

Systems Thinking and Business Process Re-design: A Case for Combining Techniques

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Abstract

This paper describes a consultancy project where the main aim was for the client to learn about systems thinking (ST) through an application in the area of business process re-design (BPR). Over a two week period, systems thinking was applied in variety of contexts: exploring the interfaces between business processes; re-designing a single process; and structuring a chronic problem relating to the client's budgeting process. It was found that systems thinking performed differently depending on the problem context within which it was being applied. Systems thinking performed well when applied to a specific and chronic problem, but less so when used to explore business processes where no particular problem had been identified. Blending systems thinking with other problem-structuring techniques, however, created an integrated and powerful method for re-designing a business process.

Four ways are described in which systems thinking was applied during the project and pays particular attention to the way a range of techniques was used to re-design a business process.

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The client's company and division

Shell companies are involved in the entire spectrum of the oil and gas industry in Malaysia, from exploration to production, and manufacturing to marketing. Sarawak Shell Berhad and Sabah Shell Petroleum Company Limited (SSB/SSPC) operate as a contractor to the national oil company with offshore activities covering a span of 700 kilometres.

The Information Division within SSB/SSPC has developed a business model called IMBOS (Information Management Business Organisation Study) as a framework to undertake all its Information Management & Technology activities along business process lines. The IMBOS model consists of ten processes "owned" by different process architects. Each model is made up of box-and-arrow diagrams linking a sequence of activities into a process (there is no reference to accumulations and flows). It is the intention to implement the new IMBOS model in order to clarify the responsibilities of different process owners to bring about improved performance as a service provider within the companies. The 'client' was the individual who initiated the systems thinking project and was not, himself, a member of one of the ten 'process teams' whose processes were examined during the project.

The client's objectives for systems thinking

The client felt that systems thinking could be used as a validation tool for the IMBOS model. The hypothesis was that the application of the systems thinking/dynamics approach could offer, primarily, derived benefits. That is to say, when applied correctly to enable the most appropriate decisions to be taken, it would save time and effort that would otherwise have been spent rectifying problems arising from decisions made without considering the wider picture. Such rectification could be in clarifying responsibilities and sorting out messy interfaces between processes.

However, the need to acquire skills in systems thinking was recognised by the client and this resulted in a proposal to undertake a pilot project with the internal consultancy of Shell International Petroleum Company Limited. The objective of this pilot project was to accelerate learning of these techniques by the client. Secondary objectives were to verify the appropriateness of the process model interfaces and to take a fresh look at the process of Data/Document/Records Information Management (otherwise known as Process 4) with a view to simulating the behaviour of the process where possible.

Four approaches to validating the process models

The validation of the ten processes was carried out through a series of workshops. For each process, the architects and their team members were given a brief introduction to the concepts of systems thinking, followed by a discussion on how to carry out the validation exercise for that particular process. By the end of the ten days, four different approaches had been investigated. While this made it difficult to compare results between processes, combining techniques presented a worthwhile learning opportunity. The approaches can be classified into four areas:

1. Applying ST to study the "heart" of the process

The first process team arrived with their business model, on which they had been working for some time, and were looking forward to using systems thinking to validate what they had done. A two-hour session did not allow very much time. One particular workshop was focused on the process of planning system development projects, and it appeared that the process architects had thought through the issues from the highest to most detailed level. They had no cause for concern about their

process and no specific problem they wanted to explore. In this context, the generation of causal loops became an exercise of translating their process model into influence diagrams on a white board.

Given the rigour with which the planning model had been designed, it was difficult for the participants to think in terms of cause-and-effect, rather than sequenced activities. In this respect, causal-loop diagramming was seen by them to be an unfocused, unstructured and inferior process mapping tool, compared to role-activity-diagrams. Direct process mapping, of course, is not the point of causal-loop diagrams and, unsurprisingly, the exercise was seen to add nothing new to the material and learning that had been generated previously by the team.

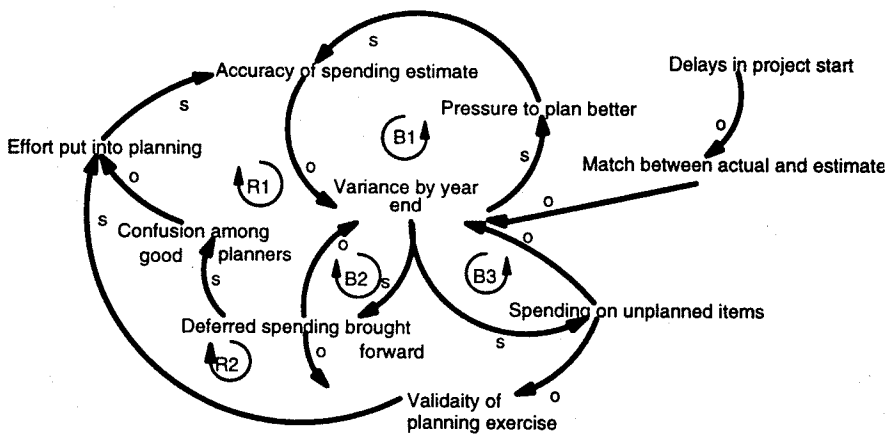
2. Applying ST to study interfaces between IM business processes.

In another session, devoted to a different process, the discussion was focused on the interfaces between this and the other processes within the Information Management division. A map of the inputs to, and outputs of, connected processes was constructed on a white board using causal-loop diagrams. This allowed the group to see clearly how other processes affected them and how they, in turn, affected the work of their colleagues. The process owners in this session were able to appreciate the difference between the ST approach and a process view (i.e. that causal loop diagrams do not aim to represent the sequence of activities, but the directional influences of one process on another). This helped greatly in the running of the session. In this way, the discussion examined the consequences of a certain action or policy carried out by one process on the others in the system.

By exploring the **consequences** of actions, rather than the **sequence** of actions, the group began to comment on how a systems view of interconnectedness can offer a new perspective on the sequential, process view. In this exercise, the importance of boundaries between decision areas became clear. In some cases, the exercise highlighted interface activities for which ownership was unclear. Such cases were taken up as points for discussion with colleagues in other process teams. It was important that these areas were sorted out before process implementation.

3. Applying ST to focus on a specific problem.

In one workshop session, the process owner had a very clear idea of the problem he wanted to explore, and so this session was focused from the start. His was a classic systems problem: it was important; chronic; had a known history that could be described, and evaded all previous attempts at solution. The problem concerned the divergence of actual spending and budgeted spending encountered at the end of the year, every year. Regardless of how much the budgeters were encouraged to spend according to their plan, there was always a variance through, curiously, underspending. As the process owner described the problem, the consultant noted the emerging



variables on a white board. Together, then, the model was refined until it contained the key elements that described the problem and how it affected not only those who had actually planned well, but also to the following year's planning exercise. The model is shown in figure 1.

Figure 1: Causal-loop representation of the budgeting problem

The process owner was satisfied that the elements of the problem had been captured in the causal-loop model and asked how it could be used to actually change the behaviour of the "culprits". The first point in this discussion was that there were no culprits, as such. This is because the problem was endemic in the system: through years of practice, the administrators were able to control most variances between estimated and actual spend by invoking balancing loops B2 and B3. To the budget, then, the system seemed to cope quite well so there was little apparent need to change their budgeting and spending behaviour. Armed with the causal-loop model, however, the process owner felt able to educate the budgeters and begin to improve the situation.

4. Applying ST to re-design a process: a tailored methodology.

The terms of reference of the project requested taking a fresh look at the process called Data, Document and Records Information Management (DDRIM, Data Management or 'Process 4' for short) with the view to re-designing the process. Of all the processes in the IMBOS model, this one had been the most problematic. Four days were spent on this exercise and a range of problem-structuring techniques were used in the belief that causal-loop diagrams or simulation software would be insufficient tools. Figure 2 shows the problem-structuring methods used, and the following section details each of these five steps.

1. The boundaries of the process were defined using VOCATE analysis (described below).
2. Hexagons were used to structure the issues and focus on important areas.
3. A high-level map of influences on key variables was drawn.
4. Core activities in the process were defined by examining fish-bone diagrams, hexagon maps and interfaces with other IM processes.
5. These activities were then mapped into a new process map and cross-checked against the team's original paper-based model.

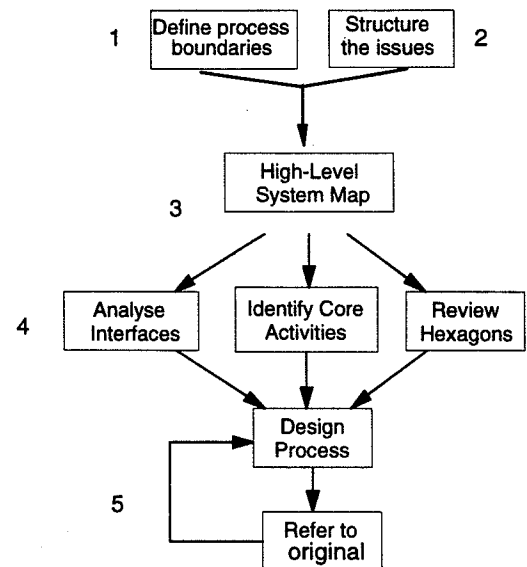


Figure 2: Overview of the approach

Step 1: Using VOCATE Analysis to define process boundaries

In the first session, the team's original process map was turned face down to allow for a fresh start. The session lasted two hours and was attended by six key 'actors' in the data-management team. The group was first given a general introduction to systems thinking. From the outset, every attempt was made by the consultant to express Process 4 in terms of a system and the following statement about Process 4 was made by the consultant to set the scene:

Process 4 is a system that aims to make a positive contribution to the IM function's activities. It will do this by transforming a set of inputs into a set of outputs that are seen as desirable. If it does not, then the existence of Process 4 within the wider Information Management process is questionable.

These are not the exact words used but the essence is that all processes should contribute to the business by adding value to inputs to give desired outputs. The next step was to agree on the kind of transformations Process 4 brings about. The technique used for this is called a VOCATE analysis (otherwise known as CATWOE), and is derived from the Soft Systems Methodology (SSM) (in Rosenhead 1989, Checkland 1991) developed by Peter Checkland of Lancaster University in the U.K. In brief, VOCATE analysis helps in the understanding and clarification of problems by looking at

them from a systems point of view. In a VOCATE exercise, participants define how the system is to be looked at, who the key players are, what the system ought to be doing and what its boundaries are. In doing so, assumptions are made explicit and a common understanding is achieved. Given that participants agreed to take a fresh look at Process 4, a high-level exercise such as VOCATE was an appropriate starting point. In VOCATE, the key elements of the system are established by asking the following questions:

<p>V: from what stand-point is the system viewed? (Viewpoint) O: who can shut the system down? (Owner) C: who are the beneficiaries or victims? (Customers) A: who actually does what is done? (Actors) T: what is changed or achieved? (Transformation) E: what must be taken as given? (Environment)</p>

During the session, the group suggested the following seven viewpoints for the Data, Document and Records Management System.

"Process 4 is a system that:

- provides services and facilities to optimise the use and sharing of information resources in a secure environment,
- promotes data-sharing and improved Data Management,
- clearly defines accountability and ownership for data quality,
- collects, manipulates and manages data throughout the life-cycle,
- improves the retrievability, reliability, security and shareability of data,
- provides policy, strategy and plans on Data Management,
- monitors and controls the use of data."

These were then consolidated by the group into a core definition for Process 4 that was then used as the viewpoint for addressing the subsequent VOCATE questions, as seen below:

Viewpoint	Process 4 is a system that plans, executes and provides services and facilities to optimise the usage and sharing of data (and other media).
Owner	IM (the head of the Information Management department, who sets the IM policy for the whole company).
Customer	Processes 1, 2 and 3 (of the IMBOS) within IM, and all information users within the operating company.
Actors	All information <i>creators</i> and <i>collectors</i> within the operating company, Process 4 service providers, and Process 1, 2 and 3 actors.
Transformation (of the company)	<ul style="list-style-type: none"> • from one where data are sometimes lost to one where no data are lost. • from one with few registered data custodians to one where all communal data have a registered custodian. • from one where Data Management is viewed as an IM activity to a company where line managers take responsibility for the management of their information assets. • from one where duplication of data causes inefficiencies to one where communal access means less duplication efforts. • from one where users have trouble knowing where to find the data to one where data are catalogued.

Environment	<ul style="list-style-type: none"> • The approved infrastructure (hardware and software) and services provided by IM. • The reliability, retrievability and security of data. • Shortage of people with skills. • Conflict of priorities of customers and actors. • Current company and industry standards.
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From this exercise, the team agreed on several points: that in designing the process, special attention should be paid to the interfaces with Processes 1, 2 and 3 (see 'Customer'); that they must consider how to communicate with information creators and collectors around the company (see 'Actors'); and that there are considerable constraints within which the process will attempt to bring about its desired transformations (see 'Environment').

Step 2: Structuring issue with hexagons

This session began with an introduction to the use of 'Hexagons' as a method for articulating and clustering the main ideas associated with Process 4. The aim by the end of the session was to work towards a high level systems view of the important issues in Process 4, by referring back to the previous day's work on the VOCATE analysis of the process. The hexagon session took approximately one hour which included the clustering of the concepts involved.

It was noticeable during the first half hour of the session that the phrases written on the majority of hexagons related to activities. They mostly described **what** actions would take place, with no articulation of **why**. This could well reflect the fact that traditional process models show what will be done, and in what sequence, rather than why or, importantly, **how** the process is executed. This illustrates that brain-storming techniques such as hexagons do not necessarily capture the whole picture. Unless participants are guided to some degree, the ideas they generate will reflect what is on their minds. In this case, it was a shopping list of activities they believed were important to Data Management.

By the final clustering, two different views of Process 4 had emerged. One viewpoint looked at Process 4 in terms of implementation. Evidence of this is that many of the hexagons described one-off activities such as the **creation** of a company database for both data and documents.

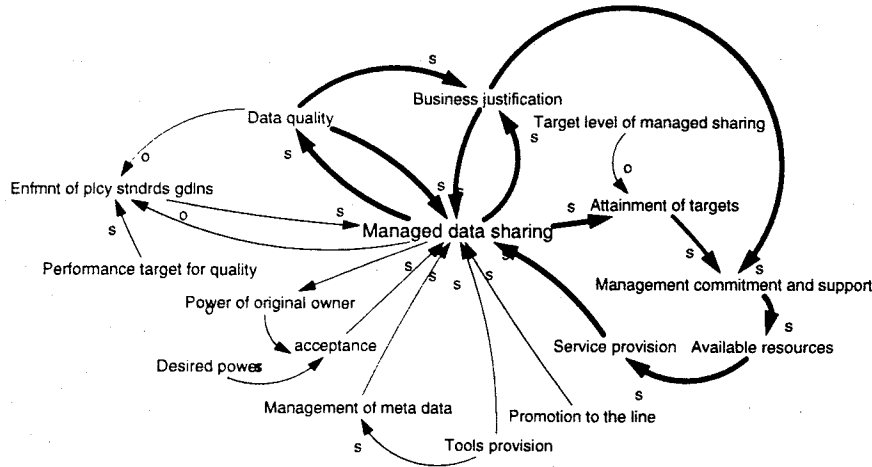
The second viewpoint considered Process 4 as a system already in place and operating on a daily basis. Here, attention concentrated on the provision of services to customers and the shareability of data on an on-going basis. The conclusion from this is that Process 4 must contain activities that are supportive of both start-up and the on-going provision of services. This is an important message, given that it will take several years before a fully functioning and stable data management process is in place. The team then referred back to the viewpoints expressed in the VOCATE analysis to check for consistency. While there were no contradictions, it was clear that the issue of implementation had been underplayed in the VOCATE exercise.

In total, the team generated 53 ideas which were grouped by placing associated ideas next to each other. Ten themes emerged and were given the following titles:

- Management commitment and support (for data-management initiatives),
- Business justification.
- Data quality,
- Management of meta-data.
- Provision of data-management services,
- Provision of data-management tools,
- Evidence of benefits.
- Enforcement of policies, standards and guidelines, and
- Managed data sharing.

Step 3: Drawing a high-level system map

The team saw "managed data sharing" as a the most important goal and agreed that the other nine points were also central to Data Management. The next task, then, was to see how these factors affect each other and the goal of achieving and managing shared data. The interactions were first marked on the white board, and then summarised in the causal-loop diagram as shown in figure 3 below.



This diagram is a first pass and also shows that there are more positive feedback loops (shown in bold) surrounding the ability to manage data, than balancing loops. It had already been pointed out to the group that systems are rarely dominated by reinforcing behaviour over long periods of time. At the

Figure 3: Causal-loop system map derived from clustered hexagons

outset of the evolution of a system, or process, there may seem to be evidence of sustainable growth. Experience shows, however, that negative feedback will, at some stage, begin to mediate the initial growth (Senge 1990). When the group was asked to reconsider the dominance of positive feedback in the data management process, it became clear that there are other factors limiting the extent to which data can be managed for sharing. At this point, reference to both figure 3 and the 'Environment' section of the VOCATE analysis, surfaced the following key questions for the team on Data Management:

- Do policies, standards and guidelines to help users improve data quality exist?
- What is the business justification for putting effort into Data Management?
- Are line management committed to Data Management?
- Are resources available for providing tools and services to the line?
- Are the business benefits monitored and reported back to management to ensure the continued allocation of resources?

By this stage, the team was beginning to understand why Data Management had been difficult to initiate in the past. It was also clear that any model of the data-management process that did not reflect the two-fold nature of the problem (process initiation as well as process continuation) would be inadequate.

The Vensim software was used to produce the fish-bone diagram below from figure 3. It shows the 'causes' of managed data sharing. Before this was taken further, the team to confirmed and accepted that the design of their process had to encompass all issues having a direct impact on the objective of their process. These issues are shown in bold on the diagram below.

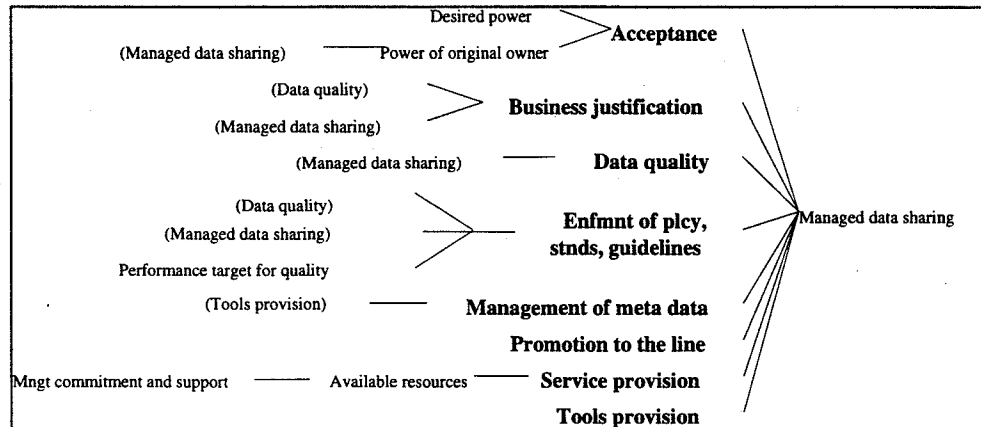


Figure 4: Causes tree for the objective of 'Managed Data Sharing'

In drawing the high-level system map, the hexagon clusters had been used to generate some of the core inputs to 'managed data sharing'. It would have been possible at this stage to explode each of these core inputs into activity sequences. For example, 'enforcement of policy, standards and guidelines' could have been broken down into activities such as: "draw up guidelines; agree guidelines; issue guidelines; implement audit process to ensure guidelines are adhered to." This was seen as premature because the group wanted one more opportunity to broaden the issues before beginning to shape them into a more traditional process map. To do this, the group was posed the following question:

What are the plus, minus and the interesting things (PMI) about managing data (as synonymous with 'Process 4') ?

Opinions were raised in turn, going round the room, and recorded on hexagons. Green hexagons were used for the 'plus' points, red for the 'minus' points, and white for the 'interesting' points. The following issues were raised:

PLUS	MINUS	INTERESTING
1. Saves duplicated data	1. Uncertainty	1. Compromise on system/application performance
2. Users know where to find data	2. Conflict w. business priority	2. Change
3. Saved costs and time	3. Less flexibility to individual	3. Disturbs the power balance
4. Improved data quality	4. Demands scarce resources	4. New business perspectives
5. Latest information available	5. Limited success stories	5. Challenge
6. Team work/co-operation	6. Low management awareness	6. Exploring the unknown
7. Encourages data discipline	7. Cost	7. Organisation set-up
8. Protection of investment		
9. Saves space		
10. Security is catered for		

The results of the PMI exercise can serve several purposes, notably as a checklist to monitor people's feelings towards the business process. The 'plus' points can be used in the generation of performance indicators by asking, "If this plus point is a desired outcome of the process, how could it be measured to ensure the system was performing as desired?". The 'minus' points can be addressed by asking whether they are constraints that can be influenced, or whether they indicate potential problems that need to be monitored as part of management control. The 'interesting' points often indicate areas of uncertainty with the process or areas where more thought might be required. Through time pressure in this project, these uses of the PMI exercise were not taken further.

Side-step: Expressing the problem

At this stage in the project, the consultant and client spent one day going over the material that had been generated so far. At first, the client expected the re-design project to lead to a computer simulation of Process 4. By this stage, however, it was clear that modelling the original process map would have been time consuming, difficult and of limited value. The distinction between systems thinking and its sub-set, system dynamics (simulation modelling), was now clear to the client and he agreed that the approach being taken was commensurate with the aim of taking a fresh look at Process 4.

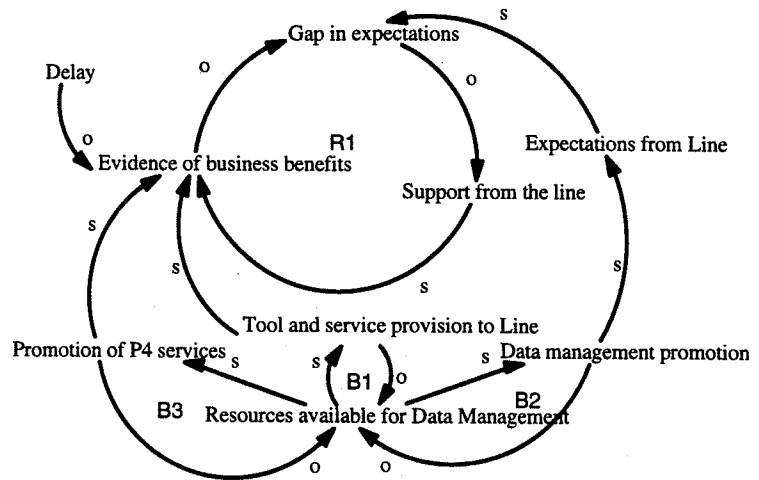


Figure 5: Getting data management off the ground

Having considered the opinions of the team so far, the consultant consolidated some of the key issues into a causal-loop diagram as an attempt to articulate the reasons why Data Management has, for so long, been a 'hot topic' but has been slow to take off. The team later confirmed that this was a fair representation of the problem and one that reinforced the need to incorporate the big issue of implementation into Process 4. It should be noted that this diagram could only have been drawn after the first two days of problem structuring, but it does not arise directly from any of the recorded results. It is rather a product of a mind 'pre-loaded' with the issues.

The variable 'resources available for Data Management' is central to the diagram. There are three balancing loops around this variable, showing that the more one promotes Data Management, the less resources there are available to do other things. The same is true of the provision of tools and services to the line, and the promotion of those Process 4 services. All three initiatives drain resources.

The diagram shows knock-on effects of these resource-allocation decisions. For example, the more Data Management is promoted as a concept, the more line management expects of Data Management. Resources spent providing and promoting actual services (as opposed to Data Management, as a concept), will eventually lead to an increase in the evidence of business benefits. It is the difference between **expected benefits** and **hard evidence of benefits** that will determine whether line management will support Data Management.

When expectations are not met, there is a gap at the top of the reinforcing loop. The larger this gap is, the less support the line managers give to Data Management. The less supportive the line are, the more difficult it is to show evidence of business benefits. This vicious circle can only be avoided if the promoters of Data Management ensure that line expectations are aligned with real benefits. In other words: no false promises.

Thinking through the problem of implementation in this way, highlighted the need to include the following activities in Process 4:

1. Provide and promote tangible tools and services for Data Management within the company.
2. Educate managers outside of the IM division so that Data Management becomes an accepted and integral element of doing business.
3. Inform line managers of what they can expect and when.

Step 4: Analysing process interfaces

The team was satisfied that many of the core activities required for Process 4 had been derived, and that potential problem areas, such as implementation, had been thought through. It was now time to draw all this material together into a new process map for Data Management. The VOCATE analysis highlighted the fact that the Process 4 team were not in fact the only actors involved in making the process work. The team had identified Processes 1, 2, and 3 as both customers and actors within their system and wanted to examine further the interdependencies between these processes. To do this, a 2 hour facilitated session was held, in which causal-loop diagramming was used as the tool. The idea was to map the variables that would **affect** the level of work done by Process 4.

The diagram, shown below, captures some of the dynamics of Process 4 service provision that might not have been so easily recorded using traditional box-and-arrow diagrams. One example is highlighted in thick arrows. This loop shows that Process 4 is expected to provide first-cut (draft) data models for Process 3, the Applications Development team. Under normal conditions, Process 4 would provide the first-cut models for Process 3 to refine and complete, leading to a balancing decrease in the number of requests passed on to Process 4 for first-cut data models. The ability of Process 4 to do this work, however, depends on the number of additions made to the departmental

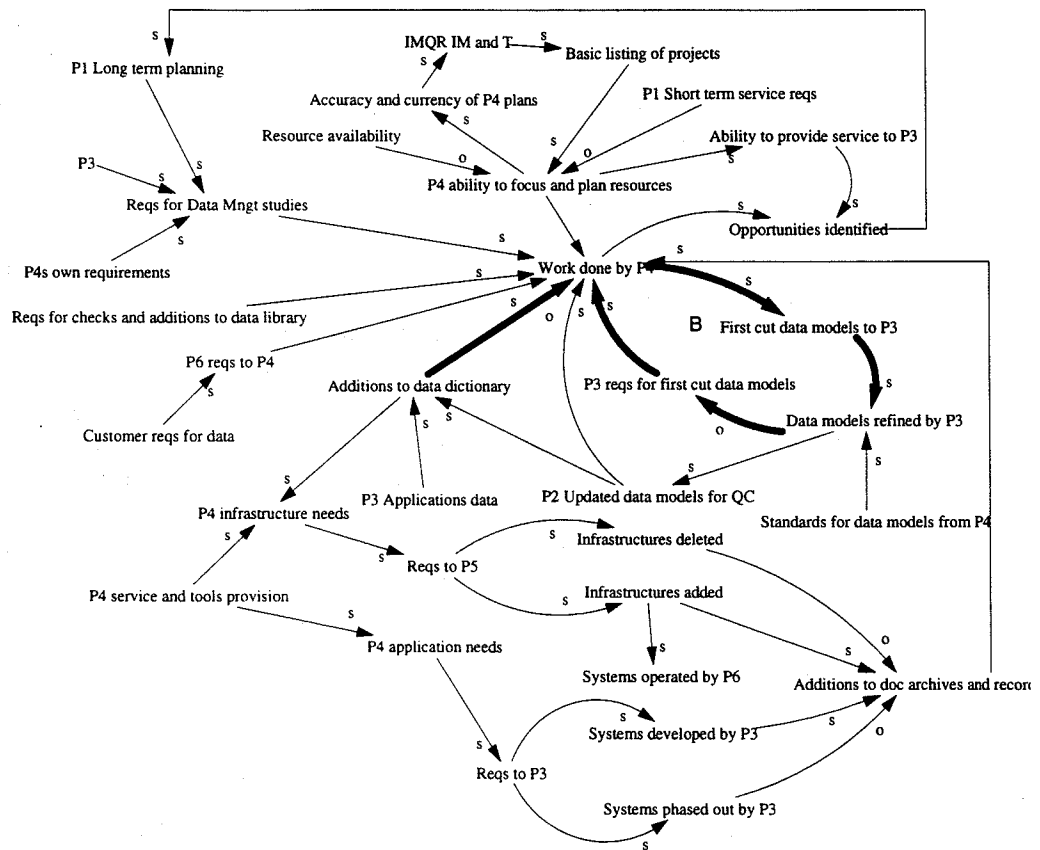


Figure 6: Interfaces between Process 4 and other Information Management processes

data dictionary: the more additions, the less work Process 4 has to do to satisfy Process 3, since it can now draw from a library of existing models.

However, when there is no data dictionary (i.e. as is the case at the outset of implementing Data Management), Process 4 is less able to meet the requirements of Process 3. The danger here is that as Process 4 now takes longer to prepare first-cut data models, short term pressure could divert attention

and resources away from establishing the data dictionary. In the long term, said the team, the data dictionary is one of the services that will be central to the success of Data Management in the company.

Step 5: Building-up the new process map

The team was now in a position to begin building up a new process model. Working on a white board allowed them to revise the model easily as new activities were added and redundant ones removed. The workshop sessions carried out so far had generated a great deal of structured material that could be used in designing the new business model:

1. The 'transformations' listed in the VOCATE exercise show the purposeful activities the process carries out. Each one of these should therefore appear in the final process model.
2. The fishbone diagram also displays variables that are key to realising the goal expressed as 'managed data sharing'. These too had to be incorporated in the redesigned process.
4. The causal-loop diagram titled, 'Getting data management off the ground' (figure 5) showed that the owners of Process 4 also had to manage customer expectations through timely provision of tools and services.
5. The causal-loop diagram shown in figure 6 was used to ensure that important process interfaces were taken into account.
6. The clustered hexagon map provided a 'structured database' to check that key issues raised there were captured in the emerging model.

The process model was drawn in the same box-and-arrow style as the original process map, but the content differed. The drafting process was very much in the hands of the team, who drew on the material developed during the workshop sessions. For every activity detailed in the new model, the team was able to trace the reason why it appeared there.

Once the first-draft process map was complete, the team carried-out a cross-reference check with the original process model. This exercise highlighted that some activities has been arbitrarily assigned to the original model of Process 4. The alternative map developed during this project served as a benchmark against which the logic of the original model could be checked. Where there was a valid case for assigning certain activities to Process 4, additions were made to the new map. The consultant's intervention finished at this point, and the team were left to refine and shape their re-designed process.

Conclusions

What did the client think?

These are the client's comments on the project:

1. Systems thinking and modelling skills were acquired by the SSB analyst. A better understanding was obtained by some members of the IM process models. Finer tuning of the process models, however, was only possible in part as the tools have limited value in process modelling.
2. Systems thinking provides good tools to generate ideas, to analyse issues, to gain new insights and to communicate them between team members.
3. The value of the techniques employed in this project have been to clarify the role of Data Management and to pin down the surrounding issues. This has cleared the way for a more structured process analysis by the company and goes a long way to ensure its success.

4. The re-designed Process 4 has been used as a basis for focusing the 1994 Work Programme for the division. The reasons behind the takeoff failure of this process has been understood. Adequate emphasis has now been placed to ensure that these reasons are addressed as key activities in the work programme. Process 4 services and tools must be delivered in time to gain early success which could generate greater confidence in the process within the company.
5. Process interface issues were addressed to allow smoother implementation of the processes based on the re-aligned IMBOS model. Subsequently, the division's organisation will be re-aligned accordingly to reflect work activities along business process lines.
6. It is hoped to use the results of the budgeting problem to produce a "Good Budgeting Guide" for the benefit of all staff in the division.
7. Opportunities will be sought to promote the use of systems thinking to solve difficult problems where it appears there is significant disagreement as to the cause and possible solutions.

What did the consultant think?

From the consultant's perspective, systems thinking (used here to mean causal-loop diagramming) was at its most effective when the process teams wanted to focus on a specific issue. In such cases, the technique was also efficient. The budgeting problem was a good example where results were achieved in less than 45 minutes. This should be compared to other sessions where participants did not have a specific problem, but wanted to use systems thinking as a final check, or validation of their process models. In these cases, the process owners were not interested in structuring problems, they simply wanted to know whether the process they had designed on paper would actually function to plan, once implemented. It is quite possible that computer simulation, using the "ithink" process-modelling approach, would have been appropriate for this.

Simply put, systems thinking worked best when the client was anxious about a specific problem whose history could be told by the client like a story; and worst when no problem could be identified. Process 4, however, fell in between these extremes: the process owners were anxious; they felt a need to re-design their process model, after all, but there was no specific problem that could be addressed from the outset. In this case, causal-loop diagramming was successfully used in combination with techniques from the field of 'Soft Operational Research'.

A case for combining techniques

The most obvious deliverable expected of a business-process consultancy is a new, or re-designed process map. Causal-loops, however, are not the most appropriate medium for depicting sequenced activities. This means that it is difficult to bundle the benefits of a systems thinking intervention into one single deliverable: a re-designed process map. However, when causal-loop diagrams were used in conjunction with associated techniques, such as VOCATE analysis and Hexagons, they quickly generated core elements of the process in question. The ability to draw on several techniques meant that as the core process elements developed, emerging problems and causes for concern could be dealt-with in parallel. The table, in figure 7, shows the contribution each technique made to the re-design exercise. The strength of that contribution is indicated by the darkness of the shading. For example, VOCATE analysis was found to be very appropriate for defining the purpose of the process and identifying core activities, but was inappropriate for showing the effects of actions. The shading is based on the consultant's impressions during the project.

If it can be assumed that the design of a business process should involve each of the points listed in figure 7, then it can be seen that no one technique spans the whole range. This is the case for a pluralist approach (Lane 1993) to business process re-design.

	VOCATE	Hexag-ons	Plus, Minus, Interesting	Causal- loop diagrams
Defines purpose of the process	Black	Grey	White	White
Defines actors in the process	Black	White	White	White
Deals with process boundaries	Grey	White	White	Grey
Identifies core activities	Black	Black	White	White
Identifies process constraints	Black	Grey	Grey	White
Generates ideas	Grey	Black	Grey	White
Uncovers potential problems	White	Black	Black	Black
Identifies performance measures	White	White	Black	White
Helps in solving process problems	White	White	White	Black
Shows the effects of actions	White	Grey	White	White
Maps the process sequence	White	White	White	Grey

Figure 7. Attributes of the techniques used

Through sequencing, each technique delivers a structured outcome that can build towards a logical conclusion: from setting the process boundaries, to structuring the important issues and creating a high-level system map of the process. While a pluralist approach can cover these building blocks of process design, however, it should be recognised the techniques discussed here are inappropriate for mapping these building blocks into a suitable process sequence. This remains the job of more dedicated tools such as Oracle Case, Role Activity Diagrams, or box-and-arrow flow charts.

Dangers and Challenges

Drawing on several techniques during a consultancy intervention is not without danger. Not only must the practitioner be well practised in several techniques, he must be able to switch between them at the appropriate time without losing rapport with the client group (Kreutzer 1993) through over-complication. At the time of this project there appeared to be no tested methodologies in which techniques are integrated for a given purpose, such as re-designing business processes. Yet such methodologies are needed. The challenge is to find ways of exploiting synergy between the disciplines of soft O.R. and systems thinking.

References

- Checkland, P. Scholes, J. 1991. *Soft Systems Methodology in Action*. Wiley.
- Kreutzer, D. 1993. *Facilitation Tools for Building a Learning Organisation*. Gould-Kreutzer Associates inc. course notes.
- Lane, D. C. 1993. With a Little Help from Our Friends: How third generation system dynamics and the problem structuring techniques of 'soft' OR can learn from each other. *Proceeding of the 1993 System Dynamics Conference* (235-244)

Rosenhead, Jonathon. 1989. Rational Analysis for a Problematic World. New York. John Wiley & Sons.

Senge, Peter. 1990. The Fifth Discipline. New York. Doubleday.

