Modelling Business Relationships in a Non-Centralised Systems Environment

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Abstract

Systems development is now occurring in a range of environments ranging from those that are simply de-centralised to those that are open and distributed. Forms of federated development activity are beginning to emerge between heterogeneous organisational units. A clear understanding of business relationships is critical for success in such situations. A Business Relationship Modelling methodology is introduced that allows both the organisational and technological issues to be properly explored and resolved. Its use is illustrated through a case study based on video on demand.

Keywords

Business relationship modelling, enterprise modelling, open distributed processing

1 INTRODUCTION

1.1 The move to openness and federation

It is a commonplace observation that organisations are tending to move away from structures that are centralised and control-oriented towards those that are more decentralised and dependent on clear levels of empowerment. Centralised, hierarchical structures drew much from traditional military forms of organisation; much corporate thinking, with its focus on strategies, tactics, campaigns, objectives and even warfare (Ries and Trout, 1986), remains steeped in military jargon.

The traditional military model can be very effective in controlling large organisations. However, in situations where rapid response to changing circumstances is necessary and organisational flexibility is at a premium it can be found wanting. There are now many

examples of how difficult the formal military structure finds it to deal with small bands of loosely coordinated guerrillas.

Equivalent difficulties exist in the corporate world. Increasingly, corporate giants are being put under pressure by smaller organisations and by the rate of change in their marketplaces. In the past, only companies with a world-wide physical presence could be viewed as players in the world market. Now, improvements in communications technology and the dawn of the information superhighway make it easier for small organisations to get their message out to the world. The overhead cost of a global infrastructure is no longer a significant barrier to becoming a global player.

Large organisations are responding to this challenge. Many accept the spirit of "small is beautiful" (Schumacher, 1974) and are seeking, not to become small, but to relearn how to behave like small organisations – particularly in terms of responsiveness, flexibility, and entrepreneurial initiative. Organisations are being flattened and decentralised; empowerment (Bowen and Lawler, 1992) and teaming (Katzenbach and Smith, 1993) are replacing command structures; networking is replacing hierarchy. It is now possible to envisage an organisation managed through a federation of teams, as in Figure 1.

Figure 1 Networked management teams.

Information technology promises to force the pace yet further. 'Openness' is increasing and it is now possible to look forward to widespread availability of open distributed processing – possibly of the kind envisaged in the ODP Reference Model standards (ISO 10746, 1993). As expected from its name, open distributed processing combines the technological concepts of openness and distribution.

The notion of open distributed processing also carries with it an implied promise of openness and federation for business management. This may be divided into two levels: internal (concerning the structure and management of a large organization), and external (concerning market opportunities and business alliances), (Veryard and Macdonald, 1994). Table 1 shows a characterisation of each level.

Table 1 Levels of openness and federation

<i>Openness</i>		<i>Federation</i>		
Technical	Portability	The capability of implementing programs without change on different computer systems.	Heterogeneity	Multiple system platforms
	Interconnection	The ability to move information between computing systems using communications.	Brokerage	Multiple system design authorities
	Interoperability	The ability of joint working between interconnected computing systems.		Autonomous agents trading objects and services
	Distributability	Extends the interoperability idea to allow processes and information to be provided and migrated automatically to the most convenient point of an interconnected set of computing systems.		
Organizational / Managerial	Evolution	The ability of an information system to be maintained to respond to changing requirements. Software engineers such as Lehman (Lehman, 1980) have encouraged us to consider the information system, across its operational life-cycle, as an evolving object.	Decentralisation	Horizontal coordination and problem-solving
	Unboundedness	The absence of barriers to the provision of information and services for the end-user. The ability of unexpected information, from unexpected sources, even in unexpected formats, somehow to enter the system.	Service culture	Negotiated relationships (service level agreements) between parts of the organization.
Market / Entrepreneurial	Low entry barriers	The ability of new competitors to 'freely' enter a market.	Business Alliance	Business process chains that cross enterprise boundaries
	Low exit barriers	The ability of competitors to 'freely' leave a market.		

Technological openness and federation allow the use of components from various suppliers in the design and development of information systems, using common standards to achieve economic benefit.

In the organisational/management sense, business information systems have always been open, to some extent. Most attempts to centralise and homogenise information systems have fallen short of complete integration and closure (Veryard 1994). Decentralisation may be viewed as an early step towards open distributed processing, with full conformance to open system standards being positioned at (or at least towards) the fully open end of the spectrum. Openness also connotes flexibility, the ability of organisations to evolve in ways not predicted or controlled by top management (Kelly 1994).

Market openness is often referred to as the 'level playing field'. Barriers to entry and exit are partly technological and partly socio-political and there are few markets where it would be appropriate or possible to wholly eliminate barriers to entry or exit. Partly, this is to do with the acquisition of obligations as a consequence of contractual or co-operative relationships.

Open distributed processing also contains the notion of technical federation. In parallel to this technical concept of federation, we believe that the availability of technological capacity that fully supports openness and distribution will act as an enabler or as an inducement to organisational federation and other forms of co-operative management. Federation is therefore relevant both as a management concept and as a technical concept.

Federation can be seen as an organisational extension of the notion of distribution; it is the distribution of management authority. Either by coincidence or design, federation is currently a hot topic both in management science and in information science. Eloquent arguments for federated management structures appear in Sloan and Harvard business reviews (Davenport et al, 1992; Handy, 1992), while the development of the technical concepts of broker and trader (ANSA, 1991; OMG, 1991) support technical federation across computer networks.

The vision of open distributed processing as it appears in the ISO standards is of heterogeneous distributed systems that cross the boundaries of traditional organisations. The Business Relationship Modelling methodology has therefore been designed to cope with inter-organisational as well as intra-organisational developments. It explores the topology of business relationships in parallel with technological relationships and in a market context as a means of encouraging a coherent approach to systems definition.

1.2 Difficulties of designing in an open world

Full openness can be viewed as the natural state of all systems, with decentralisation being a special, constrained case in moving towards it. We are, however, used to designing for such special cases and, in particular, to working within the narrow confines of centralisation.

Openness may also lead to open-ended, incrementally developed and continually evolving systems (Hewitt and de Jong, 1984) that are created even by multiple organisations. The principal difficulty in such a relatively unbounded situation is that there may be a different design process – where the process is itself distributed. Conflicts can arise because parts of the system derive from different sources and are created under different regimes. There are then issues over the consequent need for maintaining and making available specifications and reasons for particular design choices. (Veryard 1995a)

When system components and information about them are passed across organisational boundaries obstacles appear that are partly technical, partly human, and partly a consequence of the way in which capability is procured. Wood and Sommerville (1988) point out that the human problem is a result of the fact that reuse involves a kind of de-skilling of what are seen as highly skilled developers. There are economic problems associated with deciding who owns a complex object which has been built by X for Y, using components developed by Z. Technical problems are associated with the difficulty of developing reusable components – deciding whether a component is actually reusable; the absence of effective catalogues which can be searched effectively; the absence of agreed quality criteria for reusable objects and their interaction with other objects.

There are many other differences on either side of each organisational boundary:

- No common purpose; different organisational entities often lack a common purpose, especially if boundaries lie between dissimilar industries.
- No trust; this is inherent between different organisational entities. It is vividly reflected in uncertainties about the quality of software components obtained from elsewhere.
- No common economic framework; where components are provided by one organisation and used in another there may be a need for payment. There is no defined market for software components or information about them, neither is there a clear idea of how to charge for either use or ownership.
- No common legal framework; software components may be of inferior quality, or the information about a component may be inaccurate. It is unclear what, if any, legal framework applies in these cases.
- No common meaning and representation; there is little agreement about the languages which should be used for the description of software components. Misunderstandings can arise despite the presence of comprehensive descriptions.
- No common quality standards; the agreed measures for software component quality have been derived from those suitable for hardware components (e.g. MTBF, MTTF). Software quality of service is often better expressed in application dependent terms, such as mission time (the time during which a component is to stay operational with a precisely defined probability of failure for instance) (Siewiorek and Swarz, 1992).
- No support for distribution; this is a problem which requires the application of distributed processing technologies.

These organisational issues should be solved within the business process of producing new features for systems to support novel business services. They are part of a business process reengineering activity (Hammer & Champy, 1993) in which several organisations may wish to become engaged.

2 METHODOLOGICAL ISSUES

Establishing a clear definition of business relationships is a primary issue as we move from decentralisation to greater openness – otherwise solutions to other issues are in constant jeopardy of failing at the implementation stage through confusion over the execution of necessary obligations. For most organisations, to whatever extent they promote

decentralisation, there remains a concern over the means of retaining some form of management control over what is going on (Goold, 1991; Hammer and Champy, 1993; Iggulden et al, 1993).

Put simply, we need to establish

- who** is involved
- what** responsibilities they accept
- what** consequent obligations they agree to fulfil
- where** authority for resources lies.
- where** accountability for execution is invested

In our view, without a proper understanding of these, it will be difficult to achieve success in the major activities whose importance is accentuated by increasing decentralisation and openness. We therefore need to deal with:

- suitable concepts for modelling business relationships
- requirements determination
- business case formulation (supporting investment and/or procurement decisions)
- flexibility and coordination in design.

2.1 Concepts in business relationship modelling

We are interested in the rules of engagement for business activity. In Ackoff's (1972) classification, our view of business enterprise is of *purposive, multi-goal-seeking systems*. These are systems that pursue different goals with the common property of a shared system's purpose. Goals are selected for such a system (for example by strategic planning), which then chooses its own means of pursuing them.

Various styles of modelling exist to support the purposes outlined in the previous section. Our starting point has been to identify some of the concepts that recur in many of these styles, and our perception is that the notions of agent, activity and resource (Veryard and Macdonald, 1994) can provide the hub of a unified business relationship modelling language.

Agents have various intentions, expressed through such means as plans, policies, objectives and strategies. These are best understood in the context of the responsibilities and obligations held by the agent (Strens and Dobson, 1993). Obligations may be bundled into contracts or agreements (e.g. service level agreements).

Responsibilities and obligations are relationships between agents. An agent has a responsibility to another agent to maintain some desired state-of-affairs; an agent has an obligation to another agent to perform some activity.

In actual organisations, we typically find mismatches between the distribution of responsibility (R) and the distribution of authority (A), as well as with the distribution of expertise (E) and work (W). An analysis technique designed to identify and resolve such anomalies is known as RAEW analysis (Crane, 1986; Texas Instruments, 1990).

Distribution also entails some coordination activity. One of the difficulties of coordination is that in any reasonably large system, there is a very large number of things that *could* be coordinated. A good coordination methodology therefore needs to identify the things that *must* be coordinated (Veryard, 1994).

To model this aspect of the enterprise, we introduce the concept of *interaction distance* (Veryard and Macdonald, 1994). This is a logical concept, and is only metaphorically related to geographical distance. We can appreciate informally what is meant by saying that an Apple Macintosh in London running Claris Works is closer to another Apple Macintosh in California with the same software configuration than it is to a PC in the same room running Word for Windows. This captures the concept of interaction distance.

For two activities or departments or whole companies that need to be closely coordinated, we can work out the required interaction distance, and compare it with the distance in the current technical environment. This comparison is used to cost-justify both organisational changes and IT developments that reduce or bridge the distance, thus improving coordination.

The need for close coordination can be derived from a model of the enterprise that indicates where resources or decisions need to be shared (over some interaction distance). This in turn is derived from an understanding of responsibilities and obligations, as discussed above.

This leads to an identification of specific *exchanges* between agents (or between activities) concerned with: *sharing of resources*, *communication between agents* and the *coordination between activities*.

These exchanges are carried out across a measurable interaction distance. Thus if we are going to acquire and use technology to bridge these distances, we need to understand, estimate or determine two things:

- what is the business value of such bridges
- what are the specific requirements.

2.2 Requirements determination

Systems design is a process that produces a solution to a given requirement using the available technology. Technological advance therefore alters the design process; as the technological constraints on information technology systems are reduced, the choices available to the system designer are increased.

With increasing openness, the designer has new topologies to choose from, new mechanisms (including control mechanisms), and new styles of interfacing and inter-working. These new choices demand resolution by reference to the statement of requirements. This therefore places new demands on the requirements determination process. These need to be addressed by the business relationship modelling methodology.

To begin with we have to ask:

Whose requirements are they?

In trying to answer this question we find two complicating factors that become exaggerated as openness increases:

1. the developing nature of the requirements owner
2. multiple owners.

Owner development

During the requirements formulation process, the requirements owner is himself transformed: from a 'naive' client who articulates an infinite (imaginary, fantasy) demand for a magic

solution, into a 'mature' client who articulates a moderated (symbolic, formal) desire for a realistic solution. This can be illustrated in a Z-shaped schema, which shows how the development of the requirements is paralleled by the development of the client.

Figure 2 Parallel development of requirements and client.

This maturing of the requirements owner is a developmental process of which the requirements engineer needs to be aware, as it affects the relationship with the client, and may also well affect the nature of the contract – at least for the next system, if not for this. Organisational learning as an outcome of a requirements process is one that is often unrecognised. However, it is part of any engineering discipline to suggest and incorporate organisational learning improvements into the processes of that discipline (Veryard, 1994).

Multiple owners

What happens when (as is usual) there is more than one requirements owner?

The requirements formulation process may start with a collection of separate requirements owners, with overlapping and conflicting requirements. The goal of the process (not always reached, of course) is a transformation of this collection of separate requirements owners into a reasonably coherent 'we' – a group identity with a shared set of requirements. This does not imply that all conflict within the group has been resolved or suppressed, but that a sufficient commonality of purpose across the group has been forged.

There seem to be two distinct situations, which will need different contract models (Smith and Berg, 1987):

1. The stakeholders come to the group accustomed to playing parts in a larger whole. They therefore have a basis (or 'frame') for communication, negotiation and agreement. Conflicts between stakeholders exist, but can be 'contained' within the frame. Such frames typically exist long beforehand and long afterwards.
2. The stakeholders come to the group as independent wholes, with no larger entity to which they owe allegiance. There is no pre-existing frame, and the stakeholders must create one for the purpose of this project alone. Such frames usually do not outlast the project. Conflicts are not easily contained, and are at best only temporarily suppressed.

In the former case, a group of stakeholders is likely to be able to achieve a reasonable level of commonality of intention, and can for some purposes be regarded as a single system. In the latter case, typical of an open situation, any commonality of intention may be illusory.

Where we have multiple owners, what is at issue during requirements formulation is the establishment of a collective identity: 'we'. The aim then is to develop requirements statements that can be expressed in the form 'We Require This'. Such a statement contains three components, but requirements engineering usually fails to address them all.

Figure 3 Third order requirements engineering.

Most approaches address only the solution, and take the process (including procurement) for granted. These can be described as 'first order' requirements engineering. Some approaches (notably the soft systems methodology (Checkland, 1981) and the ORDIT approach (Dobson et al, 1994)) address both the process and the solution and can be referred to as 'second order' requirements engineering.

Both first order and second order requirements engineering consider the identification of the client to be merely a matter of correctly naming all the stakeholders. The development of the group identity of the requirements owner (as well as other participants in the requirements engineering process) is only properly addressed by 'third order' requirements engineering (Veryard and Dobson, 1995).

2.3 Business case formulation

One of the key components to a methodology for open distributed systems is a process for formulating and agreeing the business case for development and change. Both investment and procurement decisions are supported by such a business case, which shows benefits (tangible and intangible) outweighing costs, on some scale to be agreed. The business case formulation process, which is iterative and requires negotiation between stakeholders, needs to be fully integrated with the development and change processes.

Existing information systems development methodologies typically gloss over this area. Business case methods exist in management science and operations research, but are seldom integrated into systems development methods (Symons and Walsham, 1988). Open distributed processing also raises new issues for business case formulation. Most approaches to investment and procurement assume a central design and funding authority, but with decentralisation and federation we have to abandon this assumption. Openness introduces a problematic element to the scope of the business case and to assessing the nature of value chains in the open environment (Benjamin and Wigand, 1995).

To understand benefits, we need to recognise that benefits are distributed in three ways:

- over time
- over multiple stakeholders
- over different future scenarios, with different levels of probability.

Traditional business case methods collapse these onto a single value, assessed from a centralised decision-point. Since the distribution of benefits is three-dimensional, it follows that there are three dimensions to this collapse:

- Accounting techniques of discounted cash flow reduce the future to the present. (This is known to have some distorting effect, but the techniques are still widely used.)
- Stakeholder weighting techniques reduce multiple stakeholders to a single (virtual or abstract) stakeholder. Sometimes multiple stakeholders are just ignored or overruled.
- Uncertain benefits are converted into benefit expectations, using probability theory. This collapses branching future scenarios onto a single probabilistic future space.

With inter-organisational systems, and even within most large corporations, this notion of a centralised decision-point is a dangerous myth. There are many important issues.

- Who counts as a stakeholder?
- How do we cope with conflicts of preference between stakeholders?
- How do the costs of shared infrastructure get distributed between the beneficiaries?

If the decision-making is distributed – each stakeholder acquiring local technology in order to connect to a network – we may need to depart from the traditional business case methods, towards one that looks at critical masses (Markus, 1990).

The business case methodology therefore needs to support a range of decision-making styles:

- Central decisions require benefits to be collapsed to a single perspective.
- Central policies (especially where these do not have mandatory force, but aim to achieve a critical mass of a certain technology within an organisation or consortium) need to be analysed in terms of a dynamic take-up model. We can look at other communication technologies such as fax and EDI to help us build this kind of model. This kind of analysis also supports analysis of market opportunities by service vendors.
- Local decisions may be taken in isolation, but are also likely to be coordinated/negotiated. The business case methodology needs to support negotiation between autonomous or semi-autonomous agents, by predicting the costs, benefits and risks of particular infrastructure to each stakeholder, and therefore helping them agree on a fair basis for co-operative acquisition or development.

2.4 Flexibility and coordination in design

Key methodological issues arising from these problems are the needs to ensure that the design process provides for flexibility and coordination in the resulting systems.

Design for flexibility

Designers need to specify **flexible** yet **integrated** solutions. With closed technology, flexibility and integration were often opposed goals: the more you had of one, the less you had of the other. Openness helps the designer reconcile these goals. Flexibility is promoted by the following design goals, which are supported by business relationship modelling:

Design for diversity

- The business relationship model indicates where multiple agents may provide variant services.

Decentralise control subsystems

Design systems by composition from smaller units.

Improve the overall robustness of a system by improving the robustness of individual components.

Use responsibility clustering to divide a system into subsystems.

- Relieve bottlenecks of command and control, in which opportunities for parallel operations are frustrated by central (decision-making) authority and lack of local empowerment.
- The business relationship model shows ways in which an enterprise may be decomposed and also shows ways in which the parts may gain by being connected.
- The model may indicate particular areas of uncertainty where early commitment may be unwise.
- The business relationship model clarifies the intentions of the various agents and supports a search for those groupings of agent's that will give high internal cohesion of responsibilities and low external coupling.

Design for coordination

Coordination is promoted by supporting the following design goals:

Federate, as a cheap way of reducing interaction distance between heterogeneous systems.

Give agents the necessary authorisation to enable them to access the resources needed to fulfil their responsibilities and discharge their obligations.

Ensure that conversation parties have agency over the related policies.

- The modelling provides a means of determining current interaction distance by analysing relevant exchanges and then determining a desired interaction distance by analysing relevant intentions.
- Business relationship modelling of responsibilities and obligations is used to clarify or establish new responsibility relationships between the (pairs of) agents involved. A chain of responsibility relationships can be defined for agreement by showing how obligations pass from one agent to another.
- The modelling is used to clarify the responsibilities for **making** policy versus **executing** policy, of the parties to conversations in the conversation hierarchy.

3 THE MODELLING METHODOLOGY

3.1 Structuring principles

The Business Relationship Modelling methodology describes a number of components of a solution to the problem of modelling an open information system development project. It

does this by defining tasks which have to be undertaken in such a development and showing the role and nature of the models which need to be employed during each of these tasks.

The perspective adopted for the Business Relationship Modelling methodology is models of organisational structure and boundaries. This is an important perspective since openness is not just about heterogeneity of network infrastructure, but about federated computing across organisational boundaries (which is what may have given rise to the network heterogeneity in the first place). There is quite a lot of evidence that many difficult problems and failure modes of information systems arise where these systems cross organisational boundaries.

The Business Relationship Modelling methodology has a view of the information systems development process that was adopted from the ORDIT model of requirements capture (Dobson, 1993) then adapted. It consists of activities in four **zones** (derived distantly from the four dialogues of Lacan (Bracher, 1994)), as shown in Figure 4 below:

Figure 4 Four zones of organisational intervention.

Each of the four zones corresponds to a distinct set of activities which normally are performed by separate groups, or perhaps separate enterprises, involved in a development project. They form a natural division between separate domains of ownership or management.

In the **modelling zone** we seek understanding and develop models of business relationships. Within this zone, there are four sub-zones: scoping, (re)presenting, opting (preference structures) and prototyping.

In the **planning zone** decisions are taken over action and are translated into plans, for example, scoping plans, design plans, investment plans, evaluation plans, and action plans. The models and the understanding they promote serve to provide a basis and support for the planning.

In the **implementation zone** we seek to achieve practical change to address identified issues and gain tangible value from the change. This is where plans are put into effect; systems are built, tested and commissioned; people are trained, and new skills are deployed.

In the **learning zone** organisational learning emerges as well as general improvements in the 'state-of-the-art'. It may include comparative research, reviews of experiences and successes, selection and synthesis of findings and dissemination of relevant knowledge.

These zones correspond to separate sub-processes which occur generally in any form of system development. These sub-processes are essentially asynchronous and iterative in nature. There is no linear ordering either of the sub-processes themselves or of the component tasks within each sub-process. A complete development project will visit each zone several times, in an order which will vary from project to project.

Each sub-process will consist of some number of asynchronous tasks, the details of which will also vary according to the development project. The Business Relationship Modelling methodology and the case study provides one description of these tasks.

The methodology itself is not prescriptive about the order in which zones are visited or tasks performed, since this depends on the context of the problem, the project, and contingent features of the situation such as the development contract. However, the methodology does suggest a default approach which can be used when there is no good reason to adopt an alternative one. The choice of a route through the maze is made easier by experience, judgement and sensitivity to a problem.

Finally, a comment should be made on managing a project using the Business Relationship Modelling methodology approach. Because of the asynchronous nature of the sub-processes and tasks, it is important to define the synchronisation points between them. This is a management task, but because development of a non-centralised system will involve several management domains, these synchronisation points need to appear at well-defined interfaces between these domains. It is a frequent observation that this leads to inefficiencies in the process, for example, delays in scheduling meetings, delays in the production of documents and the meetings themselves. There is still no easy solution to dealing with these sources of inefficiency, but one of the benefits of our approach is that it allows prediction of where and when these inefficiencies are likely to arise, so that an alternative allocation of tasks to the management domain can be considered if one is found that is both desirable and feasible.

3.2 Business relationship modelling methodology task structure

The following diagram shows the overall task structure of the modelling and planning zones. Details of the application of these tasks to a video-on-demand scenario are presented in the remainder of this paper. Task structures for the implementation and learning zones are outside the scope of this paper, though some comment on implementation is provided.

Since the Business Relationship Modelling methodology is not a linear methodology, it is important to stress that the actual sequence of activity need not follow the numbers assigned to the tasks. This fact is illustrated by our video-on-demand case study, in which we started with task 2, and continued with task 4 before tackling task 1. Furthermore, we only made a quick and dirty stab at task 5 before attempting tasks 6, 7 and 8, and then returning for a second go at task 5.

Figure 5 Business relationship modelling methodology tasks.

4 VIDEO-ON-DEMAND CASE STUDY

4.1 Introduction

Video-on-demand is a service by which a consumer can electronically order a video at any time of the day or night and have that video screened immediately or at any other time chosen. It eliminates trips to a video shop and any tape handling, but otherwise offers the same functions available from a video player via a remote control.

The scenario for the case study, in figure 6, assumes relatively conventional terminal equipment. At this stage, organisational boundaries have been imposed on this technical structure in a, perhaps, arbitrary manner. Links to accounting, billing and payment systems will inevitably be part of such a system, but for simplicity they have not been included.

Figure 6 Basic video-on-demand equipment.

Telephone is used for conveying the wishes of the consumer to the service provider. A wide-band medium (offered via a local cable operator) is used to serve the customer (with video in this case). In the short to medium term this is economical since much of the infrastructure is already in place. Also, terminal equipment at the customer site is cheap, resulting in better take-up of new services.

A typical customer family has phone and cable connections. They possess a decoder and a television and an interest in particular types of video films. To protect their children they want to be able to block the screening of video nasties; to help manage the household budget they want to have access to their account to see how much is owed at any one time.

There are many different video-on-demand services available. The only way our customer can find out about differences between their requirements and those on offer, is by being informed about other services. Information provision takes the form of (unsolicited) advertising and (solicited) browsing amongst the services available.

Once our customer family has become a subscriber they will want to negotiate the particular films to be shown. For this they use the telephone to contact the video library and to direct searches through the title index. The titles and other information are displayed on the television screen.

Once a film has been selected, it can be watched from beginning to end (the phone connection being no longer needed). If the customer wishes to interact with the player, several scenarios exist concerning, for example, replay, pause, slow motion, stop. Depending on the technology supplied, these signals can be processed locally or remotely.

There is an obvious connection between the technological solution and the business issue of being able to obtain a copy of a film on tape. A tape may be replayed several times, possibly with different audiences, hence devaluing the video-on-demand service.

Both video library and customer will do some accounting. The video library will track usage of its films and either charge upon use or periodically send a bill. The customers will keep information as to what use has been made and either pay as they watch or as the bill arrives. A receipt for payment may also be needed.

The issues of what is being charged for, how accounting is done and how payments are made have a profound impact on technology and the way in which services are used. Another important issue is how the carrier companies (Phone Co. and Cable Co. are paid for the service of transporting the signals.

4.2 Application of the business relationship modelling methodology

In providing a service, such as video-on-demand, there are many design trade-offs each with associated organisational, economical and technical issues. The Business Relationship Modelling methodology allows the trade-offs to be examined such that rational decisions can more easily be made.

The methodology is always applied from a particular **perspective** and results in a model which is valid from that perspective. We have analysed video-on-demand from the perspective of the **video library**. This allows us to explore opportunities for the video library to use the video-on-demand notion to offer new products and services to its customers, and to enter new markets.

Several aspects of the scenario are not covered in detail. Payment is mentioned only in passing; regulation is referred to, but its precise nature is kept outside the scope; registration of video on demand services is not covered; complaint handling is not explicitly covered.

The methodology enables questions to be raised which help both to elucidate requirements and to achieve a suitable solution architecture. Some of these questions are left unanswered since even without them the use of the methodology is sufficiently demonstrated.

4.3 Task 1 — Model Existing Business Situation

Agents and interactions

Two current ways in which video signals enter the home were identified as: (1) Video Hire and (2) Cable/Satellite & Broadcast.

Later we decide that the Video Hire system is the one we want to improve and replace. The nature of the methodology is however to initially cover a wider area so as to ensure good understanding of the context in which new opportunities will be analysed.

For this broad context we identified the following **agents**:

- a) Video Hire: Customer, Viewer, Video Rental Shop and Video Library.

b) Cable/Satellite & Broadcast: Customer, Viewer, and Broadcaster (e.g. Cable/Satellite/Terrestrial)

There are also regulatory bodies which act as agents in one or both systems, such as film regulator, broadcast regulator and cable regulator.

The sets of agents overlap as follows:

Figure 7 Overlapping sets of agents.

Principal **interactions** were then identified. Interactions are represented in Figure 8 within, a) the Video Hire system and b) the Cable/Satellite & Broadcast system.

Figure 8 Interaction structures.

Note how the payment and delivery subsystems are differently linked in the two systems. In both cases signals are paid for. In Video Hire, a straightforward hire charge is made (perhaps in addition to a library membership fee). Cable/Satellite systems may charge for signals by providing decoders in exchange for payment. Broadcast most frequently relies on the collection of TV license moneys or is paid for by advertising.

Regulators are omitted from the picture because they do not have specific interactions with other agents and only intervene on an ad hoc basis to police adherence to regulations.

Analysis of Interactions

Once identified, each interaction is characterised in terms of its mechanism, interaction distance and availability. It is then analysed in detail by considering its characteristics of

service provision and consumption. For instance, the Library offers a service to the Shop, the Shop offers a service to the Customer and so on. Each service provision is analysed in terms of service delivery and quality.

Characterisation

Table 2 Example of interaction characterisation

Shop/Broadcaster – Customer Interactions		
System	Video Hire	Cable/Satellite & Broadcast
Mechanism	Physical Tape VHS format	Cable/Satellite broadcast Broadcast analogue (625)
Distance	Physical trip to the shop to collect and return tape	If satellite it is via a dish If cable it is via wiring to the home. Hybrid solutions also exist, whereby cable companies re transmit satellite and terrestrial signals to customers via cable
Availability	When the shop is open	24 hour transmission but only according to a schedule

Particular emphasis is placed on characterising interaction distance since this will play an important part in making the business case. *Interaction distance* can be illustrated as follows:

Figure 9 Interaction distance elements in Video Hire.

Each step implies:

- Cost: carrying video tapes to shops is expensive and involves people and trucks
- Inconvenience: mostly for the customer, who will have to visit the store to select a tape
- Delay: latest videos cannot be stocked in sufficient numbers to satisfy demand
- Risk: the risk of loss of material at any stage in the path between the library and the viewer is considerable (there are few checks along the way).

These issues indicate that the interaction distance is too great in the conventional video hire model and highlight one area for potential improvement in the existing system.

Service delivery

The analysis brings out a number of issues that might need to be clarified:

Table 3 Issues in the Video Hire scenario

Formal Contract(s)	<i>Things which need to be clarified</i>
Library → Shop	Does the shop purchase the tapes outright OR Is there a royalty payable for each rental?
Shop → Customer	Quality of physical tape e.g. first generation copy, clean tape Payment, deposit Prompt return of tape and deposit
Informal Social Agreement	<i>Things which need to be clarified</i>
Customer → Viewer	Customer could be the viewer, the parent of the viewer, the host for several viewers etc.

Table 4 Issues in the cable/satellite and broadcast scenario

Contract	<i>Things which need to be clarified</i>
Library → Cable/Satellite Co.	Does the cable company purchase material outright? Payment per showing
Cable/Satellite Co. → Customer	Payment for connection/de scrambler Payment per view Payment by advertising

Service quality

Another set of issues can be found by examining the quality of each interaction. Some issues that might need to be clarified were identified as:

- Actual quality of rented tapes:
 - Poor copies – third generation
 - Dirty tapes – breaks, cracks
- Actual quality of satellite & broadcast:
 - Interference
 - Tuning

Note that these are “technical quality” issues. We might also have considered more subjective issues related to satisfaction with service and also issues relating to registration, regulation, payment and complaint handling.

Agree model of existing situation

At this stage it is necessary to agree on the actual model for the existing system. Much of the task so far was to do with exploring the context for this model.

We decided to concentrate on a system from the Video Library perspective, not the Cable/Satellite & Broadcast perspectives. Other possibilities rejected included Interactive Video. Video-on-demand combines the benefits of both Cable and Video Rental.

4.4 Task 2 — Explore Future Business Scenario

Agents

Before going into further detail in determining the agents in a notional video-on-demand system, it is necessary to identify the level of analysis. Three possible levels are identified:

1. Commercial
2. Information
3. Technological and/or Engineering.

A diagram can then be produced to identify agents within each level:

Figure 10 Three levels at which video-on-demand could be considered.

The intention is to consider one level at the time. However, the three levels are not independent. For instance, the choice about the delivery mechanism at the home (a technical question) may enable a customer to make copies of video material on a home video recorder.

Task 6 examines the relationships between the levels further. Since we are concerned with relationship modelling, it is appropriate to start by concentrating on the agents at the commercial level. The crude identification in the diagram above requires further refinement. This can be done by asking the following key questions:

What are the roles at the commercial level?

The agents that would be involved in a notional video on demand system are as follows:

Customer, Viewer, Phone Co., Billing Co. and Cable Co., and various regulatory bodies.

If video rental shops were used then they would be classed as agents, and would need to be included in the model (in the role of "allies" and not "competitors").

Who is developing the key technologies?

The key technological components of video-on-demand are being developed by the telecommunications companies. This makes them an important agent in the new system, both as suppliers of the technology, as well as participants in the delivery of the new service.

Telecommunications companies will see the revenue they can earn from the provision of basic interconnection services drop as the technology becomes cheaper. This must be a major driver for them to diversify into service provision across the interconnection services under their control – in this case, to provide video library capability.

Figure 11 Service = Product + Technology.

Interactions

Interactions between the proposed agents are analysed next by asking the following key questions:

What are the options for payment flow?

How is payment dealt with? Electronic payment is ruled out in the short term, because the technology is not yet sufficiently mature. However, does the video library make use of well developed accounting and billing services which could be provided by either the telecommunications service provider (Phone Co.) or the cable company (Cable Co.)? Is payment by credit or is there a pay as you view policy? Is a credit card company involved?

What are the payment/service obligations?

Who pays, and for what. What rights are obtained over what from the exchange of money? If a customer pays to view a film then the video library has an obligation to screen that film with agreed quality characteristics. There are obligations on the customer and the viewer as well. Viewing a film is not the same as being able to record it and show the recording to friends. A customer has an obligation to look after the terminating equipment and not connect other equipment which is not approved by the phone or cable companies.

What other information flows are there?

The video signal itself can be regarded as information with a certain value. Similarly, if a video catalogue is part of the service then the information it affords has a value.

Identify future scenarios

Two scenarios are possible. One ignores the existence of high street video rental shops, the other uses these facilities to promote a video on demand service. The two business models which emerge from this are quite different.

The idea of including (parts of) several existing enterprises in a new enterprise raises the key question:

Do we need to consider the possibility of mergers and acquisitions?

For example, video libraries might merge with rental shops, cable companies might merge with telecommunications companies. This would affect both the business cases and the migration plans in tasks 7 and 8.

A further question is:

What are the opportunities for new agents/services to interpose?

The titles catalogue is one example of an opportunity for a new agent in the system.

In broadcasting, listings are widely distributed on paper and via teletext, prestel or minitel. A video on demand service requires a similar listing service, targeted at its customers alone. This service could be made available as an interactive catalogue and could include video clips (trailers) and other advertising material.

The video title catalogue could be modelled as a resource, which might be controlled by an existing agent (such as the video library), or as an agent, which might be owned/controlled by the video library, or spun off as an independent company. This opportunity is easily spotted by distinguishing between the video catalogue resource and the agent which makes that resource available as a service.

Agree future model

Examining issues helps in exploring the possible configurations of agents, activities and resources, which might make up the proposed enterprise. A migration path from the existing situation to a possible new situation can now be plotted.

Figure 12 Existing versus Possible scenarios.

The perspective from which this migration is proposed is of the stakeholders in a video library.

4.5 Task 3 — Analyse Issues

The existing and available systems (derived and described in task 1) and the possible systems which could emerge (analysed in task 2) can be compared and contrasted. This is best done by analysing problems associated with each of the systems and options under discussion.

Perceived issues or current problems can be identified through the many sources of complaints within the Existing system. These were identified in task 1 as:

- tape quality
- inconvenience: the shop is too far
- waiting time for new releases.

The New system will also display a number of challenges, some of which may become the source of complaints. These are projected to be:

- Synchronisation between Phone Co. and Cable Co. – for quality of service and predictability of delivery
- Transmission quality – dependent on encryption and compression techniques, and source quality.
- Payments – which can be better tailored but may be more prone to disputes.
- Control over viewing – in terms of authentication of viewer, the material which is delivered and the time at which certain materials may be delivered.

A comparison of the existing and new models will show up differences. These are potential issues. Differences can occur when agents either gain or lose roles in moving from one model to another. Here, a difference has been discovered in that there is no role for the Phone Co. in the old system and a dubious role for the Video Shop(s) in the new system

Most of the current problems are the consequence of the large interaction distance between the library and the viewing station. This problem is addressed by the new system, so our simplest option at this stage is to agree an appropriate project objective, e.g.:

"To find a way, using video-on-demand, of reducing the interaction distance between the library(s) and the viewing station(s)"

4.6 Task 4 — Propose Options

The analysis of existing and potential issues is more wide ranging than the anticipated final scope. Task 4 is about delimiting the scope of the solution and gives responsibility for identifying choices and propositions to the analyst. In task 5 there is a shift to the problem owners, who make choices and select from the options put in front of them.

The first question here is which issues and problems are or can be fixed? From those identified in task 1 the following were selected:

- Poor tape quality
- Inconvenience.

The first was a result of tape as the medium, the second a consequence of the interaction distance between the source of the video material and the place of delivery (the home).

The objectives for any resolution are then:

- Improve viewing quality (move from tape to mono/multicast)
- Reduce inconvenience (remove visit to shop to hire/watch videos; do it from home).

These are achievable through video-on-demand but still leave us with one major service issue – which agent has the prime contract with the customer? There are 4 options:

- Option 1 – Video Library
- Option 2 – Phone Co.
- Option 3 – Cable Co.
- Option 4 – Video Retailer.

The key question that needs answering here is:

Does each option satisfy our objectives for viewing quality and convenience?

This question is addressed in task 5.

4.7 Task 5 — Select Option

One of the proposed options from task 4 is selected in this task. Responsibility for making this choice shifts away from the analyst to the problem owner, and the task attempts to shed light on the nature of the choices which have to be made. Specifically we must address the issue of which agent has the prime contract with the customer.

Selection criteria must be defined that reflect attributes of the video on demand service and the process required to implement it. These are the attributes necessary to achieve the solution objectives defined in task 4 and for this example, the following criteria were identified:

Speed of implementation:	The service should be easy to implement and the implementation should be fast so as to beat potential competition at least in the short term.
Profitability:	The service should be profitable as soon as possible.
Simplicity:	The service should be easy to understand by customers. A simple system structure will also help configuration management and maintenance of the system in the field.
Risk:	Risks associated with the service, its implementation and operation should be as low as possible.

Each option is then evaluated according to the selection criteria.

Option 1 – Video Library:

The Video Library depends on both the Phone Co. and the Cable Co. for delivering signals to the customer. Since this service is the main line of business for both companies, this option should be quick and simple to implement. The only complication is that cable tends to be a multicast environment, whereas video-on-demand requires monocasting. This is no problem given sufficient bandwidth.

There is a further dependency between Cable Co. and Phone Co. which affects the quality of control over viewing by the customer. Control signals which flow from the customer to the Video Library via Phone Co. wires need to be reacted to quickly

enough (judged by the customer who expects some effect to be visible in the signal that gets passed from Video Library to the Customer via the Cable Co. infrastructure).

Both Cable Co. and Phone Co. will want to be paid for the data they ship. This option's profitability depends on the charging structures applied by the carriers so some risk is associated with a lack of control over data transfer pricing policies.

Option 2 – Phone Co.:

The Phone Co. may be keen to provide services which will encourage use of its network. Given the complexity of the network and the nature of local legislation it may be slow to implement this service.

The competition between Phone Co. and Cable Co. (who also may provide phone services) is likely to be fierce, ruling out co-operative ventures of the kind required. Where co-operation does succeed, the relationships could be quite complex and this complexity may be against the interests of the customer of the video on demand service.

On the plus side, the Phone Co. does have advanced charging and billing facilities which could be a solid basis for the administrative part of the video on demand service. The Phone Co. also has a wide-spread network, serving a majority of households in developed countries.

Option 3 – Cable Co.:

Many of the issues mentioned under option 2, are also valid here. Speed of implementing the service and making it available to a large customer base depends greatly on the area observed. For instance, most cities and built up areas in the USA and certain countries in Europe (e.g. The Netherlands and Belgium) have been cabled with wide area networks. The installed bandwidth does vary enormously, however, and video on demand services can be introduced only where the bandwidth allows. In other developed countries, and in most rural areas, cable provision is patchy.

The criteria could, however, easily be met if this obstacle were to be overcome. The Cable Co. could provide a simple and virtually risk free service for its potential customers and could prove to be very profitable.

Option 4 – Video Retailer:

The Video Retailer has customers who rent videos but placing video provisioning services in the stores still leaves the problem of how to transport the signal to the home. The customer and the retailer would still have to rely on the phone and cable networks which lie between them. This is therefore little different from option 1.

Video retailers often occupy high street premises which are expensive to rent. Although a physical presence may be comforting to the customer, it is not required and will push up the cost to the customer.

From the above analysis it is straightforward to make a selection:

The Video Library has the contract with the Customer.

4.8 Task 6 — Define Solution Architecture

Analyse implications of solution

Task 2 identified three levels at which agents could be identified – Commercial, Informational, Technological / Engineering – and concentrated on modelling the chain of

interactions at the commercial level. In this task, ways in which the different chains impinge on one another need to be examined.

One way in which to discover some of the dependencies between commercial, informational and technical or engineering concerns is to consider the ways in which a proposed system might fail. This negative analysis often delivers results more quickly than analysis of the correct operation of a system.

The following possible component failures were identified:

- child (as viewer) getting access to unsuitable (adult, X-rated) video material - this would be interpreted as a failure of some selection mechanism
- interrupted delivery - this would be interpreted as a failure of some delivery mechanism.

The following possible consistency failures were identified:

- video catalogue referring to unavailable material - this would be interpreted as a failure to co-ordinate the catalogue with the video library store
- video catalogue referring to unsuitable (X-rated) material - this would be interpreted as a failure to co-ordinate the catalogue with the selection controls.

Only a few examples of possible failures are provided here. An extended analysis is needed in real world situations.

Define required components

The following generic components were identified. These components would probably appear in any of the likely options:

- video catalogue
 - containing video titles, synopses, cast, ...
 - allowing on-line browsing, ...
- selection mechanism; a way to select some particular material from a list of possible materials
- delivery mechanism; a way to deliver the selected material to the customer or viewer
- billing/payment/collection mechanism; a way to monitor the use of a service, keep records, generate bills and account for the receipt of moneys.
- selection control mechanism; a way to control the extent to which selection can be exercised by the viewer, consistent with the wishes of the customer
- delivery control mechanism; a way to control the rate and time of delivery: for instance slow motion, fast forward or reverse
- display result ; the result of service delivery i.e. output to viewer's TV screen, perhaps not to a tape owned by the customer.
- authentication / authorisation mechanism; to validate Customers and to ensure that records of service use remain consistent with actual use.

These descriptions require refinement before they can be implemented as sensible technological components. Such decomposition forms part of the technical design of the system and only impinges on the business model when any of the concerns about the enterprise expressed here become invalid or are contradicted.

Define required contract

The contract between the video library and the customer needs to include provisions for the following items:

- Who bears the cost of failure? For example, if the connection is lost while a viewer is watching a film, does the customer pay for the whole film, for the part watched, or not at all?
- What guarantees can/must be offered? For example, is delivery guaranteed at all times of the day or is there a visible bottleneck at peak viewing times (20:00 to 22:00).
- Proforma contract (standard terms and conditions). For instance, there may be standard consumer protection clauses which are enforced by a regulatory body.

Contracts may also specify other agents, such as service registration agencies and regulatory bodies, consumer rights and other references to the law, and complaint procedures.

Confirm architecture

This sub-task can only be completed when other sub-tasks are done in more detail than is possible here.

The solution architecture is agreed between the problem owner and the analyst and as such forms part of the contract between these two agents. It has clear implications for any quality assurance process associated with the methodology.

4.9 Task 7 — Formulate Business Case*Identify stakeholders and decision drivers*

The key stakeholder from whose perspective the modelling is proceeding is the video library. However, other stakeholders include the agents of existing systems (task 1) and potential agents of the proposed system (task 2).

For each of these, an estimate of their likely decision drivers is included in the table below:

Table 5 Stakeholder and Driver analysis

<i>Stakeholder</i>	<i>Decision drivers</i>
Video library	Revenue growth
Cable Co.	Subscriber growth
Phone Co.	Revenue growth
High street shop	Survival against technological redundancy. Possible entry into niche markets.
Viewer	Ease of access, range of available material
Customer	Quality of service (value-for-money, control over use of Video on Demand service by viewer)
Regulatory bodies	Fair competition, national/Government interest, public morals and decency,

Billing agents have not been included among the stakeholders. This is because their participation in the video on demand scheme can be taken for granted and many, such as card companies, provide a known, generic service.

Identify benefits, costs and risks

For each stakeholder, it is important to estimate benefits, costs and risks. The video library is the case study's perspective but the estimated perspective of the others on the situation is nevertheless of relevance to any business case: "what will the competition do?" is an important question.

Table 6 Stakeholder value analysis

<i>Stakeholder</i>	<i>Benefits</i>	<i>Costs</i>	<i>Risks</i>
Video library	Increased utilisation of existing video stock	Hardware, software, network connection, administration, marketing	No take up of new service or conversely too many customers causing service degradation
Cable Co.	Increased utilisation of cable, increased traffic	Installation of switching capabilities	Few if any; lack of bandwidth provision or lack of take up of provided bandwidth
Phone Co.	Increased utilisation of network, increased traffic	Minimal	Minimal
High street shop	Possible short-term profit selling customer lists or customer recruitment service to video library.	None	Erosion of normal business
Viewer	Increased access to video	Minimal	None
Customer	Better value-for-money More flexible cost structure (you only pay for what you've seen).	Installation of terminal equipment; costs depend on charging structures and market conditions	Potential loss of control over viewed material & expenditure

Analyse benefit/cost/risk distribution

The analysis of benefits, cost and risks in ODP systems is no different from non-ODP systems. Some the questions that will need investigation are:

- How much can we charge the customer for the service?
- How does this need to get distributed between the various agents?
- How much is the infrastructure going to cost?

- How are these costs shared between the various agents?
- How are the risks shared between the various agents?

Formulate investment / procurement plans

It will be necessary to analyse whether each agent has a reason to participate in the video on demand system. This analysis is to be developed from the perspective of required investments and procurements. One important question will be:

How quickly (if ever) will investments be recouped?

This sub-task also cannot be completed until other sub-tasks are done in more detail.

The investment and procurement plans are agreed between the problem owner and the analyst and as such form part of the contract between these two agents. They too have clear implications for any quality assurance process associated with the methodology.

4.10 Task 8 — Define Migration Plan

Define steps towards solution architecture

- Advertise / pilot new service - this may involve service brokers or other mechanisms of information dissemination. Existing teletext services may be used and advertising in the daily or weekly press may also be needed.
- Identify components that can be used independently (e.g. video catalogue which is not on-line). These components can sometimes be separately tested. For instance an on-line programme listing service for satellite movie channels, available via prestel or teletext, is already a standard feature in broadcasting systems.
- Confirm technical capability; this can best be done with a pilot implementation, following naturally from a laboratory prototype.
- Confirm economics - verify assumptions contained in the business case; again, the pilot implementation can provide valuable feedback.
- Extend the service to cover ever wider geographical areas.

Analyse migration risks

Migration risks are best analysed by looking at the ways in which things can go wrong:

- What happens if the video catalogue starts losing information? What happens if the updates are insufficiently frequent? They will cause people to ask for videos that aren't there, leading to customer dissatisfaction, or will lead new videos not to be utilised, because nobody knows they are there.
- Risk of companies not fulfilling their contractual obligations or of going broke.
- Risk of tight coupling (synchronisation) between independent parallel activities - are there opportunities to decouple these activities?
- Risk of video shops having exclusive arrangements with video libraries, hence causing problems for access to material over a cable.
- Risk of the emergence of new technology which will leapfrog the current video on demand service proposal.

Agree migration plan

At this stage both the new and existing enterprise are well analysed and a plan for the migration from one to the other can be drawn up. This step has not been completed for the video on demand example since there are few ODP specific activities involved in these steps.

The migration plan is agreed between the problem owner and the analyst and as such forms part of the contract between these two agents. Once again it has clear implications for any quality assurance process associated with the methodology.

5 IMPLEMENTATION

5.1 General model for implementation

The authors, as practitioners in a commercial organisation, are conscious of the fact that many modelling methods have no clear link with implementation. We would argue that any apparent insights provided by such methods are flawed because they fail to provide understanding that can be acted on. The business relationship modelling methodology described and illustrated in this paper is connected with a zone of implementation (Figure 4). In this zone what we need is a general **problem-solving engine** for implementation and delivery problems. The structure of this engine is:

Figure 13 Problem solving engine.

The kind of questions that this problem-solving engine can address are:

- Can this organisation, in this context, reasonably expect to implement this solution to this problem? To what extent is the intention to implement this solution compatible with other prevailing intentions? What are the implementation risks? What are the chances of achieving the desired benefits? What are the possible side-effects, and what are the implications of these side-effects to the stake-holders?
- How do we change the organisation (and its environment and infrastructure) to get the desired benefits from a given system?

- How do we design an implementable solution for this problem of this organisation in this context? How do we set an appropriate balance between risk and reward?
- How can we decompose a large complex and high-risk change, so that it may be effected in easier steps?

To answer such questions, the problem-solving engine draws on a generic model of the implementation process, together with context-specific models of the organisation (enterprise models) and solution (technology models). Such a model requires both theoretical and empirical grounding. Different theories (for example, Attewell's, (1992) view of technology diffusion through a knowledge barrier or Fowler and Rifkin's (1990) advocate/receptor model) could be incorporated into the model.

- A good theory may provide links between the characteristics of the organisation / context, and the factors affecting successful migration / implementation.
- Alternatively, a good theory may provide links between the characteristics of the solution / system, and the factors affecting successful migration / implementation.

Each theory may prompt consideration of particular aspects of the situation, and may even provide theoretical justification for further research on specific points. The model is then used to give recommendations and reassurance (directly or indirectly) to user organisations, as well as to vendor and third-party organisations.

A simple model would describe the implementation of a single integrated solution into a single integrated organisation. In reality, we usually have to deal with the concurrent implementation of several semi-integrated solutions into decentralised or federated organisations. Thus a more complex model would deal with the complications that arise from this concurrency.

5.2 Planning and managing change

The implementation of a solution by an organisation is likely to be more successful if it is explicitly managed as a change. This management should cover both accommodation and assimilation (Hundert, 1989).

- Accommodation of the organisation to the solution can be divided into two parts. The organisation needs to ensure that its plans and policies are geared to the exploitation of the solution. And the organisation also needs to ensure that it acquires the capability to exploit the solution effectively.
- Assimilation of the solution can also be divided into two parts. The solution will offer a set of tools and methods, which will usually have to be adapted and extended to fit the requirements of the organisation. And the solution will then have to be used for the purposes of the organisation, in which it will be applied in unique ways to unique problems and projects. Application of the solution includes interpretation (creating meanings) as well as use.

If we consider the two parts of accommodation, the two parts of assimilation, together with the overall management of the change, this gives us five implementation streams, as shown in the following diagram.

Figure 14 Five streams of implementation.

When a sophisticated and complex solution is implemented into a large and socio-technically heterogeneous organisation, the effects cannot be completely predicted. Some of the changes can be planned, but there must be enough flexibility in the plan for what cannot be planned. However, a roadmap for implementation, based on a similar five stream approach, is already successfully in use within our organisation to manage the introduction of technology change in the integrated CASE tools market. This gives a degree of confidence that this model is soundly based.

For more discussion and analysis on implementation and delivery of IT solutions, see (Veryard 1995b).

6 CONCLUSION

As we decentralise and provide greater technological openness in the means of support to organisational activities we introduce more factors into our systems development decision processes. We need to be able to determine where to position systems within the complex web of business inter-relationships that will emerge on the Information Superhighway and through open distributed processing initiatives. We need to develop information systems strategies that support business strategies without them becoming locked together in ways that curtail organisational flexibility.

To satisfy these needs, there must be effective methods for modelling the business topology and the information technology topology in parallel; comparing them and supporting judgements about appropriate systems solutions. The business relationship modelling methodology described and illustrated in this paper is a step towards satisfying the needs.

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