Process Modelling & Management

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Preface

Purpose of document

This document describes and illustrates the SCIPIO process modelling standards.

Status

Incomplete draft.

Structure of document

In this document, we use the SCIPIO process modelling standards to describe a market research process.

We also describe how the model is used to implement and manage an effective market research process.

Finally, we abstract from this example, to draw out some general patterns and guidelines.

Questions

Questions and suggested exercises for the reader are included in this format.

Q	How can you make best use of this material in your own work?

Acknowledgements

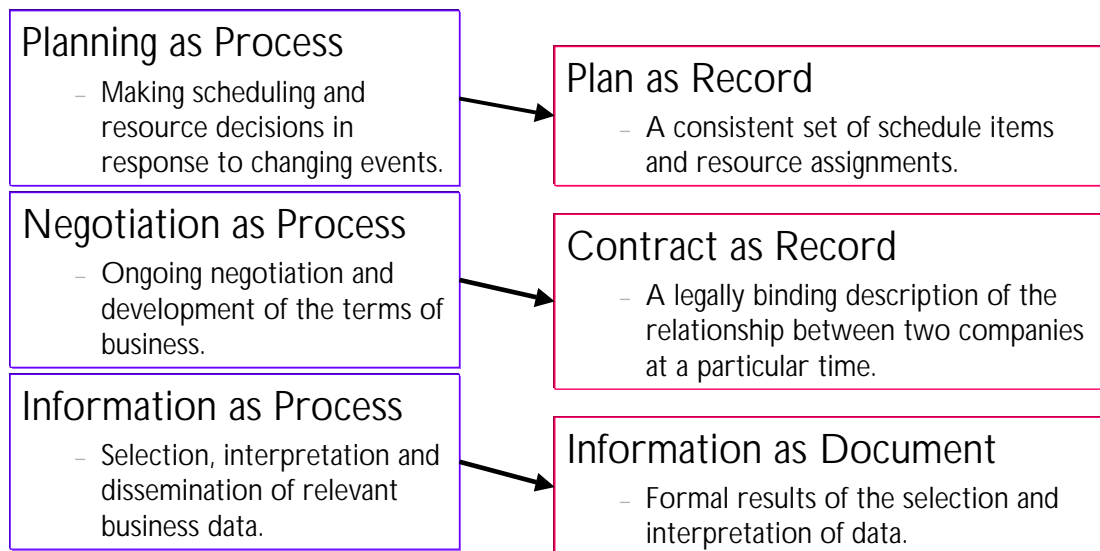Thanks to Aidan Ward and Trevor Lee-Cox for collaboration and critique.

Introduction

The need for a process view

In SCIPIO, we believe that the Process-Oriented Paradigm serves as a useful counterweight to the Object-Oriented Paradigm.

According to the object-oriented view, everything can be understood as an object. In particular, processes can be viewed as objects. This is known as **reification**. This leads us to understanding the world simply as a system of interacting objects.

The obvious way to reify a process is to think of what it produces. We define processes in terms of the things they produce.

Planning as Process – Making scheduling and resource decisions in response to changing events.	→	Plan as Record – A consistent set of schedule items and resource assignments.
Negotiation as Process – Ongoing negotiation and development of the terms of business.	→	Contract as Record – A legally binding description of the relationship between two companies at a particular time.
Information as Process – Selection, interpretation and dissemination of relevant business data.	→	Information as Document – Formal results of the selection and interpretation of data.

Figure 1

Of course, this is not the only way to think of processes as things. It is possible (and often useful) to think of the activity itself as an object: The Planning, The Negotiating, The Informing. But many people find this strange.
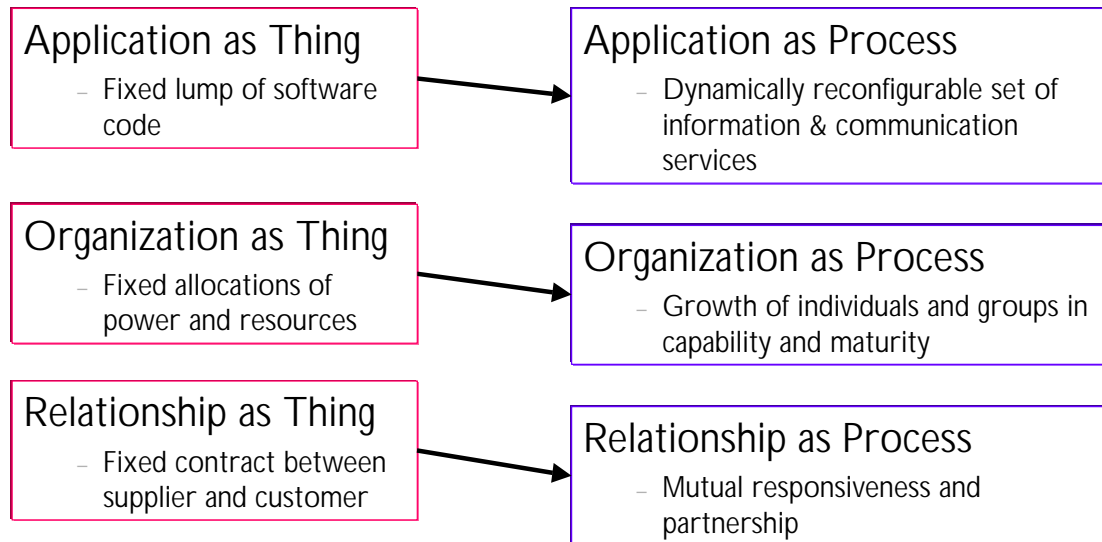
In any case, the object-oriented view fails to support the way that business people want to think about business. To them, a business is not just a group of connected things. It is not even just a group of connected people. In business, we are not merely interested in things and people that happen to have particular behaviours. We are interested in business processes and relationships.

One of the phrases used in English for a business is a "going concern". This phrase focuses our attention on two aspects of business: activity and intentionality.

Furthermore, even when confined to modelling static information, we frequently have to make modelling or design decisions that are simply undecideable within the object-oriented

paradigm. For example, if I'm asked to produce a data structure to represent BUDGET, I cannot even start without knowing (or assuming) something about the budgeting process.

Thus sometimes we want to think of processes as things. But we sometimes want to do the opposite: to think of things as processes.

Application as Thing	Application as Process
– Fixed lump of software code	– Dynamically reconfigurable set of information & communication services

Organization as Thing	Organization as Process
– Fixed allocations of power and resources	– Growth of individuals and groups in capability and maturity

Relationship as Thing	Relationship as Process
– Fixed contract between supplier and customer	– Mutual responsiveness and partnership

Figure 2

We can model a process from several different perspectives.

We can describe a process from several different perspectives, according to the purpose of the model. For example, a video-on-demand process might involves many different companies, controlling many different information flows through many different technical mechanisms.
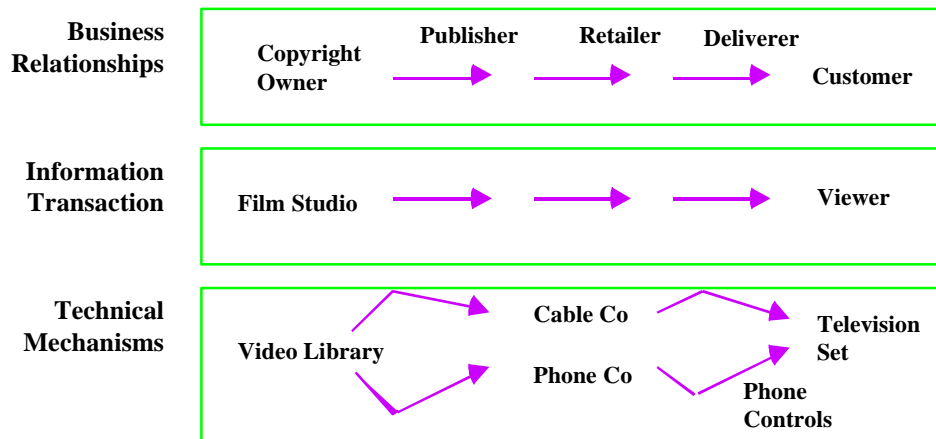
Figure 3. Video on Demand.

More formally, we may describe a distributed process from five viewpoints, as defined in the ODP Reference Model (RM-ODP). This is not described further in this document.

Market Research Process

Description

The context for the market research is the development and marketing of a range of consultancy services. The goal of the market research is to determine the nature and level of demand for these services, and thus to help decide the appropriate business response to this demand.

Note: this is a genuine example. Some business associates and I were planning some services that would use the SCIPIO method for designing and implementing business processes, together with supporting human organization and computer system infrastructure.

We wanted the market research to help us with a series of business planning decisions, including the fee structure, the way the services should be presented and promoted, the need for us to train additional associates, and so on.

We thought we should take our own medicine: thus we should use our own process modelling and management techniques to implement an effective market research process. Although our own business processes are rather smaller and simpler than the business processes we expect to find in our clients, we feel it's appropriate for us to use our own techniques and conform to our own disciplines. We also try make this visible to our clients, both to demonstrate the power of the techniques and disciplines, and to demonstrate our own professional adherence to these techniques and disciplines.

Motivation

As a business process, market research demands an interesting combination of intelligent thought and efficient operation.

For this reason, it provides more insight into process modelling and management than would a simple operational business process.

# Modelling the Process

Introduction

Ontogeny recapitulates phytogeny. In order to arrive at a reasonable understanding of a process for myself, I find it useful to step through the history of process modelling techniques, starting with the kind of simple linear process model I might have drawn in the early 1980s, and then gradually addressing more complex aspects. I also find this useful as a way of presenting the resulting models to other people.

Structured Methods

Let's start by looking at our business process using one of the structured methods that were popular during the 1980s. With Information Engineering, we understand a business process such as Market Research by drawing two models in parallel: a static data model shows the information structure, while a dynamic process model shows the flows and states of information between process steps.

Process Model

We could draw a fairly simple diagram, showing a sequential process flow. Each process would establish the prerequisites for the following process. The process flows would be defined either in terms of information flows (data flow diagram) or information states (process dependency diagram).
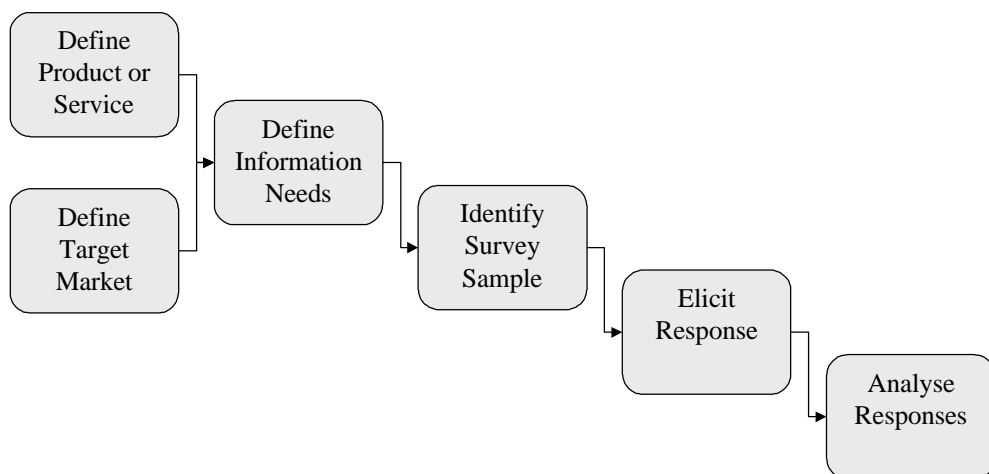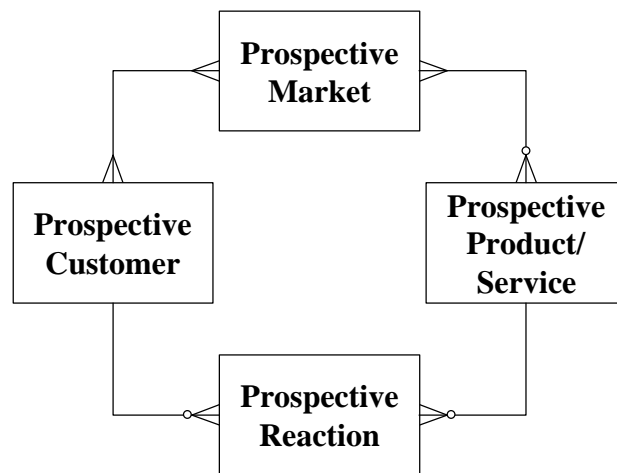

Figure 4

Requirement	Process Step
We need information to support development and marketing decisions.	Define Information Needs

Requirement	Process Step
We need to predict the reaction of the whole market to our product/service, by testing it against a representative sample.	Identify Survey Sample
Everyone in the sample is a potential customer. We need to discover and record their reaction to this product/service.	Elicit Response
The responses elicited in the survey need to affect our development and marketing decisions, in useful ways.	Analyse Responses

Data Model

Underlying this process model is an ontology that can be expressed as a data model.

Figure 5

In terms of this data model, the market research task is to assemble and analyse a set of reactions (by prospective customers to a prospective product or service) that is in some way representative of the target market as a whole.

This data structure implies three key requirements for the process.

| Requirement	Process Step
We need a way of identifying a sample population of prospective clients within a defined market.	Identify Survey Sample
We need a way of eliciting a reaction from a prospective customer to a prospective product or service.	Elicit Response
We need a way of aggregating the reactions to support decisions.	Define Information Needs Analyse Responses

Discussion

This model makes a number of limiting assumptions about the market research process. In particular, the key process step is described as a highly repeatable information transaction. This is certainly true for some market research organizations, but by no means all.

Furthermore, it assumes that we know in advance exactly what our information needs are, and what counts as a representative sample. This may be true in highly stable markets and environments - but this seems to be an increasingly rare precondition.

Object-Oriented Methods

Class Model

Sometimes when people convert from structured methods to object-oriented methods, they simply alter the notation, without altering the way they think.
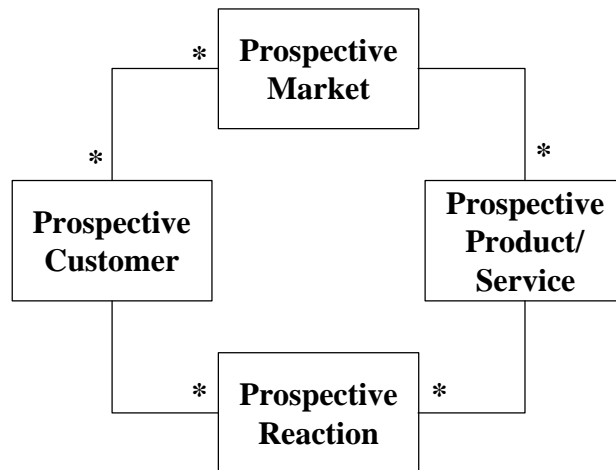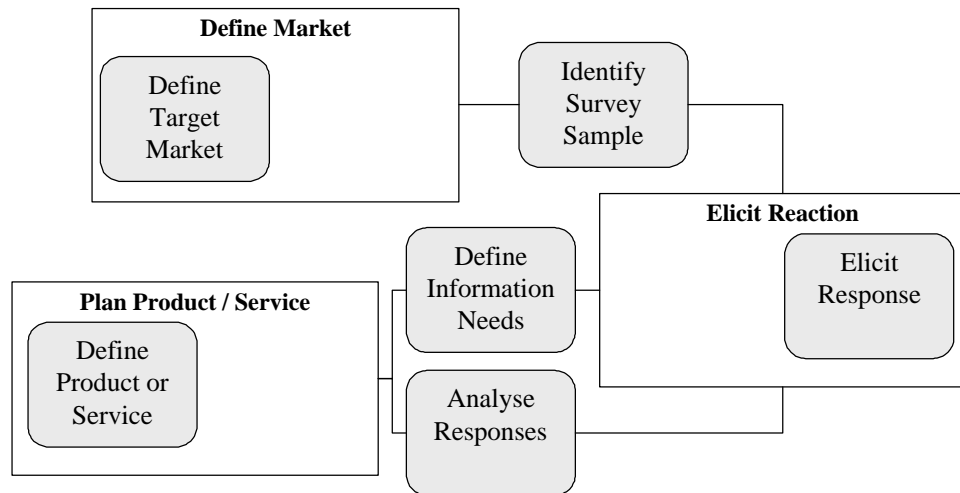

Figure 6

Collaboration Model

The crucial difference between structured methods and OO methods is seen, not in the class model, but in the collaboration model. This shows the interaction between objects or classes, but without fixing their sequence.

The following collaboration diagram uses a notation derived from Catalysis. Some actions are assigned to a single class, while others are joint actions, not yet assigned or subdivided.
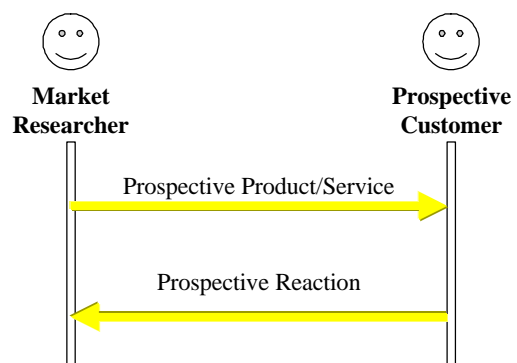
Figure 7

Note that we have the same activities as before, but without the same fixed sequence. Of course, we probably still need some rules about sequence (expressed through the pre- and postconditions of the actions and joint actions) but these can now be more subtle and flexible.

With this model we can, if we choose, allow the information needs and the sample to be refined as we accumulate the responses. (With structured methods, this would require explicit iteration loops and other complications.)

With this kind of model, it is also easier to include second-order or control processes. For example, we may want to estimate (after the event) the degree of representation that a given sample has actually achieved; this is something we may wish to take into account when using the market research findings to support business decisions.

Sequence Model

When we do need to specify sequence, there is a different OO model that serves this purpose. Here's an extract from this model.

Figure 8

Discussion: Terminology and Style

When people take their first steps into Object Thinking, they often expect the names of objects and classes to be nouns, reflecting their thing-ness. This expectation is encouraged by many OO writings and methods. (Indeed, in an OO analysis and design course I sat through recently, we were told to identify classes in a case study by underlining the nouns in a piece of

text. This is exactly the same technique that many of us used to teach in the 1980s for identifying entity types.)

But when we are trying to understand the participation of an object in a business process, it is the **characteristic behaviour** of the object that is of primary importance, rather than its thing-ness.

Let's consider an analogy. There are some sitcom characters that are so strongly defined that we can recognize their characteristic behaviours in other people. For example, Sgt Bilko or Basil Fawlty. We might say: "he's doing a Fawlty" or "he's Bilkoing".

Similarly, when we look at the characteristic behaviour of an architect producing architectures, we might say: "he's architecting".

Thus when we want to model this characteristic behaviour, what label do we put on the diagram? ARCHITECT, ARCHITECTURE or ARCHITECTING?

Most of the time, the choice of label is a matter of style and emphasis, rather than logical correctness. (When you produce a model, you usually need to describe each construct in some detail, rather than simply give it a one-word label.)

Enterprise Modelling

The models we have looked at so far are primarily information models. They omit a number of aspects of the business process that relate to other perspectives.

Here are some of these aspects:

➢ The information needs are primarily driven by a sense of the **business risks** entailed by a given plan.

➢ The prospective customers may demand some **incentive** to provide information. Alternatively, they may be motivated to deliberately distort the information they provide, in order to improve some future **bargaining** position.

➢ There may be a choice of **mechanisms** for contacting customers and eliciting their responses. Each mechanism may slant the results, in different ways. If the customer is given the choice of mechanism, then we may expect different sectors of the market to prefer different mechanisms.

Such aspects as these can easily be added to the collaboration diagram (Figure 7).

Q   Develop a collaboration diagram showing these aspects of the process.

Managing the Process

Having defined the process, we need to be able to implement and manage it.

Allocating Roles

The model in Figure 7 can be extended into the model in Figure 9 to show the three main loops, as follows[1]:

Strategic market planning loop	Define Market - Build Campaign - Track Competition
Product management loop	Capture Reaction - Build Sales Intelligence - Design Product / Service
Market research loop itself	Build Campaign - Capture Reaction - Track Competition
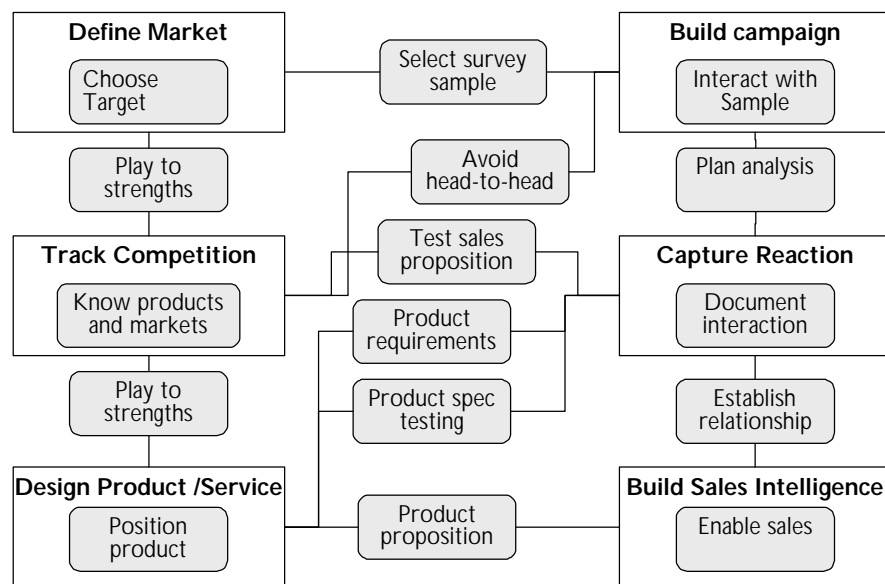
Figure 9

This view of the process is used to take and develop particular roles as well as sharing the burden of the task work.

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[1] Thanks to Aidan Ward

Monitoring and Controlling Progress

Where a process involves some degree of iteration, there is often a management difficulty determining how much progress is being made. A growing pile of deliverables and successive versions may create the illusion of progress, but this all too often indicates an inconclusive oscillation between two or three alternative solutions, rather than convergence towards a single good solution, or evolution towards an even better solution.

Take for example the activity DEFINE TARGET MARKET. We want to be able to start with a rough notion of the target market, and end with a much better notion. Whether we draw a linear process model with iteration loops, or a continual improvement collaborative process, we expect that there will be a series of definitions, each one better than the previous one, until some satisfactory outcome is achieved.

In order to manage this effectively, we must specify the DEFINE TARGET MARKET activity precisely, so that an improved definition of the target market is recognisable as such.

Monitoring and Controlling Costs

Where a process involves some consumption of resources, there is often a management difficulty determining how much expenditure is legitimate. There is also an expectation that the costs being incurred should be in proportion to the progress being made, and to the business value of the results.

Monitoring and Controlling Quality

The other major headache for managing this sort of process is to know whether the results are any good.

> **Q**   How can we assess the results of market research?
>
> **Q**   What additional activities would be required, to make the process self-controlling?

General Discussion

Synchronic and diachronic

There are two ways of viewing a process: synchronic and diachronic. SCIPIO allows us to alternate between these two views, as appropriate.

Diachronic	Synchronic
• Sequential. Task-oriented.	• Parallel. Technique-oriented.
• Concerned with progress through activities.	• Concerned with the collaboration between activities.
• Best described procedurally, in terms of sequence, selection and iteration.	• Best described declaratively, in terms of objects and their responsibilities and exchanges.
• Works best for describing individual scenarios. Totally generalized diagrams are usually too complex to read.	• Works best for describing general rules. Detail can be encapsulated in subordinate diagrams.
• Supports workflow management (i.e. work scheduling, task assignment, progress management, …).	• Supports the management of capability (i.e. skills training, organization structures, standards, tools provision, …).
• Measured using productivity and progress metrics	• Measured using quality and service metrics.

A process must be described both diachronically and synchronically. Many people will prefer to start with a diachronic description. However, if managers and system designers work exclusively from a diachronic description, the resulting computer systems and working practices are likely to be sequentially restrictive. This is a common flaw with many computerized clerical systems, which only work effectively if the documents arrive in the 'right' order. This is why SCIPIO has ways of describing process workflow both diachronically and synchronically.

The same is true for describing a method. Any method (including SCIPIO) can be described both diachronically and synchronically. Most of the users of the method will prefer to start with a diachronic description. However, sophisticated use of the method (including customization and optimization) ideally requires access to the synchronic description. Furthermore, the synchronic description is essential to the people building tools to support the method. If the tool builders work from a diachronic description, the resulting tools are likely to be sequentially restrictive. This is what happened with early CASE tools, which supported the underlying method only if you did the tasks in the 'right' order.

Self-controlled processes

Process management includes activities to control such aspects of the process as progress, costs, and quality.

Many modelling techniques exclude such process controls from the process model itself. SCIPIO allows them to be included, if this is appropriate to the purpose of the model.

> **Q**   When would it be appropriate to include process controls in the process model?
>   When would it not be appropriate?

References

Catalysis. Desmond F. D'Souza & Alan Cameron Wills. Objects, Components and Frameworks with UML: The Catalysis Approach. Reading MA: Addison Wesley 1999.
See also http://www.catalysis.org/

RM-ODP - the reference model for Open Distributed Processing.
The official website for RM-ODP is http://www.iso.ch:8000/RM-ODP/
See also http://www.dstc.edu.au/AU/research_news/odp/ref_model/