analysis of the process and, through the

simulation of the process, assist in the optimisation (or redesign) of the processes. Process models in business process analysis tools are typically in graphical format.

One of the problems of using a tool-based repository, according to Biazzo (2002), is that a modelling tool can never be neutral and, since there are so many different modelling techniques available, every tool will pre-select from the available methodologies. The particular selection of methodology (and tool) will have an impact on the way the process model is analysed and consequently re-designed.

Recker (2006) mentions the choice of a process modelling toolset as one of the four decisions required before embarking on a process modelling project. Toolsets are especially important as the number of process maps that are part of the project grows.

4.8. Where Processes Modelling can go Wrong

In this section mention is made of the problems that process modelling faces. Initially a set of 22 "pitfalls" as described by Rosemann is presented and afterwards some general comments from other writers. In stating problems in process modelling as pitfalls, the counter suggestion would be to simply avoid the pitfalls, and as such this section implicitly also has several suggestions on how to improve the success of process modelling.

According to Rosemann (Rosemann, 2006a) (Rosemann, 2006b) there are 22 potential pitfalls to process modelling. He has defined some subdivisions and the 22 pitfalls will be introduced accordingly.

Governance and Strategy

1. Lacking strategic linkages. Process modelling needs to compete for funds and for a manager's attention. As such, it is very important to show the link that can be made between process modelling and the company strategy. Process modelling must make a contribution towards the execution of strategies.
2. Lacking governance. Process modelling needs to be governed. Through governing the act of modelling processes, the responsibilities, tools and procedures can be defined and then managed. Without a form of governance, process modelling may never yield worthwhile results.
3. Lacking synergies. In many organisations, different organisational units map the same processes in different toolsets using different technologies for different purposes. Thus, for SAP implementation, processes are documented in Tool A and at the same time another team of process mapping experts is asking questions relating to the same processes that will be mapped in Tool B for the purpose of Sarbanes-Oxley compliance. True economies of scale can only be achieved if existing work can be re-used.

Stakeholder involvement

4. Lacking qualified modellers. Too much attention is given to the ability of modellers to know a particular toolset, and far too little to his/her ability to actually facilitate workshops and create quality models. Rosemann is of the opinion that the larger a modelling project becomes, the less viable it becomes to perform a quality assessment on every process diagram created and thus the ability of the modellers to do it right the first time is critical.
5. Lacking business representation. In order to model accurately, quality information is required. Often time does not allow modellers to do detailed time and motion studies and, for this reason they are dependent on business representatives who know their processes and know the difference between the "as-is" and "as-if" models.
6. Lacking buy in. Process modelling is more about the process of modelling than it is about the models themselves. The value of process modelling is in many cases more related to the act of modelling than to the models. To ensure buy, in the models that are created must be created in open sight, and they must be available and be reviewed by the people who provided the information. If end users need to take a process model and copy it to Power Point in order to "pretty it up" before using it in communication, the model is lacking pragmatic quality.

Tools and project requirements

7. Lacking realism. At the start of projects, the eventual scope of the process modelling effort is typically underestimated. Decisions made around the technology used to support process modelling should take into consideration the scalability of the solution, both in terms of tool aspects like model maintenance and repository management, but also the choice of methodology.
8. Lacking fit between modelling methodology and modelling tool. Rosemann describes how the choice made first eventually leads to a compromise on the second. To model all aspects of a methodology in one tool will lead to some shortcuts being taken.
9. Lacking detail. Any modelling technique has a particular purpose in mind, thus it caters for that purpose and not for all the information that may be required from process models.
10. Translation capabilities. Many tools claim the ability to seamlessly convert easy to understand business models in executable process models. This ability is often demanded when evaluating tools but seldom used as it is not that easy to do.
11. Lacking modelling capabilities. The most popular tool for process modelling is MS Visio, but this (and many similar tools) is a user friendly interface to create drawings. Visio lacks the abilities of a powerful repository, reporting and analysis and version control required for substantial process models.

Pitfalls in the modelling practice

12. Lacking a good methodology. Vendors of tools, do not necessarily provide a methodology with their tools. Thus an environment that is capable of handling one or more modelling technique (IDEF, EPC, UML, BPMN etc.) is available with several tool functionalities, but no structured approach is provided to

give guidance on how to approach the modelling effort. The methodology must suit several requirements:

1. Those implied by the modelling technique
2. Those required by the way in which the project needs its deliverables
3. Those imposed by the toolset.
4. The methodology should include the following:
 5. Modelling conventions
 6. Guidelines for workshops
 7. Quality assurance procedures
 8. Publication and review cycles
13. Modelling for the sake of modelling. In some projects the energy is not directed towards the understanding of the process but more towards building models. In these cases modellers are more concerned about completeness than relevance. Process modelling should never be an end in itself, it must always address the needs of a particular worthwhile purpose.
14. Over-engineered models. In some organisations, the actual structure of the model is debated for its scientific correctness for days on end. Model design should focus on the applicable use of the model and not strive for academic perfection.
15. Lacking focus on modelling. The models are likely to be less important than the action of modelling. People involved in a modelling intervention remember the insight they came to and the discussions around the process more than they value the diagram that resulted from the discussion. Process modelling must be conducted in a highly interactive fashion.
16. Focusing on too much detail. In many projects the modelling team dives in too deeply into a level of detail that eventually becomes difficult to manage. At lower levels of detail the mapping of exceptions becomes important to the stakeholders and more effort is required to map the exceptions. The models created on such a low level will soon be outdated. Rosemann suggests that 80% modelling is sufficient, thus only define the processes that consume more than 80% of the resources and happen more than 80% of the time.

Designing to-be models

17. Lacking imagination. In many projects the "as-is" is seen as the only source of potential improvement opportunities. This should not be the case.
18. Dangers of best practice. The use of reference models and specific approaches to parts of a company's process because it is best practice have many hidden dangers. The full set of cultural practices and complementary processes that exists in one company can not be copied to another when using a best practice process that worked for them in their circumstances. Best practice examples are only useful in the analysis of process models in that they provide structure and guidance for new ideas in designing new processes.

19. Models developed for the sake of IT. "To-be" models must address the core problems of the process and is not intended to show where new IT solutions will be used to address unresolved process issues in an automated way.

Maintaining process models

20. Modelling success is not business success. The satisfaction of actually creating a valid "to-be" process model does not mean that the altered process has been implemented. Until the time when a newly defined process model is actually implemented, it simply remains a model of something that does not yet exist.
21. Maintenance problems. If models have been created by large teams over a period of time, in the huge repository of process models, many of them will become outdated. As repositories grow the importance of maintaining them also grows and sound practices are required to ensure relevance of process models. Rosemann mentions the concept of model ownership, the content of the process model is the responsibility of someone in the business, whereas the quality aspects of the model (syntactical quality, semantic quality and pragmatic quality) remain the responsibility of a central process group.
22. Lack of measuring. To prove value, the process must be measured before and after the intervention. It is important to define the parameters that must be improved and they must be measured, before and after.

One of the pitfalls in process mapping is the non-linearity of processes, especially in service industries. In manufacturing, processes are very predictable and planned in their sequence and exceptions are rare. In service industries there are many potential ways of altering the process that all deliver valid process outcomes. The problem with business process models (versus system process analysis that require much more detail) is that the model depicts a "should be" view of the process, as if the process was executed under ideal circumstances by people who react like machines to predictable situations.

Human interaction in process modelling is challenging because two different types of people are involved (Rosemann, 2006: 251). Creative thinkers are often the creators of processes, and when sitting down to model the processes, right brain people will have to interact with left brain analysts involved in the mapping and improvement of processes.

From the author's personal experience, but only validated indirectly from literature is the notion of using a single process modelling technique, vs. using several. Biazzo (2002), Ferdian (2001) and Hay (2003) all refer to multiple views within a single process model. The views are, however, typically developed using different modelling techniques. Within a suite of techniques like IDEF or UML, the different types of diagrammatical representations do share some common elements, and therefore in one model both IDEF0 and IDEF3 diagrams can potentially be used. But the problem lies then in the specific purpose of the suite of modelling techniques.

Often projects require some form of functional analysis that is suited to one technique and other views on the behaviour of the process that requires a different technique. Two options are available, both with negative consequences. Either separate modelling environments can be maintained for "pure" views, but this doubles the maintenance effort and puts a strain on the re-use of modelling artefacts, or as an alternative, both techniques can be incorporated into one model, but that leaves the model as something of a mixture, where some of the concepts in the original techniques need to be altered to suit both the requirement for object re-use and the limitations of the modelling toolset.

Choi, Kim and Kim (2005) state that there are limitations in traditional process modelling methodologies (in this case, rather the techniques) as they feel the techniques are too generic and lack terminology and performance metrics that they would want to see for their purpose of business modelling. Techniques developed for IT modelling do not suit the needs of business process managers. Although Choi, Kim & Kim (2005) differ from other writers in how methodologies and techniques are difficult to fit to your purpose, they do agree that obtaining a fit between methodology and purpose is hard to achieve.

The process paradox described by Varghese (2004) also contains one of the pitfalls of process modelling: not adding any business value because the process that is being optimised is not directly related to the success of the business.

According to Biazzo (2002), one of the problems in process modelling is the idea of seeing the human involvement in a process simply as another type of resource; there is a large part of the interaction of humans in a process that can be attributed to social aspects of human behaviour. The more routine a task is, the more the conventional method of simply seeing the person as another resource is applicable. Processes that are non-routine require a different method. Biazzo does, however, not propose a different process mapping solution for non-routine tasks.

4.9. Avoiding Pitfalls

Hammer, as one of the fathers of business process re-engineering has a radical solution to improving the chances of success of a newly designed process (Hammer & Stanton, 1999: 109). He realised that it was difficult to superimpose a new integrated process on top of the old functionally based organisation structure and, thus rather than adapting the process, he suggests changing the organisation.

According to Hammer (Hammer & Stanton, 1999), organisations that are committed to processes have process owners. The role of a process owner is entrusted to a senior manager, who takes responsibility for the end-to-end process. He or she should have real authority to design and change the process and train people working on the process. Hammer further mentions that functional managers should have budgets allocated to them by

the process managers (Hammer & Stanton, 1999). One person that looks after a repeatable process design reduces the chances of improvisation and variation in the process (Hammer, 2002: 27).

Hill et al (2006) suppose that one of the tips for success in managing processes in an enterprise is to group specialists into one unit. The skills to define business processes and act as intermediaries between the people with process knowledge and the end users of business processes are not readily available. Thus it is best not to disperse this scarce skill of process facilitation, but rather group them into a single unit.

Nurcan et al (2005) state two typical challenges that they have experienced: the large volumes of detail that needs to be handled and analysed in order to improve business processes; and the difficulty to establish what the best fit is between the organisational needs of the process maps, and the system requirements of the process maps.

In order to address large volumes of work, they suggest that it is better to work from the top downwards, but to start at the level of detail that is required for the analysis and then go one deeper. Levels of abstraction in process models are necessary to deal with large volumes and with complexity, but having more levels add its own difficulty. Nurcan et al believe that a quality assurance mechanism must be in place to ensure that on lower levels of abstraction objects are still at the same level.

Rosemann (2006a) mentions that the responsibilities for process modelling are typically separated in most organisations: business areas assume responsibility for the content of business processes, whereas a centralised process management organisation takes care of consistency and sticking to the modelling conventions.

4.10. Chapter Summary

Before starting any modelling project, careful consideration should be given to the following aspects:

1. Deciding on a modelling strategy - where to start and very importantly deciding exactly why the modelling is required;
2. How to manage the modelling effort, centralised or decentralised;
3. Deciding on the modelling technique (also referred to as the modelling language);
4. Deciding on a process modelling tool; and
5. Deciding on a reference model.

Modelling business processes come at a cost and the cost can be directly linked to the number of levels used to depict the business process. As more levels of detail are added, the modelling cost increases at an exponential rate, but the value of the additional information gather diminishes. At a level of detail where the cost to benefit ratio is optimal, modelling effort should be contained.

Six Sigma, meaningful process improvement and reference models are tools that can assist in the modelling effort. In essence, these are guidelines that either depict the steps that should be taken (a modelling methodology) or the processes that should be mapped (process reference model). The important aspect of these process modelling tools is that they must be decided upon prior to the start of any modelling activity. A process modelling methodology includes some tools, but the essence of it is not the tools suggested to be used, but the sequence in which information is gathered and then analysed using the tools. Consulting firms and companies with process modelling units can develop their own methodology, and even own reference process models. The important aspect of these two concepts is that they should be decided upfront and then be applied throughout the modelling endeavour.

The pitfalls in process modelling can be grouped into six areas:

1. Governance and strategy: Process modelling must have a valid purpose and must be controlled to deliver that purpose.
2. Stakeholder involvement: This is critical as all parties involved in the process must also be involved in the modelling of the process.
3. Tool and project requirements: The environment into which the process models are documented should be capable of delivering the required functionality.
4. Modelling practice. Which is the way in which process modelling teams approach the task of modelling. The pitfalls under modelling practice include a lack of methodology, a lack of focus and modelling at an incorrect level of detail.
5. Pitfalls relating to future models: These include lacking imagination, sticking in "best practice" and simply automating a process.

6. Maintenance issues and lack of measurement: These pitfalls endanger the sustainability of the process models.

The next chapter defines the research design required to answer the remaining two research questions:

- "How is business process modelling viewed from a South African perspective?"
- "What factors are influencing the sustainable use of business processes in South Africa?"

5. RESEARCH DESIGN

5.1. Chapter Introduction

This chapter defines the research design required to answer the two research questions:

- "How is business process modelling viewed from a South African perspective?"
- "What factors are influencing the sustainable use of business processes in South Africa?"

In the orientation chapter the reasons for choosing a structured interview as research instrument were described. This chapter focuses on the design of the discussion guideline that was used by the author during interviews with process experts.

The design of the discussion guideline touches on all of the research questions, but the focus of the design is towards extracting from the process experts their opinion on the state of process modelling in South Africa: What is different about the South African context and what are the factors that point to sustainable business process modelling in South Africa?

This chapter also describes the structure of the data analysis tool and how the scoring of comments made by process experts was managed.

5.2. Discussion Guidelines

The interview was structured in the sense that although the discussion and the points made by the respondent were allowed to take any format, the researcher needed to ensure that all the potential factors influencing sustainable process modelling were addressed. The interviews had the following overall structure:

- Introduction to the study and between the researcher and the process expert;
- Definitions of business process related concepts;
- Discussion on the purpose of business process modelling in South Africa;
- Discussion on the nature of models (fit for purpose);
- Discussion on the nature of modelling;
- Discussion on the what sustainability means to the process expert;
- Reasons for failure and success;
- Ranking and validation of framework constructs; and
- General discussion on current trends.

The interviews all required between one and two hours. The interview was divided into three main sessions:

- **Session 1** - *Introduction and research topics*. In this part the researcher introduced himself and introduced the research topics. Every research topic was then discussed by the process expert without any interruption or introduction of additional concepts by the researcher. This session required approximately 40 minutes.
- **Session 2** - *Detail verification*. In this second session the researcher worked through the list of detailed "questions" or "topics". If the process expert discussed the topic in detail during session one, the researcher gave his reflection on the process experts opinion; if the researcher paraphrased the expert's incorrectly, the expert had the opportunity to add or amend the comment documented. If a topic was not discussed, the researcher then introduced the concept. During this stage of the interview, discussions were not allowed to move to other points, but were focused towards addressing every concept. This session typically consumed another 40 minutes. At the end of the session, the researcher asked the process expert to give a quick view on the main reasons for success and failure of business process modelling.
- **Session 3** - *Framework verification and general*. This last session required only 15 to 20 minutes and closed the interview. The researcher presented to the process expert two frameworks, one to be ranked in terms of importance and the other to verify validity. Then the researcher asked the general questions that did not relate directly to the content of this study, but eased the interview into an informal discussion and winded it down.

In Table 6 the full discussion guideline is presented. In the following sections each of the topics of discussion are described in more detail.

Table 6: Discussion guideline

Structure for interview: Sustainable Business Process Modelling**1 Introduction**

- a Who I am
- b Who am I interviewing
- c Position in organisation
- d Purpose of the study
 - What is business process modelling?
 - Why do organisations use business process modelling?
 - Why use business processes in a sustainable manner?
 - How can business process modelling be optimally applied?
 - How is business process modelling viewed from a South African perspective?
 - What factors are influencing the sustainable use of business processes in SA?

2 Definitions*Discussed*

a	How do you understand the term Business Process Model?	
b	How do you understand the term Business Process Modeling?	
c	What would you understand under the sustainability of business process modelling?	

3 Purpose of business process modelling in SA?

a	What is the purposes of modelling in SA in your experience?	
b	Do SA companies utilise the full potential of their modelling efforts?	

4 The nature of models (fit for purpose)

a	What technique / notation / language ensure success? (one or many?)	
b	What are the views required?	
c	What are the importance of a taxonomy /reference model?	
d	What is the importance of a meta model in ensuring success?	
e	What methodologies ensure success?	
f	What are the measures of model quality required to ensure success?	
g	What are the tips for tool selection (if tools are important)?	
h	What are your tips for tool use (if tools are important)?	

5 The Nature of modelling

a	What would successful Project management include in a modelling project?	
b	How would you ensure valid information sources (if deemed important)?	
c	How would you ensure stakeholder participation (if deemed important)?	
d	How would you ensure management involvement (if deemed important)?	
e	How would you ensure process modelling skills on a project (if deemed important)?	
f	How many levels of abstraction ensure success? (top down or vice versa?)	
g	Is governance in the modelling project important to ensure success?	
h	Comments on focus in the team, to create models or to deliver results?	

6 Defining sustainability*Availability*

a	Re-use of models	
b	Maintenance of models	
c	Reviewing model content	
d	Using process repositories	
e	Publication of models	
f	Centralised v.s. decentralised modelling control	

Integration into enterprise

a	Process ownership	
b	Process measurement (before and after)	
c	Decision making based on process model information	
d	Measurement of the organisation against a process maturity scale	

7 Reasons for failure and success

a	Reasons for failure (project or sustainable use)	
b	Reasons for success (project or sustainable use)	

8 General

a	Do you deem it important that process modelling is linked to strategy?	
b	Do you agree that Process modelling requires a in-house competency?	
c	How would you view the involvement of consulting firms?	
d	Your opinion on UML	
e	Your opinion on BPMN	
f	Your opinion on Business Process Management	
g	Your opinion on automating processes / workflow / BPM (in IT definition of BPM)	

5.2.1. Guideline 1: Introduction

The introduction was, in essence, the part of the interview where the process expert was allowed to freely express his/her views. The detailed guidelines included:

- Introduction to the researcher and the research topic.
- Request for some background information of the process expert, his/her position in organisations and process modelling engagements.
- The researcher then introduces, as open ended topics, the research questions of this study:
 - What is Business Process Modelling?
 - Why do organisations use Business Process Modelling?
 - Why use business processes in a sustainable manner?
 - How can Business Process Modelling be optimally applied?
 - How is Business Process Modelling viewed from a South African perspective?
 - What factors are influencing the sustainable use of business processes in SA?

The information given by the process expert during this part of the interview represented his/her raw opinion on the topics. The researcher needed to attend not only to the aspects discussed and opinions voiced by the process expert, but also those topics not mentioned in order to cover them in the second stage of the interview. During this stage the interviewer did not enter into any content discussion but only used affirmative questioning to get more detail regarding the topics the process expert mentioned him/herself.

5.2.2. Guideline 2: Definitions

In this section the researcher verified the expert's understanding of the terminology used: business process model; business process modelling; and sustainable process modelling. The researcher needed to share his views on these concepts to ensure that the process expert discussed the topics that followed with the correct construct in mind.

5.2.3. Guideline 3: Purpose of Business Process Modelling in South Africa

This topic specifically addressed one of the research questions and was discussed around:

- What is the purpose of business process modelling in SA in your experience?
- Do South African companies utilise the full potential of their modelling efforts?

Answers given by process experts could be interpreted to point towards not only what process modelling was used for, but also to what the process expert believed process modelling should be used for.

5.2.4. Guideline 4: The Nature of Models

The following topics were discussed to determine the impact that the process models themselves have on the sustainability of process modelling:

- What technique / notation / language ensure success? (one or many?)
- What are the views required?
- What is the importance of a taxonomy / reference model?
- What is the importance of a meta model in ensuring success?
- What methodologies ensure success?
- What are the measures of model quality required to ensure success?
- What are the tips for tool selection (if tools are important)?
- What are your tips for tool use (if tools are important)?

The researcher actively investigated the possibility of finding indicators for the sustainable use of process modelling in the structure of the process models themselves. In this way the researcher attempted to pinpoint the essential attributes of a well constructed process model.

5.2.5. Guideline 5: The Nature of Modelling

This set of questions relates to the act of modelling and how a team of process modellers would work together on a project that is intended to produce business process models:

- What would successful project management include in a modelling project?
- How would you ensure valid information sources (if deemed important)?
- How would you ensure stakeholder participation (if deemed important)?
- How would you ensure management involvement (if deemed important)?
- How would you ensure process modelling skills on a project (if deemed important)?
- How many levels of abstraction ensure success? (top down or vice versa?)
- Is governance in the modelling project important to ensure success?
- Comments on ensuring focus in the team: was the focus to create models or to deliver results?

This set of questions delved into projects. It was based on the assumption that successful projects are more likely to deliver output that can be used in a sustainable way. Some of the answers given by the process

experts on this set of topics may also apply to process modelling that is performed outside of a modelling project.

5.2.6. Guideline 6: Defining Sustainability

This guideline was to ensure that all of the concepts in literature that do point to either modelling success or to sustainable process modelling are introduced to the process expert.

- Re-use of models;
- Maintenance of models;
- Reviewing model content;
- Using process repositories;
- Publication of models;
- Centralised vs. decentralised modelling control;
- Process ownership;
- Process measurement (before and after);
- Decision making based on process model information; and
- Measurement of the organisation against a process maturity scale.

These questions pointed towards the optimal type of structure for a process modelling capability within an organisation.

5.2.7. Guideline 7: Reasons for Failure and Success

The researcher introduced this guideline through giving a quick overview of all the concepts discussed thus far and then asked the process expert to list the concepts that are most indicative of process modelling success and failure.

5.2.8. Discussion on Graphical Models

In closing down the interview, the researcher then presented two graphical frameworks to the process expert.

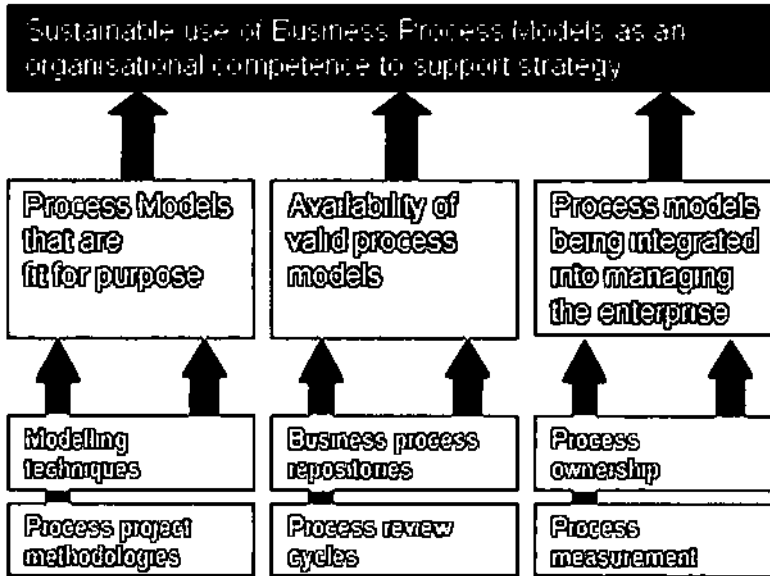


Figure 37: Literature review framework

The researcher asked the process expert whether he/she agrees with the framework depicted in Figure 37 that shows concepts that can lead to process modelling sustainability. This was intended to be an open discussion and freedom to alter the framework was given to the process expert. The researcher also added to this framework based on earlier statements made by the process expert.

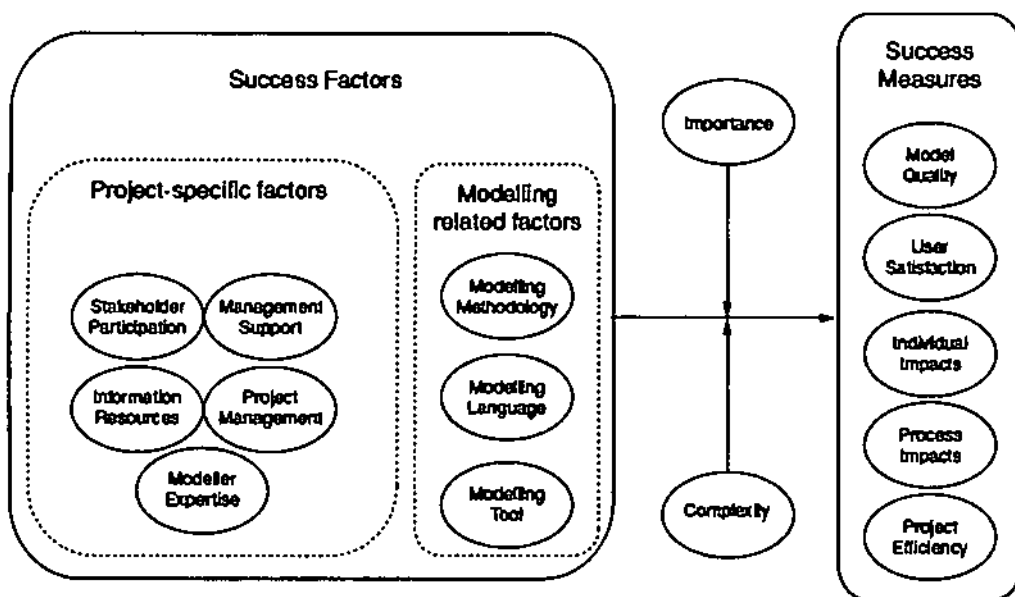


Figure 38: Re-specified process modelling success model. (Bandara, Gable & Rosemann, 2005: 357)

Then the process expert was asked to rate the 8 success factors identified in the Bandara, Gable and Rosemann model (Figure 38) using a simple 1, 2, 3 scale:

- 1 - Very important
- 2 - Also important
- 3 - Not that important

5.2.9. Guideline 8: General

The purpose of the general discussion was to ease the interview into an informal discussion and to close it off. The topics addressed do not directly relate to the study but are current trends in business process modelling. If the expert made a statement that related to the field of this research it was included in the data analysis.

5.3. Technical Considerations

To successfully conduct the interviews, the researcher had prepared an interview guideline form with all the main topics and detail listed. At no time was the process expert directly exposed to the guideline form. A second page with the two frameworks printed out was also used during the interview. These printed diagrams were showed to the process expert at the end of the session and he/she ranked the concepts in their importance on the basis of a three-point scale.

The researcher made use of two voice recording devices to ensure that all comments made by the process expert were captured for later analysis. As the researcher was actively involved in the discussion, notes could not be actively made during the interview and thus the majority of the data was retrieved from the recordings and not from notes made during the interview.

5.4. Data Analysis Tool

In order to interpret the information gathered through the interviews, a database was developed in Microsoft Access. The database structure included the following:

Question-

The question table included all the discussion points that could have been used during the interviews. Although called "questions", these discussion points were not necessarily addressed in a particular sequence nor did the nature of the interview allow for all of the points to be discussed with every interview. The discussion points are classified according to the research question it addresses and the section in which it could be used. This allows for analysis based on what the process expert mentioned based on very vague pointers or the comments that were mentioned as a response to very specific discussion points.

Comment-

In this table, a summary of the comments made by the process experts is set out. In many instances the comments included detailed examples from past projects, but for the sake of analysis only the core of every comment was documented. These documented comments are all related to one of the "Questions" (or discussion points) and also to the person who made the comment.

Respondent-

This table includes the personal detail of every process expert and is categorised according to the type of position he/she holds in his/her respective organisation. All the comments made can be related to one of the respondents.

Concept-

As concepts were identified throughout the codification of interviews, these were added into a comment table. The concepts were categorised into another level for reporting purposes.

Relation-

The relation table was used to give a score between the comment made and one or more of the concepts identified. A comment field was provided to explain why the relation was made and the strength of the relation can also be scored.

Figure 39 explains the relationships between the different tables and also an example of the format in which the information was entered when the interviews were codified.

In Figure 40 the database structure and an example of the data capturing view of the data analysis tool is depicted.

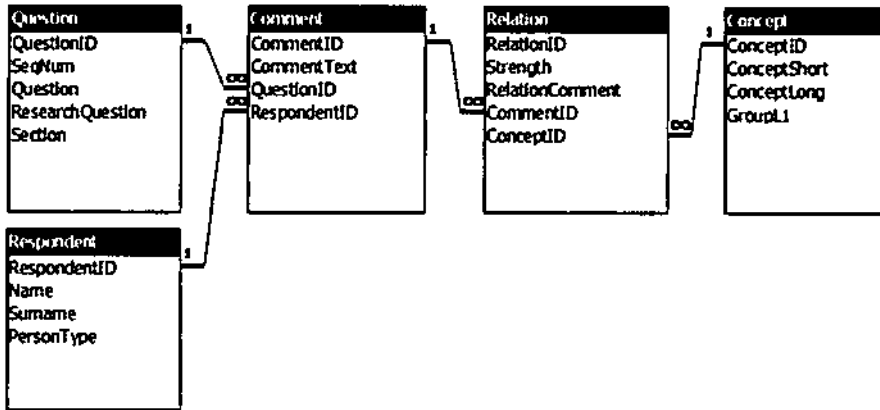


Figure 39: Database structure used for analysis of interviews (by the author)

Microsoft Access - [Question: Table]					
File Edit View Insert Format Records Tools Window Help					
Type a question for help					
SeqNum	Question	ResearchQuestion	Section		
1	Introduction - What is business process modelling?	What is modelling	Intro		
2	Introduction - Why do organisations use business process modelling?	Why use modelling	Intro		
3	Introduction - Why use business processes in a sustainable manner?	Why use sustainable	Intro		
4	Introduction - How can business process modelling be optimally applied?	How to apply optimally	Intro		
5	Introduction - How is business process modelling viewed from a South African perspective?	SA perspective	Intro		
6	Introduction - What factors are influencing the sustainable use of business processes in SA?	Factors that influence	Intro		
CommentID	CommentText	QuestionID	RespondentID		
25	Discussion of level of risk, but of the opinion that this is not particular to SA, low level of maturity in rest of the world as well, they only do it for compliance purposes	1			
RelationID	Strength	RelationComment	ConceptID		
35	1	but regarding European context	USB - Compliance		
(AutoNumber)	0				
108	The use of tools to make the processes more visible and to make analysing the process maps more user friendly. More available even in hard copy format.				
129	getting people involved in buying in				
RelationID	Strength	RelationComment	ConceptID		
129	1	getting people involved in buying in, greater involvement with the	Design - Stakeholder participation		
130	1	Capacitate people - to get people active involved	Enterprise must be enabled to use processes		
131	1	ensure that processes are updated	Sustainability - learning and process update		
(AutoNumber)	0				
110	Identify process owners that are responsible for their process areas				
176	The new BPM software that developed from the workflow world. It does not contain functionally based, but a only takes from a legacy system of the information required to perform a process and places it on the desk of the person responsible. If not completed in a certain time it gets escalated to senior levels. This will force				
177	Measurement of processes. There is no process operational units in enterprises for processes so there are OD and IT organizations in enterprises				
179	Many organisations claim that they have a process focus and is a process centric organisation, but do not put money and people towards managing processes				
333	the full use of a repository is not realised by SA companies. Thus no maturity and no managerial attention is given.				
334	the criteria for sustainable process modelling are all outside the models. It is about process ownership, the heart of it, the methodology and change management plan. As then the quality of the "after service care" is what extent is the modelling and measurement included in the measurement of people. Supervisors must be				
336	as SA companies do not. Many organisations see process modelling as a once off. SA companies do not realise, they do not publish enough, they do not enforce maintenance of processes.				
(AutoNumber)					

Figure 40: Data capturing screen (by the author)

5.5. Scoring of Interviews

Since a structured interview is not a questionnaire, the information gathered was not in a format that could immediately be used for analysis. The audio recordings made during interviews were analysed and every comment made condensed into a core statement and then, where applicable, associated to one of the recurring concepts. In order to give prominence to the issues discussed in depth by the process experts the following rating was adopted:

- Whenever a statement was made that supported one of the concepts, the concept was related to the comment with a strength of 1.
- If the respondent iterated that the point was really important, the strength between the comment and the concept was captured as a 2.
- In a case where wording was used that pointed towards a very strong opinion in favour of a concept (words like "critical", "utmost importance", "cannot be a success without") the relation to the concept was captured with a strength of 3.
- The discussion point that asked for the respondent to give his or her top four to six contributing factors were all related to the concepts it addressed, scoring at a strength of 3.

The scoring of the "Re-specified process modelling success model" of Bandara, Gable and Rosemann (2005) proved to be inconclusive when only using numeric equivalent numbers (1 = not that important, 2 = important, 3 = crucial). As the three numeric values are very close, the total scores for the eight contributing factors according to this framework did not clearly indicate factors more or less important to the South African Business Process Modelling community. To overcome this obstacle the scoring was recalculated using numeric equivalents that are more disperse, i.e. 1 = not that important, 3 = important, 5 = crucial. Using this scale a more diverse scoring range was achieved and the leading factors could then be isolated.

Scores made regarding the eight concepts of Bandara, Gable and Rosemann were also included in the final scoring of all concepts, but rather using the initial 1,2,3 scheme to indicate importance.

The scores made in this study are a quantitative method to analyse qualitative data, and as such, the scoring cannot be seen as absolute. In the interpretation of the results, the content of the actual comments made regarding a concept is taken as the primary input, with the numerical totals secondary.

5.6. Chapter Summary

This chapter described the development of two instruments to assist in the analysis of qualitative information that can be extracted from respondents when using an interview.

Firstly the discussion guidelines that directed the interviews around the following points discussed:

- Introduction, both to the concepts under investigation and the author who investigated.
- Definitions, to achieve some alignment of terminology used in the remainder of the interview.
- Business process modelling in South Africa, a discussion on the use of models and the unique aspects of process modelling as it relates to its application in South Africa.
- The nature of models, how a model should be structured to ensure sustainability.
- The nature of modelling, how managing the team and the modelling activities play a part in the quality of models.
- Discussion on the nature of sustainability.
- Opportunity for the process expert to provide his/her most prominent factors that point to sustainable Business Process Modelling.
- Discussion of the "Re-specified process modelling success model"
- General and trend-related discussion points and closure.

The chapter then concluded with a discussion of the database use to codify comments made by process experts and the scores that were linked to statements. The database used 5 tables and the scoring system employed numerical equivalent values for statements that ranged from being mentioned to being emphasised:

- 1 = Mention was made of a concept that supports sustainability
- 2 = The interviewee re-iterated the importance, either by stating that the concept is very important or by mentioning the concept several times in the same comment.
- 3 = Adjectives similar to "critical" or "of utmost importance" were used when referring to a concept that supports sustainable business process modelling.

In the next chapter the detailed results of the interviews are presented.

6. RESULTS: A SOUTH AFRICAN PERSPECTIVE ON BUSINESS PROCESS MODELLING

6.1. Chapter Introduction

In the following sections, the results of the analysis of the interviews are presented. After introducing the process experts, the different concepts that were identified in interviews are listed and the method of grouping them to calculate the final scoring is discussed.

Individual highlights of the individual responses from the process experts interviewed are then presented. Individual views are not coded into similar concepts but are presented as the "raw" responses to open ended questions. The author will provide in all cases the main reasons for sustainable business process modelling mentioned by the experts, and then provide a summary of the respondent's main arguments.

After discussing every respondent, graphs and tables are used to give detail on the combined responses of the process experts. Grouped results are presented for the following main categories:

- Main contributing factors to sustainable process modelling. The four to six primary contributing factors as mentioned by every interviewee;
- Unsolicited opinions: the factors mentioned during sections of the interview where open ended questions were asked;
- Opinions regarding the nature of process models;
- Opinions regarding the act of process modelling;
- Opinions regarding the sustainability of business process modelling;
- Scoring of the "Re-specified process modelling success model" of Bandara, Gable and Rosemann (2005); and
- Overall scoring incorporating all sections.

Lastly, an overview is given of the alterations suggested by the respondents to the framework presented by the author to explain the factors that contribute to sustainable business process modelling.

6.2. Introduction to the Process Experts Interviewed

Interviews were arranged with seven process experts. Of these, only one could not have been completed. Interviews typically lasted up to two hours and were conducted in either the working or home environment of the interviewee.

Table 7 provides some background information on the level of experience of the process experts interviewed. It is sorted according to the level of experience and is not presented in the same sequence as the individual summaries that are presented in section 6.4.

Please note that three of the people interviewed represented consultation companies and three were working as process custodians (internal consultant or manager of process modelling activities) in large companies. The equal number of consultants and custodians provided a basis for comparing the results of the study for consultants and process custodians.

Table 7: Demographic detail of process experts

Person Type	Relevant experience				Background / Qualification
	5	10	15	20	
Consultant					B.Com
Consultant					MBA
Consultant					MBA
Process Custodian					Engineering
Process Custodian					Operations Research
Process Custodian					Doctorate in Process Management

6.3. Concepts used to Score Comments made by Process Experts

The process of codification of the interviews led to the creation of a list of concepts. A concept was a factor that was mentioned by one of the process experts that could influence the sustainability of business process modelling. The codification of the first interview added the highest number of new concepts to the list and by the end of the third interview no new concepts were added. To limit new concepts was necessary to ensure that the last interviews codified were not measured against a set of concepts totally different from the first. The total number of concepts mentioned was 51, but not all of these could be directly related to factors contributing to sustainable business process modelling as some refer specifically to the use of process modelling in South Africa.

The 51 concepts and how they were grouped are presented in Table 8 and Table 9.

Table 8: Concepts used in scoring and the corresponding factors (part a)

ConceptShort	Factor	Factor definition
Sustainability - is about the willingness of people	Buyin	Buyin addresses the willingness of people to interact with processes. It means that they believe in the value process modelling can deliver and are ready to engage.
People - Motivation to interact with processes - incentives and rational		
Models must talk to Business leaders		
Business Buy in is required		
Process culture is required	Culture	Culture relates to people that do not understand the value of process models, but are living it every day
People must see themselves in the process models		
Governance in projects teams are required	Governance	Governance relates to the activities required to ensure that process models are focused and modelled according to the rules of both language and methodology.
Alignment and focus in the modelling team is required		
Diagram > Modelling language	Language	Making the right choice of modelling language or technique
Sustainability - is about re-use	Maintain	To maintain and keep process models up to date.
Sustainability - learning and process update		
Executive Buy in is required	Management support	management support means that top management are believing in the value of process modelling and are backing their believes with personal time, making budget available and actively supporting the process modelling effort.
Diagram > Management support		
Leadership from top management is required		
Sustainability - Measuring against a maturity scale is important	Measurement	This grouping relates to the importance of knowing how good a process or the management of a process was at some point in time and how well it is doing today.
Process measurement is required (before and after)		
Diagram > Project management	Method	Method as a grouping refer to all the knowledge and skills that can be found in a process modeling team. Method is something that is initially sourced from external sources and then customised for the particular organisation. Method is something that must be defined and the adhered to.
Diagram > Modelling methodology		
Top down is best approach		
Project Management is required		
Reference models are required		
Methodology is required		

Table 9: Concepts used in scoring and the corresponding factors (part b)

Concept/Short	Factor	Factor definition
Process Models are graphical	Nature	
Process Ownership is required (Cross Functional)	Ownership	Process ownership. Having a respected individual who assumes responsibility for a process, its definition, its update and its performance.
Process Ownership is required (Functional)		
Modelling requires actual participation from business (vs. Modeler/consultant)	Participation	Participation relates to actual engagement between the process modelers and the people knowledgeable about the process. Participation points towards a joint effort in creating process models.
Information > the correct sources of information must be available		
Diagram > Stakeholder participation		
Diagram > Information resources	Purpose	Purpose relates to having the "why" of every process modelling project clearly defined, typically a link to an issue of strategic importance.
Correct purpose for modelling must be defined		
Link to objectives and strategy		
Complete project focus > Strategy, Organisation, Technology and Process	Skills	Skills refers to the level of knowledge and skill in both the modelling team and the people they are interacting with regarding the basic theory of process modelling language and methodology.
Enterprise must be enabled to use processes		
Skilled process modelers required		
Diagram > Modeler expertise	Tool	The "tool" grouping refers to both the tool in its importance as being a repository for process information and its easy of use to support modelling and analysis.
Tool ease of use		
Single model with multiple views from one data set		
Diagram > Modeling Tool	Use	
USE - Application design		
USE - Compliance		
USE - standardisation		
USE - Communication		
USE - Training		
USE - Optimisation		
USE - Analysis		
USE - OD design		
USE - Capturing knowledge	User requirements	User requirements. This grouping refers to the concept of making the user king. The user need to get what he/she wants and not necessarily what is required.
Quality is when the process model makes sense and add value to the user of it		
Quality of a model/diagram depends on the understanding of User requirements	Validity	Validity refers to good models that in respect to their content reflect reality and have clear re-use potential due to its correctness.
Current number of levels		
Models must reflect reality		

The concepts listed in Table 8 and Table 9 and the grouping applied to them are based on the author's understanding of the terminology and concepts. Both the initial list of concepts and the grouping of them into factors may have introduced some bias into the study, but steps were taken to reduce as far as possible other sources of variation that could have influenced the study. All interviews were conducted within a time span of four days using the same discussion guideline. All interviews were coded within a short time span of one week. Although the grouping and scoring performed by the author may not have been objective, they were consistently applied across all six interviews.

6.4. Individual Summary

The individual summaries in this section, document the main contributing factors as listed by the process experts condensed into single sentences. Between four and eight comments regarding factors that influence sustainability of business process modelling were obtained from every interview. If the process expert expressed out of his/her own accord some interesting opinions, these are briefly discussed. A graph showing in detail the codified factors of the total interview is presented as a pie chart. Approximately 80% of the respondent's coded responses are indicated with the relative percentages and the remaining 20% are condensed into "other".

6.4.1. Respondent 1

The respondent mentioned the following as his/her list of key indicators for sustainable process modelling:

- The process model must reflect reality. It must be a depiction that is warmly accepted for being accurate and true by the stakeholders in the process.
- There must be buy in from the business. Stakeholders must agree with the process followed and participate in the modelling effort.
- A process culture must be in place in the business. This is a prerequisite for sustainable business process modelling.
- The organisation must take ownership of the models, not the consultants who created it.

The respondent also mentioned reasons for failing to create sustainable business process models:

- Not having business buy in;
- Attempting projects that are too big, rather than small focussed projects; and
- Commitment and experience are not always being available within South African organisations to deliver value from small focused process modelling projects.

The respondent placed an emphasis on the people who are operationally involved in the process and linked the sustainability of the process not to modelling, but rather to the culture of people. Thus in this respondent's view, a process culture needs to be established so that an audience exists in the organisation who can accept the output of process modelling efforts.

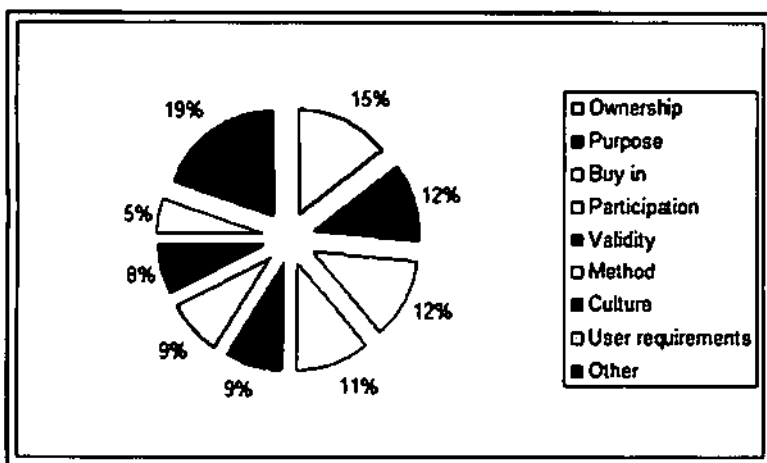


Figure 41: Scoring of factors for respondent 1

6.4.2. Respondent 2

The factors rated as most important by respondent 2:

- Whether they (as a consulting firm) have managed the client's expectations.
- Whether they (as a consulting firm) have managed stakeholders effectively and whether the client knows what to do to in order to sustain the process model afterwards.
- The client should accept ownership of the process model.
- Effective control of the quality of process models is required by governing the modelling team.
- The process modelling project and the process models must be tied to strategy.
- The quality of information received from and engagement with the users of the process.

Respondent 2 placed the emphasis on the role that people play in process modelling. Stakeholders must be involved; they should all understand what the purpose of the modelling exercise is. Members of the modelling team should adhere to governance and the chosen modelling methodology to deliver sustainable process models.

The respondent mentioned that sustainable business process modelling is closely related to keeping the client happy. If the client is happy the consultant has delivered.

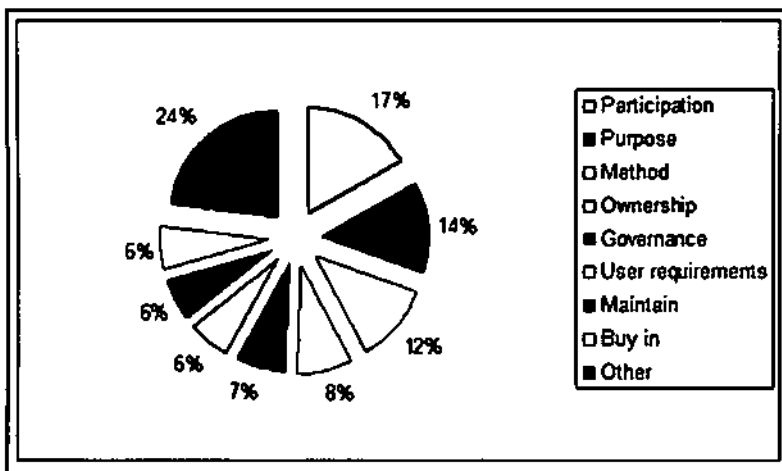


Figure 42: Scoring of factors for respondent 2

6.4.3. Respondent 3

The factors rated as most important by respondent 3:

- The linkage between an organisation's overarching strategy and the processes must be clear.
- The tool is important. In a large project there will be a high number of processes, and therefore the tool is important. The nature of the tool must be easy to use.
- Process ownership is an important factor for sustainable business process modelling. With ownership the intention is not inclusivity of many different role-players into the modelling effort, but rather core individuals in key positions at a level of maturity to admit and fix the problems in their processes.
- The levels of skill of both the modelling team and the custodians of the process models in the organisation (i.e. the cross functional process owners) are important.

Levels of skill were discussed in detail by the respondent. The modelling team must be able to work with the model (in a toolset) and should be able to simulate and analyse the processes. Secondly the level of skill of the modelling team should ensure some credibility. Thus the team should not be people who simply make connections between rectangles, but people who earn a level of trust in their judgement, even if their recommendations are uncomfortable to implement.

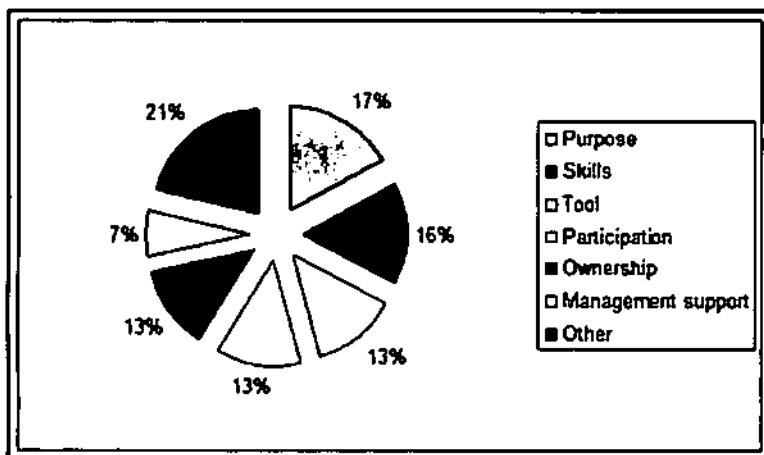


Figure 43: Scoring of factors for respondent 3

6.4.4. Respondent 4

In the organisation represented by respondent 4 there is a large investment in the management of business processes. In essence this organisation has moved beyond the mere modelling of processes and the organisation is engaging in the management of business processes. Business processes are managed according to the large platform systems are used across multiple business units.

A large portion of the complexity in this organisation revolves around the management of process ownership as a mixed model of both cross-functional and functional process owners are deployed. More than 40 business units all have their own process organisations and a central organisation is in place. Between the business units there are some shared responsibilities as some are delivery channels; others are product houses and then other units represent market segments. In all this confusion several process owners may exist in the different business units, with a single process custodian that manages the end-to-end process in conjunction with the process owners.

The factors rated as most important by respondent 4:

- Top management support. Members at board level need to position process management as a high priority.
- Process culture. Representatives across different units all need to keep the process in mind.
- There must be leadership. Clear guidance is required from top management regarding the road ahead.
- End-to-end process ownership. Processes must be managed across different business units.
- Standard technique/ practice. The same notation must be used to model to the same level of detail using the same reference model and engagement strategies.
- Governance of process modelling. The standards must be enforced from a centralised process division.

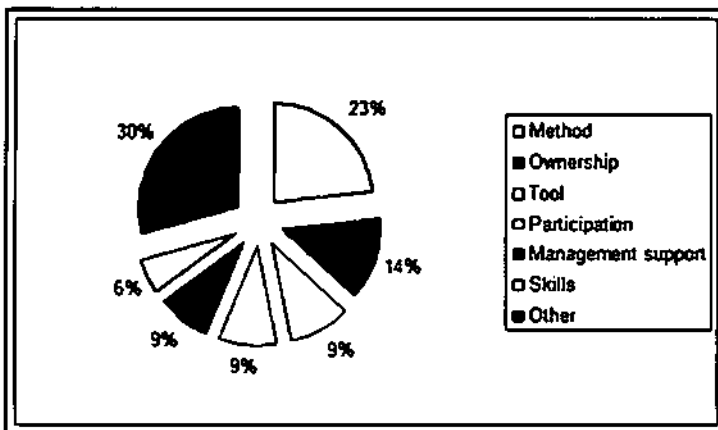


Figure 44: Scoring of factors for respondent 4

6.4.5. Respondent 5

The organisation represented by respondent 5 is currently busy with the implementation of a business process management system (BPMS). When referring to methodology, the respondent also included the larger methodology required to implement business process management (BPM) and not only the methodology used to model business processes. In an environment where a BPMS is implemented, the level of process maturity is typically higher than in other organisations. Therefore, the repository, either used for high-level business processes or for detailed-level workflow diagrams, is of cardinal importance.

The factors rated as most important by respondent 5:

- A reference model.
- Quality of the models.
- Stakeholder involvement.
- Having the right skills on the team.
- Process ownership.
- Governance: how to manage the team.

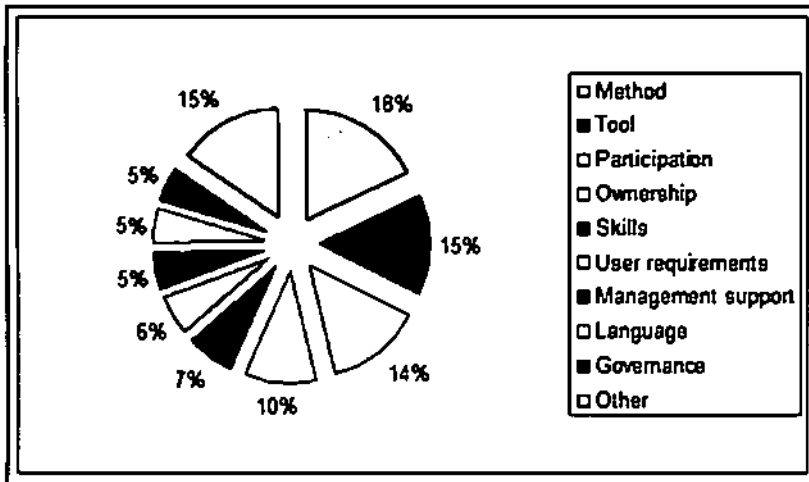


Figure 45: Scoring of factors for respondent 5

6.4.6. Respondent 6

Respondent 6 alluded to the possibility that governance in process modelling can ensure that the processes are also aligned with the compliance strategy. Thus points of control (a requirement for most compliance frameworks) are built into the process models. Ultimately, process management is a core capability of the organisation. An organisation that is better at managing processes can compete in a marketplace where the goods and services sold are all commoditised.

The factors rated as most important by respondent 6:

- Ownership is the most important aspect; a process model must be signed off.
- To ensure that the process matters in the thoughts of staff, the process must be measured and people measured against the performance of the processes they are involved in.
- Using a taxonomy to ensure alignment over business units.
- Enforcing a good methodology by making sure that all process modellers across the organisation are contributing re-usable process models.
- People that can create good models are ensured by investing in the skill levels of employees involved in creating business process models.

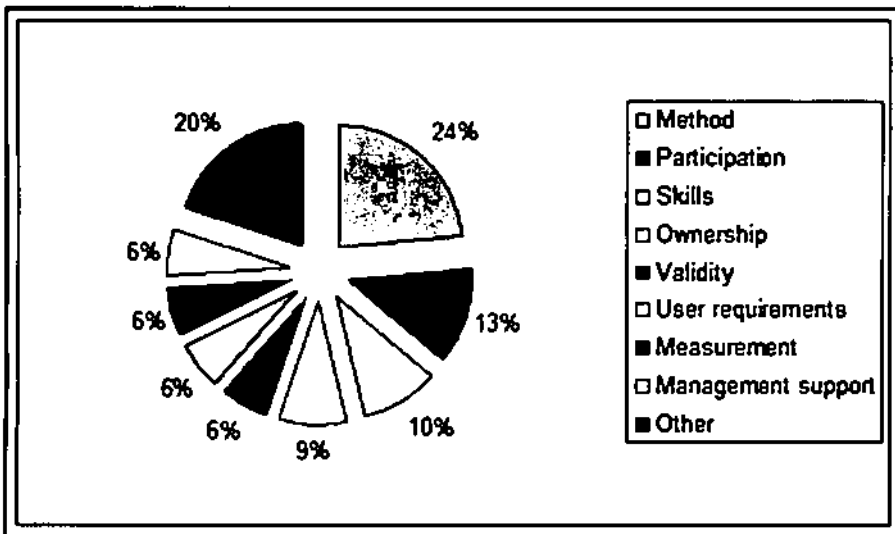


Figure 46: Scoring of factors for respondent 6

6.5. Grouped Results for Sections of the Interviews

In the following paragraphs the results from every section of the discussion guideline are presented individually. Analysing the different sections is important, since the initial development of the sections was structured around the research objectives of this study.

6.5.1. Use of Business Process Models

This section of the discussion guideline sought for answers to the research question: "Why do organisations use Business Process Modelling?"

From the interviews it became apparent that process models are often used for the purpose of compliance. The comments made by process experts pointed towards the notion that compliance is a core reason for process modelling and their expectation that this use of process modelling will grow in future. Thus, one can assume that the current use of process models is not so much tilted towards compliance but that it will do so more and more in the future. The expected usages of optimisation and communication/training are well represented. Application development, which was one of the key uses of business process modelling during the era of ERP implementations, is not rated as highly as expected. Also low down on the list of uses for process models is the notion of developing human resource structures (organisational design - OD).

Capturing knowledge was mentioned by the respondents as being specific to larger public organisations that need a method to preserve knowledge in a time where new people are taking up positions previously held by staff with extensive experience. The rating which was given to the different uses of business process modelling is presented in Figure 47.

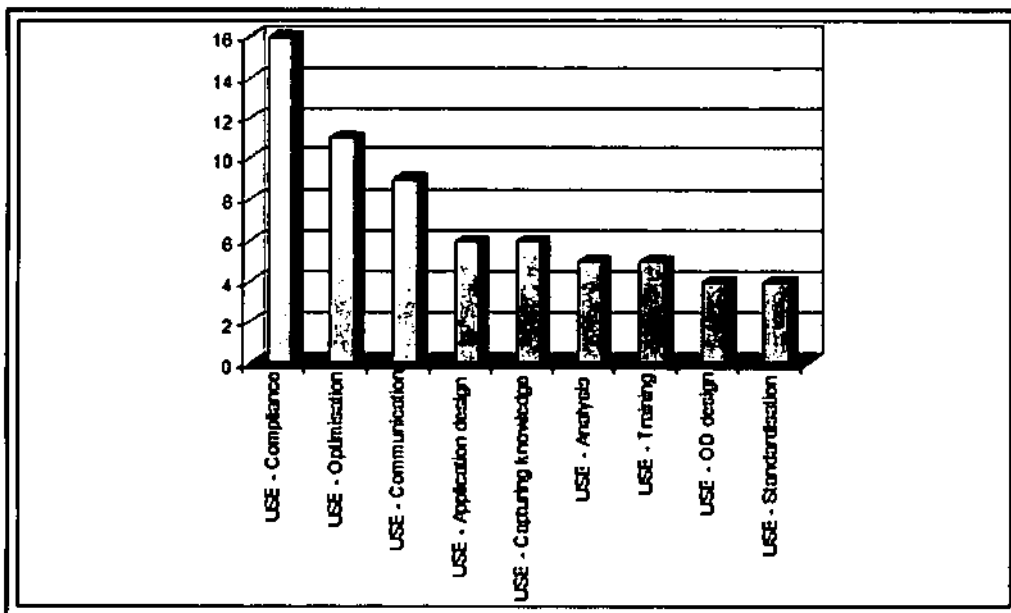


Figure 47: Use of business process modelling

6.5.2. Opinions regarding the Sustainability of Business Process Modelling

The research question: "Why use business processes in a sustainable manner?" did not lend itself to a quantifiable set of results. Most of the comments made were unique and some of the more prominent ones are presented below:

Proving negligence

Business processes can be used as a mechanism in proving or disproving negligence. In manufacturing industries the need to avoid costly legal action as a reason for having up-to-date business processes is more prominent. It still remains a valid reason for process modelling in service industries. An example was mentioned of an incident at the workplace where an individual was injured on duty. If a process model for the correct procedure to be followed has been signed off by both management and representatives of labour, appropriation of blame can be easily proved when matching the sequence of real life events to that stated in the signed-off process document. Negligence on either the side of management or of the individual worker can be identified and the matter resolved. In the case where a process or procedure was not documented, the matter will most probably need to be resolved by legal action.

Protecting project value

Sustainability is required to ensure that work completed on behalf of a client by a consultant can be preserved. Without a handover to a process owner within the organisation, the value of the consultation quickly disappears and may need to be repeated in future at additional cost.

Strategic planning

Up-to-date process models that are available as a resource for planning point to the need for sustainable process modelling. One respondent mentioned the example of many companies where the processes must "catch up". In these companies, strategy immediately informs action. Thus, when a decision has been taken to change direction, resources are committed and the process models need to catch up. This is not an advisable method to follow in an organisation where process models are being maintained. If available, the new strategy should first be modelled and if the analysis of the newly proposed process proves viability, only then should the commitment of resources follow. When processes are placed between strategy and the project that commits resources, the process models will always be sustainable and the organisation may prevent expensive experiments that sometimes fail due to a lack of analysis.

System maintenance

In the maintenance of systems, the processes may have been initially documented, but maintenance of the system is often done without the processes being updated. When at some point in future the system needs to

be integrated with another or be replaced, the process models are outdated and a new project must be initiated to cover the gap which could have been covered through sustainable process modelling.

6.5.3. Opinions related to the Uniquely South African Perspective on Business Process Modelling

The research question: "Why use business processes in a sustainable manner?" is addressed in this section. Once again the question did not lend itself to quantifiable data and a qualitative summary is presented here.

The overall opinion of process experts was that process modelling in South Africa is not that much different from process modelling anywhere else in the world. Process modelling is based on universal theory. The only potential difference between South Africa and the rest of the world may be in the way that our local culture needs to be taken into consideration when a process modelling methodology and notation is adopted. Some interesting comments are listed below:

Process modelling as a specialist function

Process modellers need to be seen as experts in their field. It seems as if finance, human resources and IT are well established as functional units within organisation structures and are accepted by the organisations as being experts in their field. Internal process modelling units in South Africa do not carry as much authority. Recommendations made by internal units must be accepted by the organisation, even if they are a "bitter pill to swallow". But in South Africa it seems as if every major process project is rather outsourced to a consultancy. This practice does not promote the status of internal process modelling units and, because new concepts and techniques are introduced with every consultant process modelling engagement, a sound base of sustainable process models cannot be internally developed.

Paper based process models

South African organisations still prefer their process models on paper. Even if the processes are documented using software-based repositories, printed copies of process models are preferred.

Simple notation

South African organisations prefer to use simple notations. In many instances the process modelling team will have complex process models used for analysis, but will only show to the end user very simple representations of the process model.

Preserving organisational knowledge

The requirement to model business processes in order to preserve organisational knowledge is slightly different from that in other parts of the world. Capturing knowledge is used worldwide to speed up the development of

new resources and for analysis. In South Africa the mere preservation of process knowledge is important, as experienced individuals are frequently lost from public organisations without passing on their knowledge.

Inclusivity

Mention was made about the South African approach to "participation". Inclusivity is important in South Africa and thus the action of process modelling requires wide consultation with all potential stakeholders, even those that do not have a direct relation to the process. Identifying the single individual to take process ownership is more challenging since responsibility is often rather shared than assumed by an individual.

The author identified that most of the references made regarding process ownership by the South African process experts referred to "functional" process ownership. Functional ownership implies that the senior manager of a functional organisation unit assumes responsibility for the processes performed in his/her unit. Functional process ownership is in contrast to the literature survey that points towards cross functional process ownership. (Hammer, 2002: 27) (Hammer & Stanton, 1999: 112) (Varghese, 2004: 19)

6.5.4. Opinions on Business Process Models and Modelling

Two sections of the discussion guidelines addressed the research question: "How can business process modelling be optimally applied?" One section in the discussion guideline related to models themselves (nature of models) and the other related to the way in which the models are created (nature of modelling). These two sections also correspond to the two subsets defined in the "Re-specified process modelling success model" (Bandara, Gable & Rosemann, 2005) that distinguishes between "project-specific factors" and "modelling related factors".

In the paragraphs to follow the nature of models, the nature of modelling and the relative scoring given by process model experts for the ranking of factors in the Bandara, Gable and Rosemann model are presented.

6.5.4.1. Opinions Regarding the Nature of Process Models

Process models themselves are important since these are the artefacts of modelling efforts. The concepts of "methodology" and "language" were not interpreted by all respondents in exactly the same way. The author is of the opinion that when respondents referred to the "methodology" the notation and modelling standard were often supposed.

It is interesting to note that the user's perception of model quality (as user requirements are interpreted as creating quality diagrams that the user can understand and which addresses his/her need) was rated higher

than the tool used. This rating seems to indicate that good-looking and easy-to-understand diagrams may be valued more highly than detailed process information in a tool based repository but the relative scores of 13 and 12 are not significantly different.

In Table 10 the rating of factors that most influence process models are shown.

Table 10: Factors related to process models

PersonType	Consultant	Process Custodian	total
Method	8	15	23
User requirements	6	7	13
Tool	6	6	12
Language	3	7	10
Purpose	7	3	10
Governance	3	2	5

6.5.4.2. Opinions Regarding the Nature of Process Modelling

The activity of modelling involves people; therefore, it is not surprising that participation was ranked as the factor that contributes most significantly to the sustainability of process modelling. Skills of people were ranked second and the method used third. Thus, the top three factors that relate to successful modelling are all present in the interactive sessions where process modellers and business representative are together modelling processes.

Please view Table 11 for the detailed ranking of factors relating to process modelling.

Table 11: Factors related to process modelling

PersonType	Consultant	Process Custodian	total
Participation	11	8	19
Skills	6	7	13
Method	3	8	11
Governance	5	3	8
Purpose	3	2	5

6.5.4.3. Scoring of the "Re-specified process modelling success model"

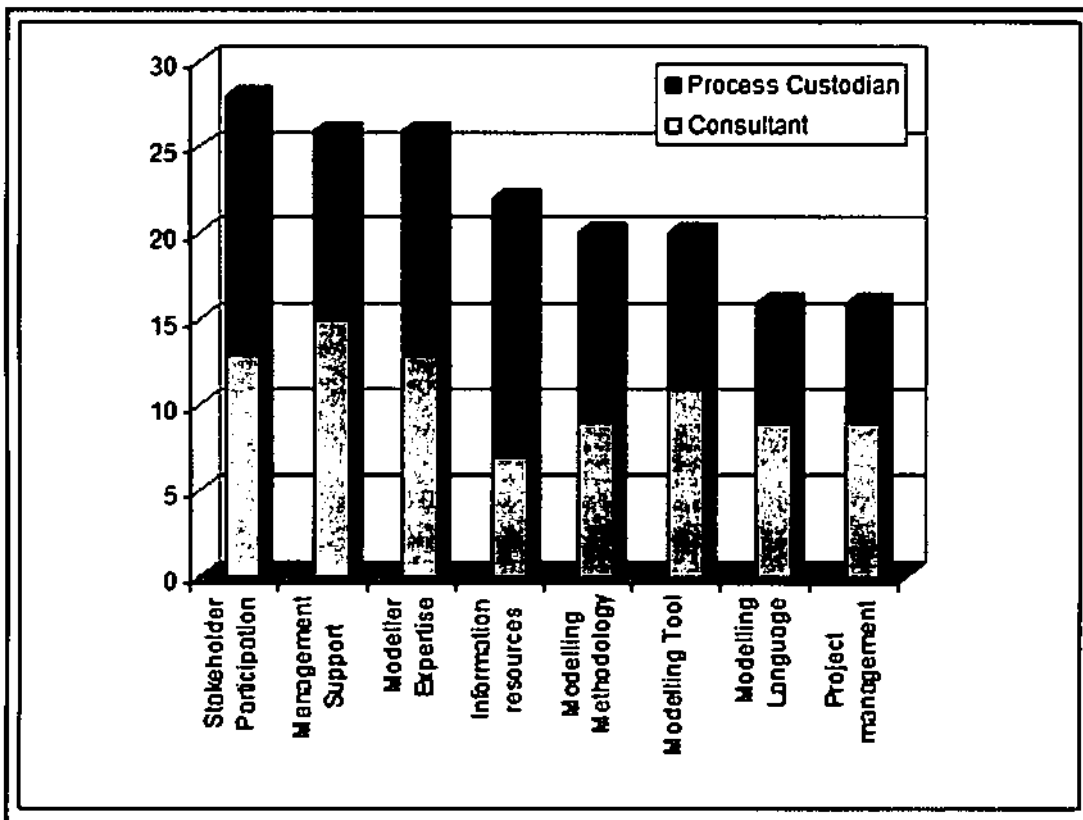


Figure 48: Ranking of factors as per the "Re-specified process modelling success model"

Process experts were asked to rate the "Re-specified process modelling success model" of Bandera, Gable and Rosemann (2005) against a three point scale where:

- 1 = Very Important
- 2 = Definitely helpful
- 3 = Not that important

Once again the process experts were asked to keep the sustainability in mind and also the notion that the model was developed specifically for individual process modelling projects. The project-specific factors were highly rated and the modelling factors came out lower in the rankings.

The differences in opinion that existed between consultants and process custodians were not as visible as in other sections of the interview (please refer to Figure 48). The high levels of correlation between process custodians and process consultants can possibly be attributed to the fact that the model was scored as a project-based model. Both consultants and process custodians related their scoring to the project nature of this

model, whereas in the remainder of the interview consultants talked from a project perspective and process custodians who took a longer term view.

The relative difference in the scores for every factor is very small even in the view of the fact that for the purpose of Figure 49 graph the 1, 2, 3 scale was converted into a 1, 3, 5, scale. A potential difference between this section of the interview and others would lie in the nature of the discussion point. In all other points discussed, a factor could or could not be mentioned as contributing to sustainability. In this case, all the factors had to be scored, resulting in a score for factors that would not have been mentioned by the process expert in other circumstances.

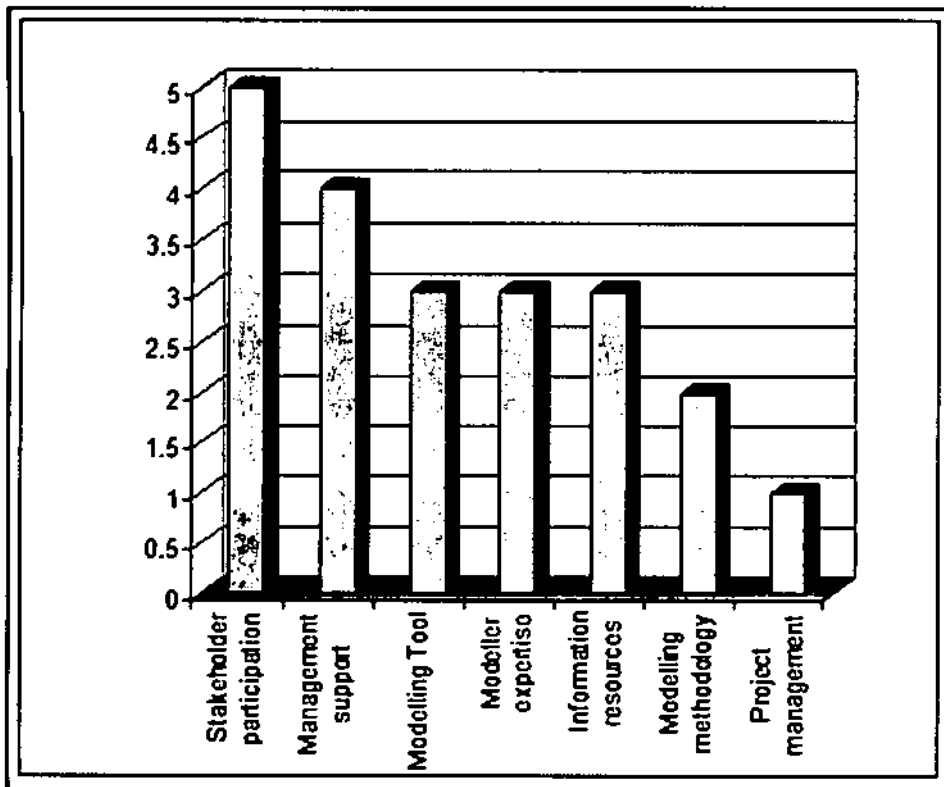


Figure 49: Ranking of factors as per the "Re-specified process modelling success model" only including those that were considered "very important"

When only those factors are looked at that were marked by process experts as being "very important", the ranking remains approximately the same, but the difference between factors is more significant. In addition, the concept of "modelling language" was not ranked as "very important" by any one of the experts. On the other end of the scale, "stakeholder participation" clearly stood out as five out of the six respondents indicated this factor to be "very important".

For the purpose of ranking, the author decided to rather use the second ranking, only taking into consideration the count of comments indicating "very important". The South African ranking of the eight factors in Bandara, Gable and Rosemann's model is presented in Figure 50.

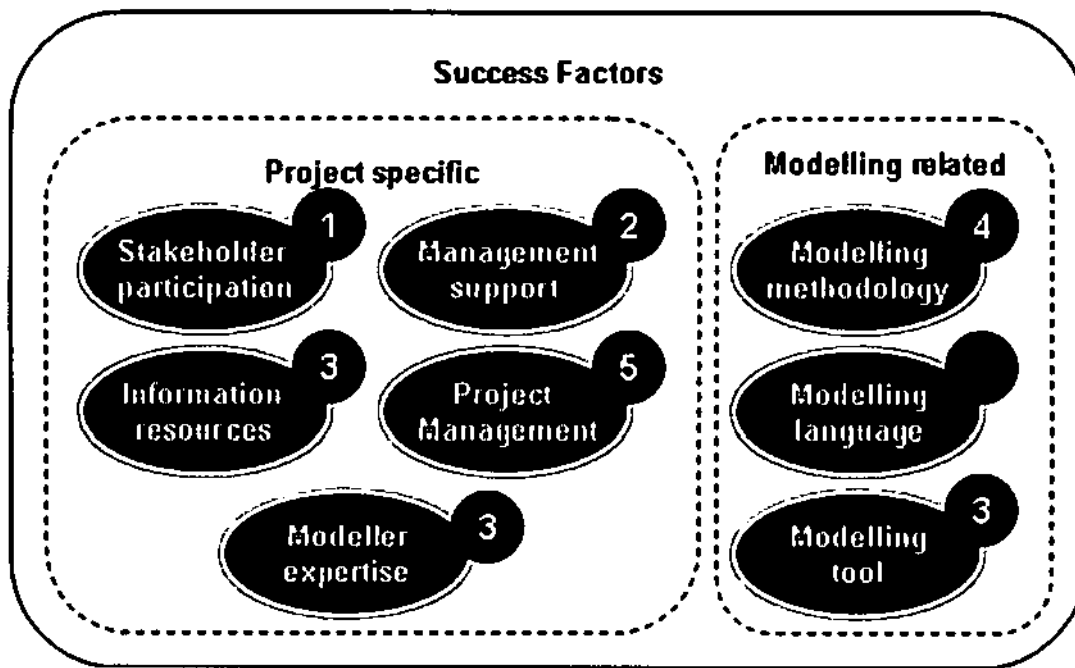


Figure 50: The "Re-specified process modelling success model" as ranked by South African process experts (Bandara, Gable & Rosemann, 2005: 357)

6.5.5. Main Factors Contributing to Sustainable Business Process Modelling

The information presented in Figure 51 relates only to the responses of respondents based on a single discussion point. The importance of this data lies in the fact that the answers given here do not reflect any bias that the discussion guidelines could have introduced into the total count of concepts mentioned. The results presented here have been gathered from the process experts after more than an hour of interviewing. All the potential concepts had been introduced by that time and the process expert then had to simply list the four to six contributing factors he/she believe have the highest contributing effect to sustainable business process modelling.

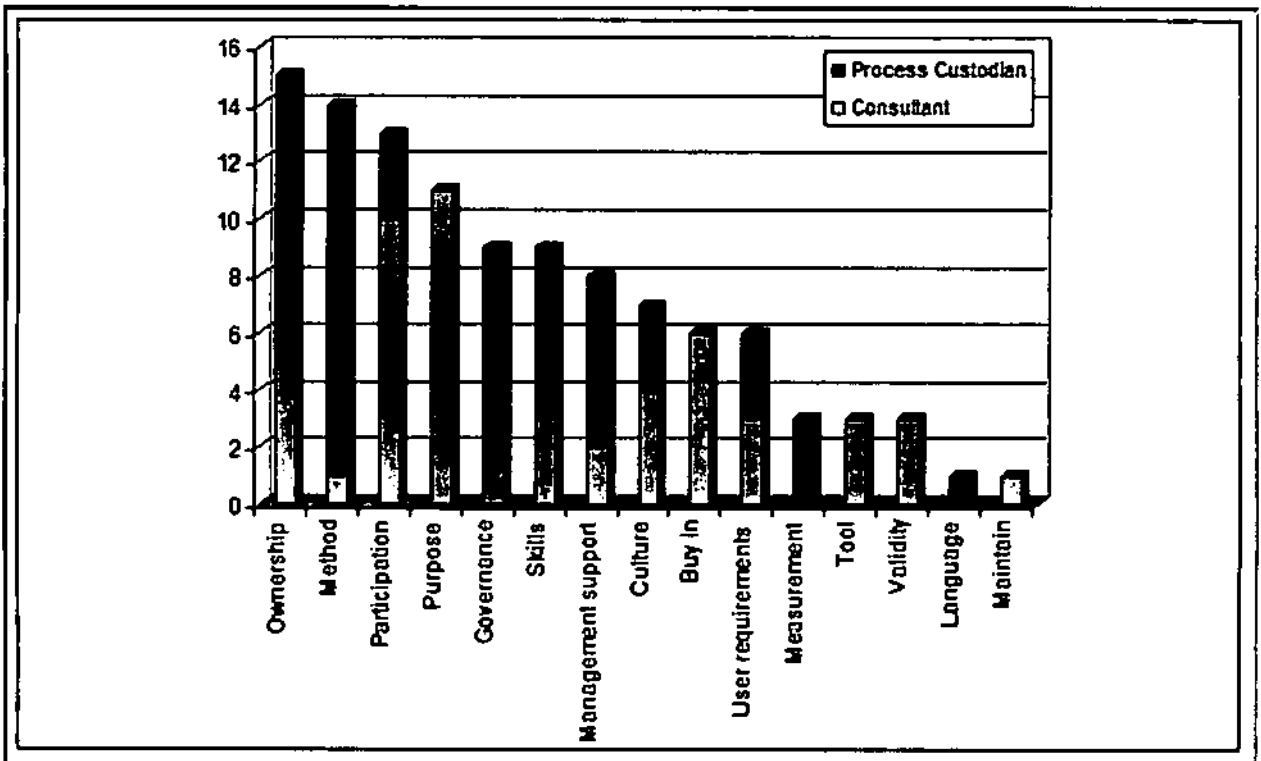


Figure 51: Factors mentioned under core reasons for sustainable business process modelling

The goal of the research was to identify the influencing factors that South African process experts believe have the highest impact on sustainable process modelling. The data presented here only includes the factors mentioned by process experts when asked to list four to six influencing factors. It is very interesting to note that the consultants and process custodians do not agree about all the influencing factors. Participation and purpose was rated highly by consultants whereas the process custodians working inside organisations were far more concerned with methodology. It is also important to note that ownership, the number one influencing factor, was rated highly by both process consultants and process custodians.

Although process ownership clearly came out on top of the grouped data, only one respondent listed process ownership as the first factor on his/her list. However, process ownership was listed by everyone. From this quick analysis it is clear that not all knowledgeable people working with process models agree on what the most important factors are, but the common factors all agreed on were process ownership, participation, governance and skills.

6.6. Alterations to the Literature Review Framework for Sustainable Process Modelling

The process experts each had a different opinion on how the literature review framework should be altered to represent a framework for factors contributing to sustainable business process modelling. The following instructions to change the literature review framework were given by every process expert:

- Respondent 1: Need to add a validity column towards the left. The fact that the model is valid adds a lot to its sustainability. A process culture should be the basis of both the columns for availability and integration. Process ownership should appear everywhere.
- Respondent 2: Fit for purpose column depends on client need. Add process ownership to the availability column.
- Respondent 3: Modelling expertise need to be added to the fit for use and availability columns. Add strategic validation in order to integrate the processes with the daily operations. Process reviews should not become an administrative burden.
- Respondent 4: Remove the columns for "fit for purpose" and "availability". Then add: "ownership", "management support" and "sharing of the process management vision by top management"
- Respondent 5: The columns for "fit for purpose" and "availability" do not point to sustainability but rather the delivery of value. Two other concepts that should be added are: "models that are consistently used and regularly monitored and measured" and "models that are deployed via a best practice of change management"
- Respondent 6: "Governance" should be right over the top of all factors on the diagram. There should be reason for doing all of the actions, being the strategy or the plan. This plan should be broken down from a group wide plan to lower levels for every unit. The plans for the units must align with that of the full strategy or vision.

Figure 52 gives a graphic representation of the alterations to the literature framework as suggested by the respondents.

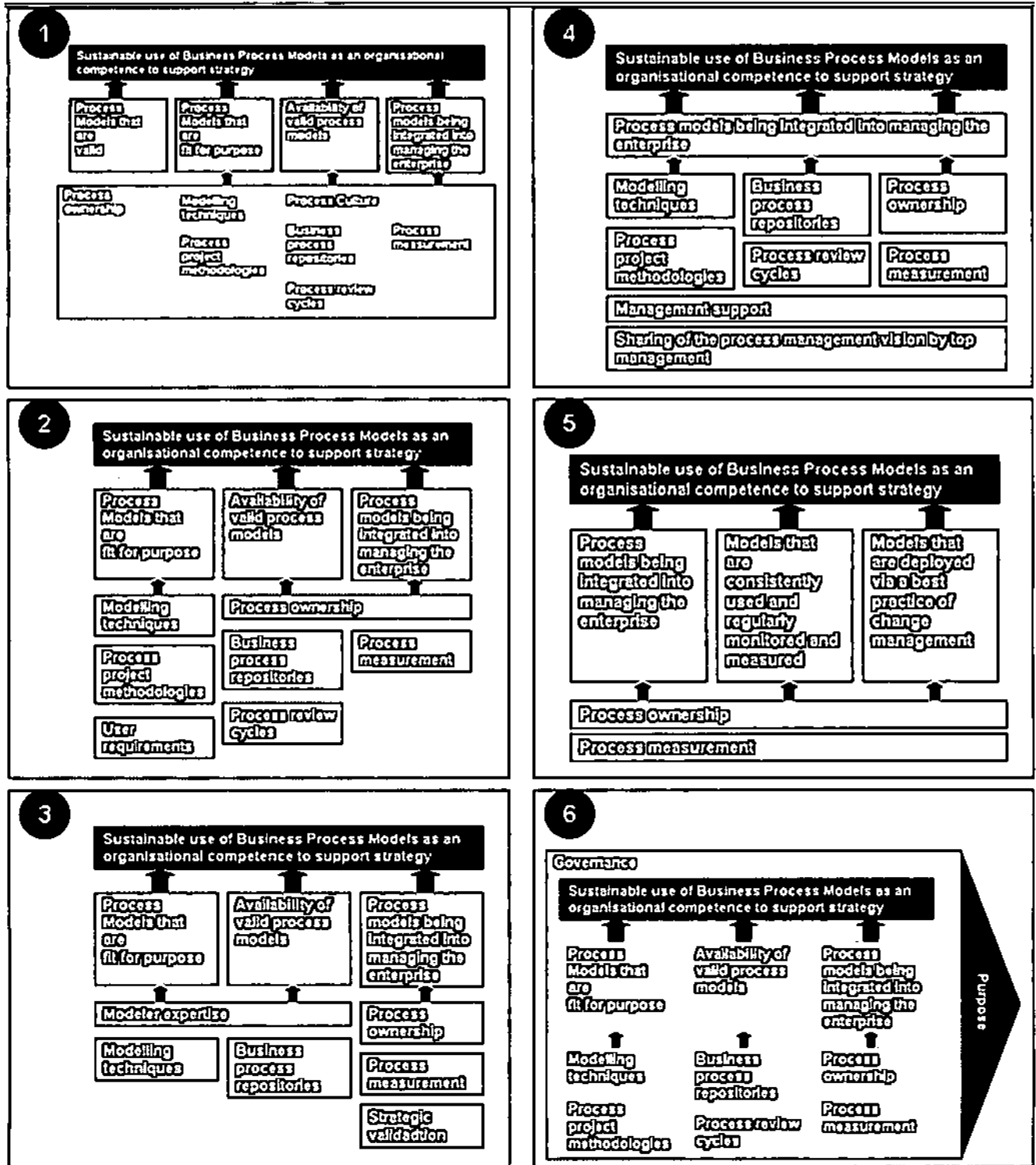


Figure 52: Alterations to the literature review framework

6.7. Overall Scoring Incorporating all Sections

Table 12: Total values for all sections of the interview

Section	PersonType	Total	Method	Participation	Ownership	Purpose	Tool	Skills	Management support	Buy in	User requirements	Language	Governance	Culture	Maintain	Validity	Measurement
Core reasons	Consultant	109	56	1	10	6	11	3	3	2	6	3	3	2	1	3	
Core reasons	Process Custodian		53	13	3	9		6	6		3	1	6	3			3
Diagram	Consultant	111	55	12	13			7	8	9		6					
Diagram	Process Custodian		56	12	18			9	5	7		5					
Intro	Consultant	159	68	1	4	19	14	1	2	2	10	2		5	5	3	
Intro	Process Custodian		91	18	6	17	6	9	1	5	3	2	1	2	6	3	6
Modelling	Consultant	79	39	3	11	2	3		6	1	3	2	1	5	1		1
Modelling	Process Custodian		40	8	6	1	2	1	7	2	1	2	2	3		3	
Models	Consultant	95	45	8		1	7	6	1		2	6	3	3	2	1	3
Models	Process Custodian		50	15	2	2	3	6	3		2	7	7	2			1
Sustainability	Consultant	41	18			6	4								7		1
Sustainability	Process Custodian		23			6		7	1	1			1	2	3		2
			92	75	69	50	49	43	35	27	27	26	25	23	20	17	16

Table 12 above and Table 13 below show the detailed information for all the sections of the interviews mapped against the influencing factors. A large number of the comments scored were made during the "introduction" and "core reason" sections of the interviews and, therefore, the final scores are strongly influenced by the comments made by process experts with very limited interaction with the researcher.

Table 13: Percentage allocation of influencing factors

Factor	Total	%	Cum
Method	92	15%	15%
Participation	75	13%	28%
Ownership	69	12%	40%
Purpose	50	8%	48%
Tool	49	8%	56%
Skills	43	7%	64%
Management support	35	6%	70%
User requirements	27	5%	74%
Buy in	27	5%	79%
Language	26	4%	83%
Governance	25	4%	87%
Culture	23	4%	91%
Maintain	20	3%	94%
Validity	17	3%	97%
Measurement	16	3%	100%
	584	100%	

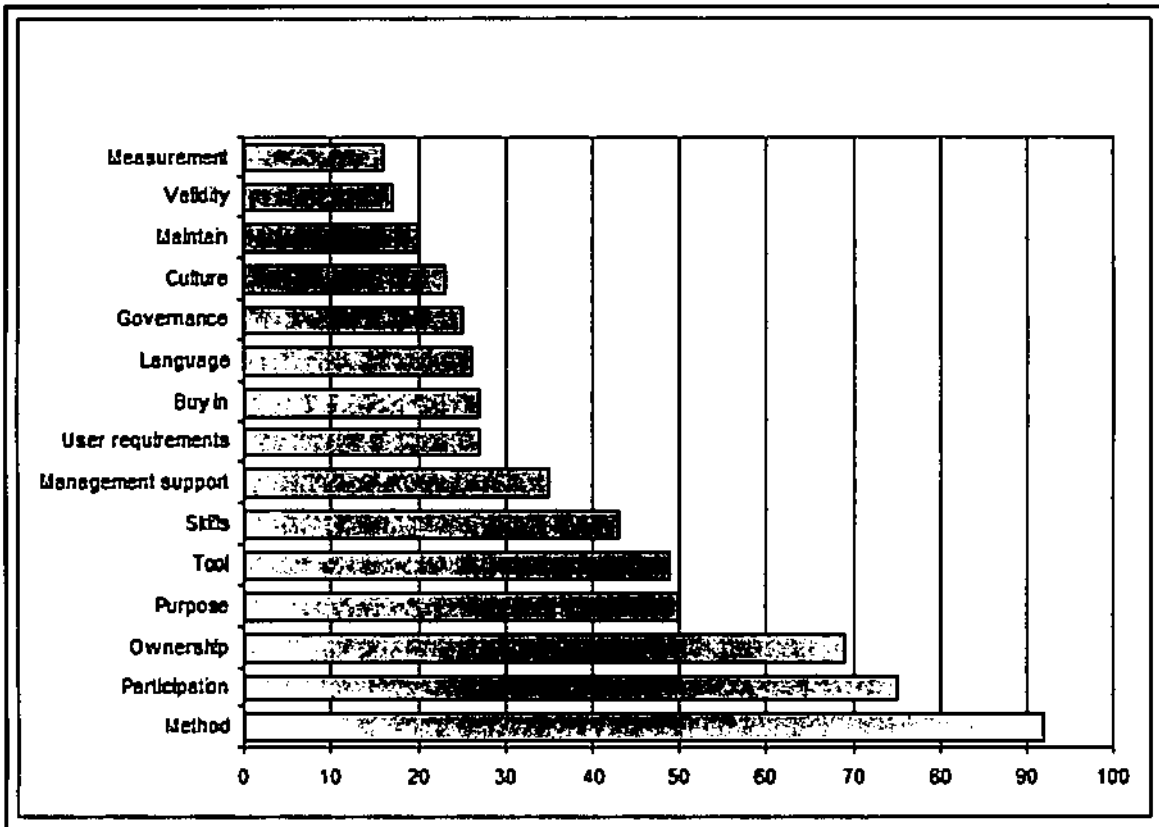


Figure 53: Ranking of influencing factors

When ranking all the factors in order of the total sum of comments made three factors are clearly indicated as the factors that have the most influence on sustainable business process modelling. From Figure 53 it is clear that method, participation and ownership have the highest level of influence.

Then four further factors with significant influence are purpose, tool, skill and management support. Together these seven factors account for 70% of the comments made.

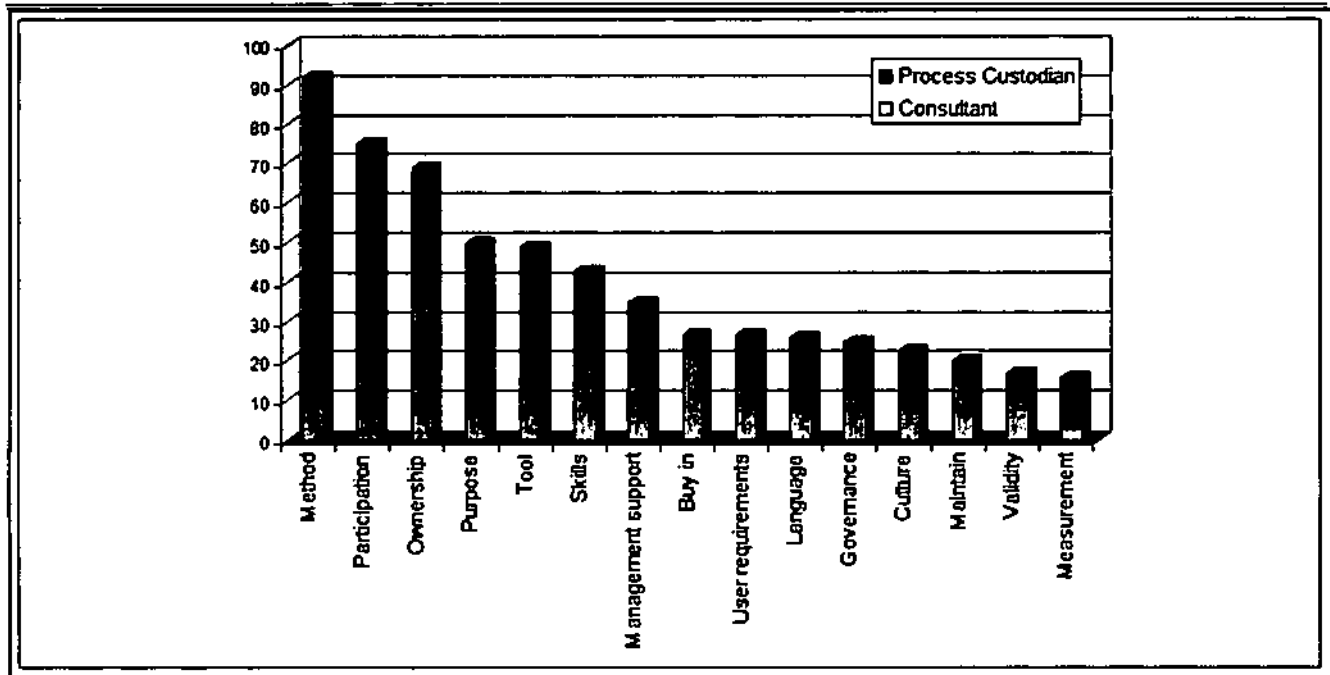


Figure 54: Influencing factors, consultants and process custodians compared

When the results of consultant interviews and those of the process custodian interviews are compared (please refer to Figure 54), it becomes clear that the views of these groups of process experts are not aligned. "Method" is ranked as the number one influencing factor, but this is mainly the result of the preference of process custodians. Consultants would have rated "method" only in fourth position. "Purpose" is very important to consultants. If consultants were ranked on their own this would have been the top scoring factor, but to process custodians this factor ranks 11th in their list.

6.8. Chapter Summary

In this chapter the results from the structured interviews were presented. The views of process experts showed variation. Consultants have a different opinion regarding the factors that influence sustainable business process modelling from that of process custodians working for large organisations. The ranking of influencing factors are included in Table 14.

Table 14: Ranking of factors by consultants and process custodians compared

Consultant		Process Custodian
Purpose	1	Method
Participation	2	Participation
Ownership	3	Ownership
Method	4	Tool
Buy in	5	Skills
Skills	6	Management support
Tool	7	Language
Management support	8	User requirements
Maintain	9	Governance
User requirements	10	Measurement
Culture	11	Purpose
Governance	12	Culture
Language	13	Validity
Validity	14	Buy in
Measurement	15	Maintain

In the next chapter the results presented in this chapter are discussed and final conclusions and recommendations presented.

7. DISCUSSION, CONCLUSION AND RECOMMENDATION

7.1. Chapter Introduction

This chapter starts off with a detailed discussion of the results. By interpreting the results, the author places them into some context. The aim of this study was to find answers to the six research objectives stated in the orientation chapter. A brief answer is given to every research question in this chapter.

The method used in this study had some advantages and disadvantages. The impact of the method on the results obtained is briefly discussed before coming to a conclusion and then presenting some recommendations.

7.2. Discussion of Results

The research approach taken allowed two methods of determining the top rated factors that support sustainable business process modelling. One method was by analysing the results from the discussion point related to the "core reasons" where process experts provided four to six core factors to sustainable process modelling. The other method of determining the top rated factors was by analysing the overall scoring from the interviews.

In Table 15 on the next page, the "core reasons" and overall scores are compared for every respondent. The three consultants are listed on the left and the three process custodians on the right.

From the initial representation of the results it became clear that "method" and "purpose" were rated as two of the top seven influencing factors, but consultants and process custodians had widely different views on the factors. In this section, the possibility is investigated whether these two factors were not "hidden" in the overall results and simply left out when the core factors were mentioned.

Table 15: Individual comparison of influencing factors per process expert

C1	Core	Overall	PC1	Core	Overall
	Participation	<i>Ownership</i>		Management support	Method
	Buy in	Purpose		Ownership	Ownership
	Validity	Buy in		Method	Tool
	Purpose	Participation		Governance	Participation
	Culture	Validity		Culture	Management support
		Method			Skills
		Culture			Language
					Governance
C2	Core	Overall			Culture
	Participation	Participation			
	Purpose	Purpose	PC2	Core	Overall
	User requirements	Method		Management support	Method
	Ownership	Ownership		Ownership	Tool
	Governance	Governance		Method	Participation
	Buy in	User requirements		Governance	Ownership
		Maintain		Culture	Skills
		Buy in			User requirements
					Management support
C3	Core	Overall			Language
	Tool	Purpose			Governance
	Skills	Skills			Culture
	Purpose	Tool			
	Ownership	Participation	PC3	Core	Overall
		Ownership		Method	Method
				Skills	Participation
				Ownership	Skills
				Measurement	Ownership
					Validity
					User requirements
					Measurement

From Table 15 presented above it is clear that "method" was ranked high in 5 of the 6 respondent's overall results, even in the overall results of two consultants who did not rate "method" on their core responses (indicated in blue italics).

The same is, however, not true for "purpose" which was ranked high for consultants, but was not listed for any of the process custodians, either directly or indirectly.

When the occurrence of factors is compared among all of the process experts, only two were present, either directly or indirectly, in the list of top-ranked factors. They are "participation" and "ownership" shaded in yellow and green respectively.

7.3. Discussion of Research Objectives

7.3.1. *What is Business Process Modelling*

From the literature survey the following statements describe the essence of a Business Process Model:

- A business process is an activity performed by or within an organisation where the activity is performed for a reason, whether that reason is found in strategy or can be directly related to a client need.
- A process can not be performed without some input that will be transformed into a valuable output; the input to a process may be physical material, or information.
- To transform the input, resources are required. Resources are items that must be there to complete the process, but will still be there after the process has been completed. Typically machines and human resources can be seen as resources (or mechanisms) to a process.
- Processes require a form of control to direct them, whether the form of control is labelled as governance or business rule or process logic depends on the modelling language.
- Lastly, the activities that make up a process need to have some sequence in which they are executed. This sequence will move the process from its trigger (event) to its outcome (or result).

Business process modelling is the act of creating business process models and to effectively do so a process modelling team need the following:

- A notation or process modelling language for depicting processes;
- A place to store the process depictions in such a way that they can be re-used, typically a software based toolset, often referred to as a process repository;
- A process modelling methodology that describes the sequence of events in a process modelling project that ensures quality process models; and
- Skilled process modellers.

7.3.2. *Why do Organisations use Business Process Modelling*

The primary reasons for using business process models are:

- Compliance;
- Optimisation;
- Communication;
- Application design; and
- Capturing knowledge.

7.3.3. *Why use Business Processes in a Sustainable Manner*

Reasons for the sustainable use of business processes were not as directly identified as hoped for when the information from the interviews were analysed. Intuitively the reasons for having sustainable process documentation relate to an organisation's ability to understand itself. Whether in terms of the responsibilities assigned to individuals in an organisation or the current activities performed in different areas for different customers. From the usage information the need to have up-to-date process models is a requirement for compliance. The comments made by process experts specifically related to sustainability include:

- Business processes can be used as a mechanism in proving or disproving negligence;
- Sustainability is required to ensure that work completed on behalf of a client by a consultant can be preserved;
- Up-to-date process models which are available as a resource for planning is pointing to the need for sustainable process modelling; and
- In the maintenance of systems, the processes may have been initially documented, but maintenance of the system is often done without updating the processes.

7.3.4. *How can Business Process Modelling be Optimally Applied*

To optimally apply process modelling the following aspects are important regarding process models:

- Method. A clear methodology needs to be followed to ensure quality process models.
- User requirements. These must be clearly defined and the modelling team should deliver models that are in adherence to the user requirements.
- Tool. A repository that is capable of handling large volumes of process information must be in place.
- Language. A modelling notation that is easy to understand and use.

Regarding process modelling the following aspects are primary influencing factors:

- Participation. Participation relates to actual engagement between the process modellers and the people knowledgeable about the process. Participation points towards a joint effort in creating process models.
- Skills. Skills refers to the level of knowledge and skill in both the modelling team and the people the team is interacting with regarding the basic theory of process modelling language and methodology.
- Method. Method refers to all the knowledge and skills that can be found in a process modelling team. Method is something that is initially sourced from external sources and then customised for the particular organisation. An important aspect of method the clear methodology that needs to be followed to ensure quality process models.
- Governance. Governance relates to the activities required to ensure that process models are focused and modelled according to the rules of both language and methodology.

7.3.5. How is Business Process Modelling Viewed from a South African Perspective

The overall opinion among process experts - whether consultants or process experts - is that the South African perspective on process modelling is not that much different from the perspective anywhere else in the world. The only exception may be in small cultural differences, but this is a reality in any part of the world.

This study did, however, uncover that the expectations and approach to sustainable business process modelling of consultants and those of modelling custodians in large organisations differ widely. The author did not investigate if this was only a local South African reality, or if this divide also exists in other regions of the world.

7.3.6. What Factors Influence the Sustainable use of Business Processes in South Africa

The factors that have the highest levels of influence on sustainable business process modelling in South Africa are method, participation, ownership, purpose, tool, skills and management support.

The factors listed above are, however, the generalised result of the structured interviews. On closer investigation, it was found that the factors influencing sustainable business process modelling were quite diverse among the two different communities of process experts investigated.

Table 16: Differences in opinion to influencing factors

Consultant		Process Custodian
Purpose	1	Method
Participation	2	Participation
Ownership	3	Ownership
Method	4	Tool
Buy in	5	Skills
Skills	6	Management support
Tool	7	Language
Management support	8	User requirements
Maintain	9	Governance
User requirements	10	Measurement
Culture	11	Purpose
Governance	12	Culture
Language	13	Validity
Validity	14	Buy in
Measurement	15	Maintain

Table 16 adopts the notation of indicating in green influencing factors that are closely matched between consultants and process custodians. Those that are not closely matched are indicated in red. From the table it can be seen that only "participation" and "ownership" was consistently ranked highly by both consultants and process custodians.

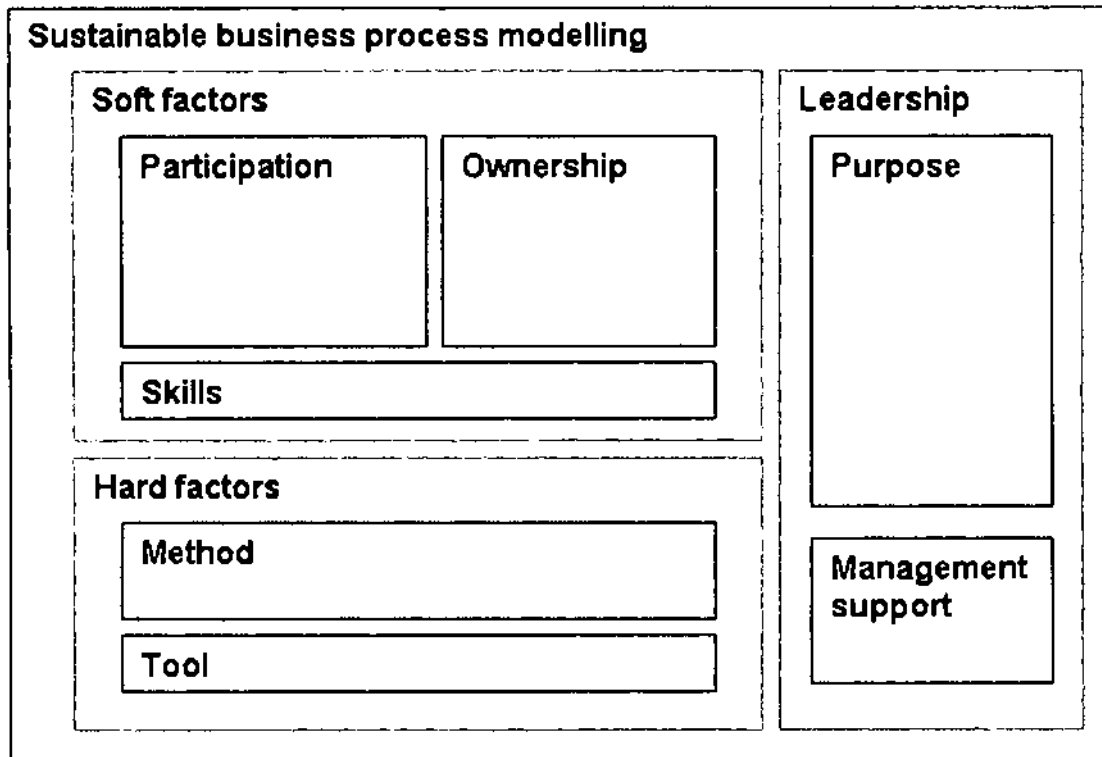


Figure 55: Model for sustainable Business Process Modelling in South Africa

Figure 55 above presents the finding of this study. It shows the seven factors considered to have the highest level of influence on sustainable business process modelling. The relative size of every factor underscores its importance.

7.4. Discussion of the Research Method

The research method used in this study proved very useful and appropriate but, in the structuring of the discussion guidelines and the scoring of interviews the approach taken could have potentially been improved.

The discussion guideline was focused on many of the "hard" factors that could potentially influence the sustainability of business process modelling. From the results, it became clear that the softer side of process modelling, i.e. user participation and process ownership, were consistently ranked high by all parties involved. Owing to the large number of topics included in the discussion guidelines that focused on the "nature of the model" and the "nature of modelling", the high ranking that was ultimately given to "method" may have been introduced via the structure of the discussion guideline. Based on the core reasons that were separately ranked, "method" was outranked by "ownership" as the most important factor and "governance" joined the ranks in the top seven with "tool" losing its place in the top seven influencing factors.

During the scoring, only positive statements were accounted for. Specifically the topic of "project management" included as one of the eight factors in the "Re-specified process modelling success model" (Bandara, Gable & Rosemann, 2005: 357) was often greeted with comments indicating that project management doesn't matter. Since negative topics as possible answers to the discussion guideline were not included in the design, negative (or comments stating that a concept /topic has no direct influence) were not accounted for. As a result some of the factors initially thought to be indicative of sustainable process modelling, based on literature, but not applicable to the South African context, were not identified.

The nature of a structured interview leaves the researcher with hundreds of comments to interpret. This becomes a linguistic issue, especially when the initial list of 51 topics was condensed into a list of 16 factors. Full transcripts combined with a powerful thesaurus-based analysis tool, could have been more appropriate than the database developed by the researcher, who had to interpret the comments made by process experts without a thesaurus.

7.5. Conclusion

Seven factors were identified that influence the sustainability of business process modelling in South Africa. They are: method; participation; ownership; purpose; tool; skills; and management support.

The factors identified from interviews with South African process experts were, however, not ranked in a similar pattern of importance by the consultants and the process custodians included in the study. The difference of opinion between internal and consulting experts points to a potential clash of interest in the instance where consultants are used by an organisation with in-house process custodians for a process modelling project. Consultants require a strong sense of purpose and clearly defined user requirements to deliver, what would be in their opinion, valuable and sustainable process models. Consultants also value buy in from the organisation they are working with. Process custodians are very specific about the specific method used, where this issue is not as highly rated by consultants.

The factors common to both consultants and process custodians are "participation" and "process ownership". Both of these point to the interaction that is required between a process modelling team, whether consulting or in-house, and the business community for whom the modelling team is creating business process models. The implication of this finding is that "soft" factors are more indicative of sustainable business process modelling than "hard" factors. The nature of the modelling interaction is more important to sustainability than the models themselves. Ensuring sustainability in business process modelling is therefore more of a social science than a physical one.

The two factors that could ensure a higher level of sustainability are "participation" and "ownership". The other five factors identified in this study could assist in creating a more sustainable model, but without "participation" and "ownership" sustainability is not possible. The dilemma facing process modelling teams is that neither "participation" nor "ownership" is directly under the team's control. Creating an environment that makes sustainable business process modelling possible is squarely in the hands of the business and the leaders of organisations. Process custodians and process consultants can only influence the leadership and staff in an organisation towards the value of business process modelling; they themselves cannot create it.

7.6. Recommendation

In the orientation chapter it was stated that this study aimed to provide a set of guidelines that could be used to increase the sustainability of business process modelling. In the paragraphs that follow, process modelling audiences are provided with guidelines specifically pertaining to them.

Guidelines for process practitioners (consulting or in-house)

People are the most important ingredient of any business process modelling endeavour. Involve stakeholders in process modelling by clearly identifying burning issues in their lives related to the processes they are involved in. Address these issues through process modelling to demonstrate the value of process modelling and thereby ensuring future commitment and involvement of the stakeholders. Involve stakeholders by documenting their requirements and reach a formal agreement with all parties involved regarding the deliverables. The most important stakeholder to involve is the process owner, process owners have to be prepared for the important role that they play in sustainable business processes.

Ensure that the methodology used to gather and verify process information is highly interactive, not time consuming but intense and valuable. Modelling of process flows should be interactive, process modellers may facilitate, but never dominate process modelling sessions. Technically the following aspects of the process modelling environment are important:

- A sound methodology with good governance to manage the creation of models and the people creating it;
- A suitable process repository. Use a tool that is easy to use by modellers and easy to understand by the users of the process models;
- Invest in the levels of skill in process modelling teams; and
- Quality assurance and governance of process model content.

Guideline specific for consultants

In defining the project plan for a process modelling project, schedule time to first investigate the process modelling methodology and modelling notation in use. Allocate time and resources to skill and equip members of the process modelling team so that they can model according to the methodology and tools in place at the client.

Guidelines specific to process custodians engaging with consultants

Ensure that all information required by a consulting firm to model business processes according to the organisation's modelling standards is available. The information required may include access to methodology documentation, internal process modelling training and process modelling toolset documentation. It is important that an internal custodian assist the consulting team in defining the purpose for and scope of the modelling project. After documenting the scope, have it signed off by all stakeholders. Lastly it is important to assist the

consulting team to correctly identify the people with valuable process knowledge and to identify the appropriate process owners.

Possibilities for future research

The difference in opinion between process consultants and process custodians working in organisations identified in this study warrants further research. Such a study may take the form of an analysis of failed and successful process modelling projects and determining whether the reasons for failure correlate to the difference in ranking factors influencing sustainability as identified in this study.

This study found that the "soft" factors are more indicative of process modelling sustainability than "hard" factors are. A study that firstly identifies other "soft" factors in the literature and then tests those through structured interviews could potentially add new insight into the detail of the factors termed in this study simply "participation" and "process ownership".

Literature consulted for this study mentions process ownership as a cross functional activity. This study indicates that process ownership is often viewed, in South Africa, as a functional responsibility where a line manager must take responsibility for the processes in his/her area. A study that investigates the essence of process ownership in South Africa, viewed against the backdrop of international best practice, may identify the strengths and weaknesses of functional process ownership as applied in South Africa.

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