

Soft Systems Methodology

Conceptual Model Building and its Contribution

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Chapter Three

Selection of Relevant Systems

RICH PICTURE BUILDING

The real world of organised activity is highly complex. The intention within SSM is to use the models of purposeful activity systems to help in structuring that complexity. Thus at some point it is necessary to make a transition from delving into the real world to try to describe and understand the nature of the situation to the intellectual processes that eventually contribute to that understanding. It is also necessary to undertake the transition back again in order to make something happen as a result of the intellectual activity. The concern of this chapter is with the first of these transitions.

The main concern here is, having had some immersion in the real world, how to use the knowledge gained to select those systems that it would be useful to model. It is also important to have some mechanism for deciding how to organise this initial immersion and when to make the transition.

‘When to make the transition’ is dependent upon the terms of reference (remit) in place at the start of the study and these also affect the choice of systems that are taken to be relevant. Clearly there is more scope for variety in this choice if the study is concerned with the identification of areas for improvement in an organisation than if it relates to deriving requirements for a data warehouse for a marketing function. Whatever the terms of reference are, however, some way of expressing the situation is required so that the state of current understanding is made explicit.

A useful way of achieving this is through what is known as a ‘rich picture’. This is literally a picture of what the situation is taken to be. It includes the organisational entities of interest, the relationships between them, roles of apparent significance, issues, areas of conflict, etc. Symbols are used, where appropriate, to represent entities and roles: arrows, of various kinds, are used to express relationships. For the picture to be coherent, the symbols and arrows must be chosen with care. Those symbols and arrows, which *look* the same must *mean* the same.

One of the best examples of a rich picture is an Ordnance Survey (OS) map. This is an explicit representation of a piece of terrain, rather than an organisational situation, but its symbolism is consistent and this makes it easy to interpret. A rich picture of an organisational situation requires the same degree of consistency within the one picture, although Ordnance Survey maintains the consistency of meaning from map to map. Thus a square with a cross is always a church with a tower, it is never a church with a steeple. This transfer of consistency is not required from organisation to organisation as rich pictures do not need to be transferable, but consistency is essential within each picture.

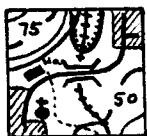
The advantage of pictorial representation over text is that the information within the picture can be processed in parallel whereas, with text, it can only be processed serially, i.e. it has to be read. This is particularly valuable for that information which is concerned with relationships. Also *the*

interpretation of the situation is made explicit through a picture whereas with text the interpretation of what has been read remains in the mind. This is particularly important when a group of analysts is involved. The construction of the picture allows differences of interpretation to be identified and permits agreement to be made on the interpretation to be taken. Thus the group of analysts can embark on the analysis knowing that they are all referring *to the same situation*. If differences of interpretation emerge during the analysis, commitments will have been generated and it will be that much more difficult to reach agreement. Little commitment has been generated at the picture-construction stage, since this is prior to the analysis, so that agreement over interpretation is relatively unemotional.

It is the construction of the picture that is important from the consistency of interpretation point of view, but it is the completed picture that is important as a source of inspiration on what purposeful activity systems it would be useful to generate. Assimilation of the significance of relationships, issues, etc. is what leads to the choice of *relevant* systems, i.e. it is based upon what the picture tells you. Here the old adage that a picture is worth a thousand words is demonstrated to be true.

Consider the example in Figure 3.1. Here a one-inch square picture, using OS symbols, represents a piece of terrain. It is actually less detailed than a real OS map but the amount of information contained in the picture is greater, by an order of magnitude, than what could be provided in a one-inch square of text.

In Figure 3.1 the textual description is also given. In order to illustrate the process of rich picture construction, consider a number of passages of text, together with their translation into a picture format. The extracts of text follow below and the pictures are given in Figures 3.2, 3.3 and 3.4 respectively.



The village is situated between 50 and 75 metres above sea-level, in a valley that runs North-East, South-West. A railway runs through the centre of the village and emerges from a cutting just prior to passing under a road bridge. The main road, which couples the two built-up areas, swings to the right to cross the bridge as it passes by the Hotel in a North-easterly direction to then swing to the left to continue directly North. There is a footpath which goes South from the Hotel, across the road and passes a church with a steeple just before it bends to the left to go alongside the railway

Figure 3.1 An OS map extract

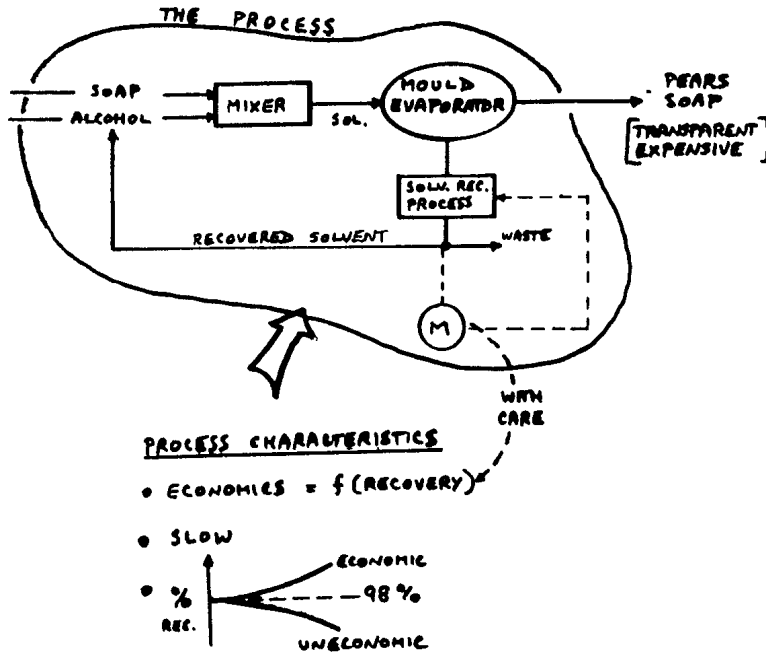


Figure 3.2 Pears Soap—rich picture

In a real situation, the process of rich picture construction is not one of translation but of representation. However, it is translation that is used here in order to illustrate how symbols can be used to represent entities and their relationships.

Words may still be used, but sparingly. The conversion of text into pictures should not be done by merely writing statements in boxes and joining the boxes by arrows.

Extract 1 Pears soap

Pears transparent soap, which is expensive, is made by dissolving soap in alcohol and allowing the alcohol to evaporate slowly. This is done in moulds which are the shape of the bars of soap: the natural shape achieved when the solvent evaporates is the oval with the characteristic depressions in it. The economics of the process depend entirely on recovery of the solvent for recycling. At least 98% has to be recovered if the process, which is in any case slow, is to be economic: hence the alcohol recovery has to be carefully monitored.

The picture corresponding to this extract is given in Figure 3.2. The picture is essentially in two parts. The extract describes a 'process' and the upper part of the picture is a process description. We are also told something about the process and so the lower part of the picture identifies the three features as the process characteristics. The above extract is a fictitious example used to provide a simple illustration. A more complex example is given in the second extract and this is also fictitious.

Extract 2 Slimline shoes

'Slimline', manufacturers of women's shoes, are hoping to improve their performance with a new range called 'Carefree'. (From a peak return on capital of 22% three years ago they have fallen to 15% then 11%.) The Managing Director discovers that the Production Department have introduced a new glue for

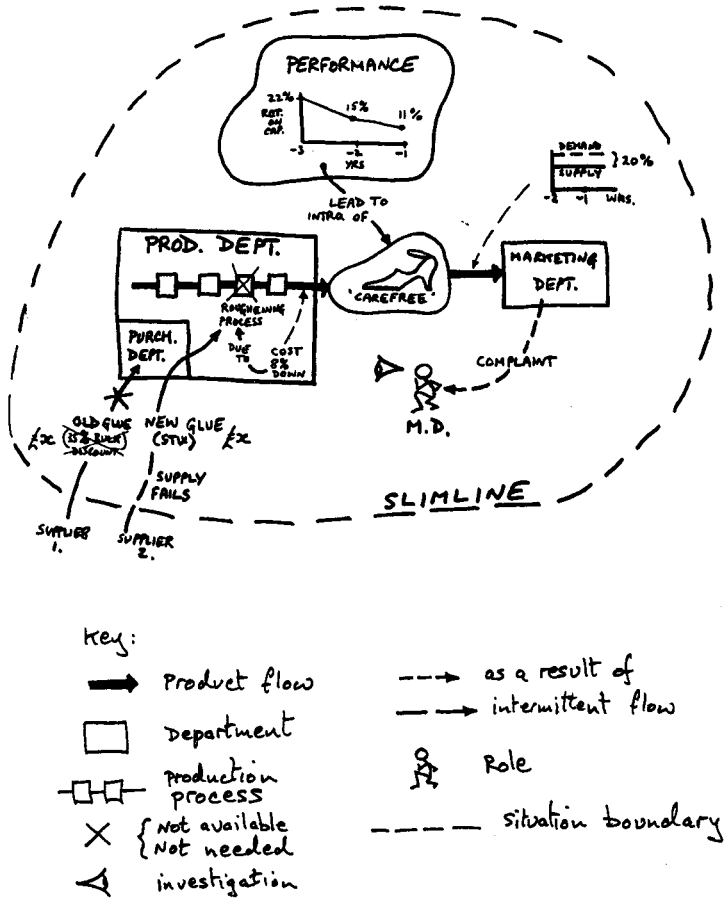


Figure 3.3 *Slimeline shoes—rich picture*

sticking soles to uppers. This eliminates a sole-roughening process and has enabled them to achieve an 8% reduction in production cost. The MD, however, when investigating a Marketing Department complaint that for the last two weeks they have been 20% down on the supplies of shoes they need from Production, finds that the glue is in short supply. It seems that the Purchasing Section of the Production Department has cancelled an arrangement by which they received a 35% discount on bulk supplies of the original glue (this discount could not now be reinstated) and are buying the new glue ('STIX'), at the same price as the old glue, from a different supplier who has failed to meet delivery promises.

Figure 3.3 is the rich picture corresponding to this extract.

The final example is represented by an actual extract from a national newspaper.

Extract 3 Meccano

The workers at the Edge Hill (Liverpool) factory of Airfix Industries are currently staging a 'work-in'. This particular factory produces Meccano, the traditional construction toy, and Dinky toys, which range from model cars through all varieties of vehicles to agricultural implements. The situation has arisen from model cars through all varieties of vehicles to agricultural implements. The situation has arisen because Airfix have stated their intention to close the factory, making some 940 workers redundant. Very little investment in new machinery has taken place over the last 50 years, resulting in production methods

which are antiquated. The workers claim that they have a viable product and, given the opportunity, they intend running the factory as a workers' cooperative. This would require financial support from the government and a meeting has been arranged between local union officials and representatives of the Department of Industry to discuss the situation.

Meccano, which has been a household name in toys for most of this century, was invented by J.F. Hornby, a Liverpool businessman in 1893. As the business developed he added model trains and Dinky toys, all three products being highly successful. After the last war they suffered severe competition from other manufacturers, such as Lego, Triang, and Matchbox toys, resulting in the decline of the Meccano share of the market. Fifteen years ago, Hornby Trains Ltd was bought out by Triang, leaving the two product lines currently produced at Edge Hill.

The picture in Figure 3.4 focuses on the factory of Edge Hill in Liverpool. This represents the current state of affairs following growth and diversification since 1893. A number of arrows of different kinds are used and the meaning is explained in the key. This example is intended to illustrate the need to use different types of arrow to cope with the variety of meaning.

Although the extract makes no mention of a consultant, one has been included to make the point that, if we are being asked to interact in some way with an organisation, we should include ourselves

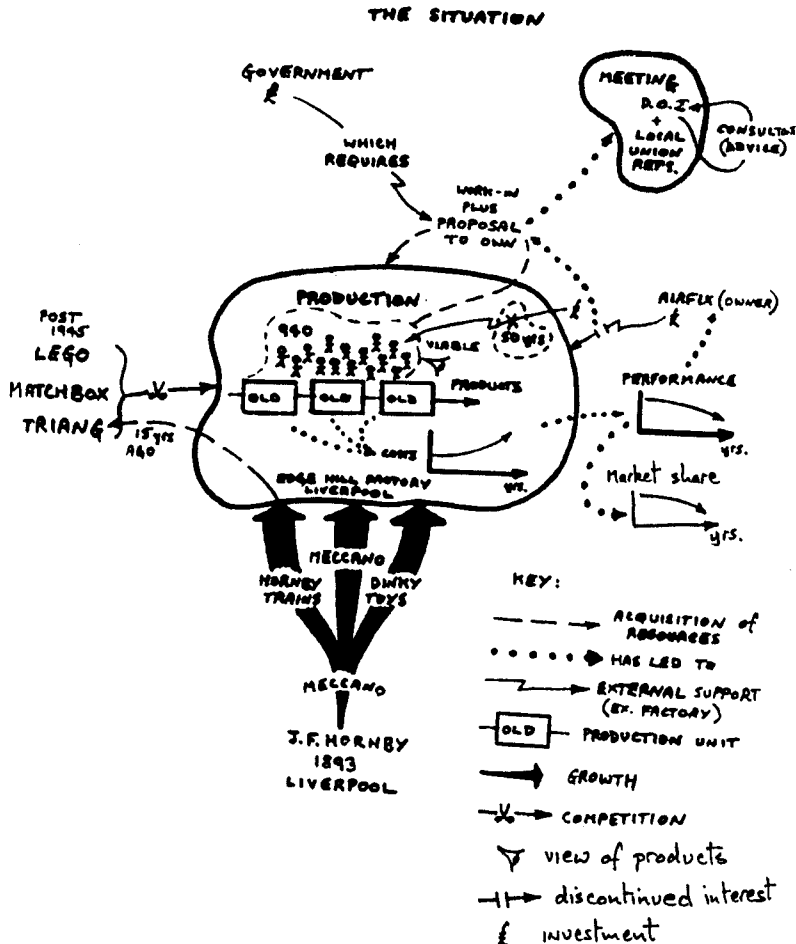


Figure 3.4 Meccano—rich picture

in the picture. We are part of the situation and our relationship to it is important. This illustrates that the consultant has been brought in by the Department of Industry (DOI) with the terms of reference: to provide advice to the meeting. Thus including the consultant (or ourselves, as consultant) we make clear who the client is and their expectations of us.

Because of the degree of variety contained in each problem situation, flexibility in the use of symbols and arrows needs to be retained. However, there are certain symbols which tend to appear in most rich pictures and a selection is given in Figure 3.5. This is *not* exhaustive and the freedom to use alternatives and to create new symbols to represent particular features must be maintained. The major offender to coherence in pictures is the use of arrows. They tend to be inserted casually so that arrows all look the same but have a multitude of meanings. Within badly constructed pictures, the same arrows can represent general relationships which are unspecified; they also represent information flows, material flows, communication, inputs of various kinds, statements about something and so on. If the same kind of arrow is used to illustrate all these facets of a situation the picture becomes unintelligible.

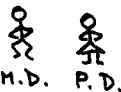
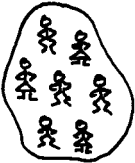
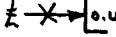
SYMBOL	MEANING	SYMBOL	MEANING
	organisation unit		growth, expansion, elaboration
	Particular role		flow, input
	group, Population		intermittent flow, input
	document report		external input
	financial report		competition, conflict
	report contents		a process
	information about market share		analyst, Problem-solver
			uncertainty, Questionable
			a view about, oversees
			removes
			removes financial support
			discontinues
			support

Figure 3.5 Common symbols

Also more complex symbols than is necessary could be generated to represent characteristics. In the Meccano situation the process operating is old. It is much easier and quicker to insert the word 'old' than represent it as a process festooned with cobwebs. A pictorial representation can still include words but it must be a balance between symbols and words. The important aspect of picture construction is that it is capable of being processed as a total image. Individual words inserted into the picture do not destroy this facet. The insertion of sentences does, however, as the sentences have to be read.

A rich picture is an aid to the problem-solving group, i.e. the analysts. Thus it is essentially private to that group. It is not usually the case that the pictures are available to the personnel within the client organisation who are external to the problem-solving group.

It may be quite important in relation to a representation of power within the problem situation to include within the picture the following symbol:



This tells us that the Managing Director is a big-headed individual (egocentric) who thinks that he is a gift from God (has a divine right), but it would not be diplomatic, or helpful, for this interpretation to reach the MD. Such a revelation could, in fact, terminate the project. Only in exceptional circumstances and for very good reasons should a rich picture find its way into the general domain and then it should be devoid of political and personal messages. The only exception to this is if the actual reason for its general release is to convey a political message.

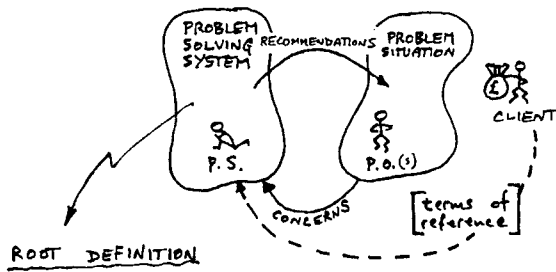
Whatever else is contained within the rich picture, it should include reference to three roles; the problem-solving group, the client and potential problem-owners together with their relationships.

A generalised picture of these roles and their relationships is illustrated in the upper part of Figure 3.6. This shows an interaction between a problem situation and the activity of problem solving within a problem-solving system. The three roles are illustrated within their respective contexts.

The client is defined as the role that *causes* the interaction to take place between the situation and problem-solving activity. This role (client) provides the finance to enable the interaction to be funded and defines the terms of reference. The problem solver is the role that defines and undertakes the intellectual process leading to the formulation of recommendations and can be an individual or a group of analysts.

The role of problem owner(s) is the individual or group *nominated by the problem solver* to be usefully considered as potential owners of problems and who would provide useful insights into the range of perceptions of the situation that could provide the source of relevant systems. It must be emphasised that these are roles: any one individual could occupy all three roles.

This was the case in a project to be described later (Chapter Six) concerned with the organisation of a governing body for a secondary school in Cumbria. I was the chairman of the Governors and was concerned about the requirements of a governing body that was to take on the responsibility of the management of the school. I decided to use SSM as the intellectual process that would lead to an analysis of these requirements and an eventual structuring of the governing body into management



A CLIENT-OWNED SYSTEM, OPERATED BY PROBLEM SOLVERS, TO MAKE RECOMMENDATIONS TO ALLEVIATE IDENTIFIED CONCERNS WITHIN A PROBLEM SITUATION TO THE SATISFACTION OF THE PROBLEM OWNERS, BY USING APPROPRIATE CONCEPTS AND METHODOLOGIES WITHIN DEFINED CONSTRAINTS.

CATWOE ANALYSIS

- T - TO MAKE RECOMMENDATIONS TO ALLEVIATE CONCERNS
- W - USING APPROPRIATE CONCEPTS AND METHODOLOGIES WILL LEAD TO RECOMMENDATIONS
- C - PROBLEM OWNERS
- O - CLIENT
- A - PROBLEM SOLVERS
- E - DEFINED CONSTRAINTS [may include finance, terms of reference, time, etc.]

Figure 3.6 Problem solving/problem content

groups. Thus I caused the analysis to take place (as the client). I did the analysis (as the problem solver) and it was my concern that drove the analysis (thus I was the problem owner).

This is only the case when you are solving your own problem. In general, different individuals or groups occupy the three roles.

The problem-solving system of Figure 3.6 is a purposeful activity system and can be derived through the mechanism of a root definition. This could be done in relation to any problem situation and be specific to it. Such an analysis is useful in defining the approach to be adopted, the skills and capabilities required in the problem-solving group and the management processes needed in the execution of the problem-solving activity. However, to indicate the kind of analysis a generic problem-solving system can be derived. A root definition is formulated in Figure 3.6 together with its CATWOE analysis. The resultant conceptual model is contained in Figure 3.7.

The top-left activity, 'Understand the nature of the problem situation', is the activity that is aided by the production of the rich picture. This understanding leads to the selection of concepts and methodologies believed to be appropriate. This is completely general and so the concepts could be mathematically based, or based upon any other discipline. Here, of course, we are concerned with concepts and methodologies which are SSM-based.

The essence of this chapter is the transition from the activity 'Understand the nature of the problem situation' to 'Select concepts and methodologies believed to be appropriate'. The rich picture aids the understanding so what is available to aid the selection?

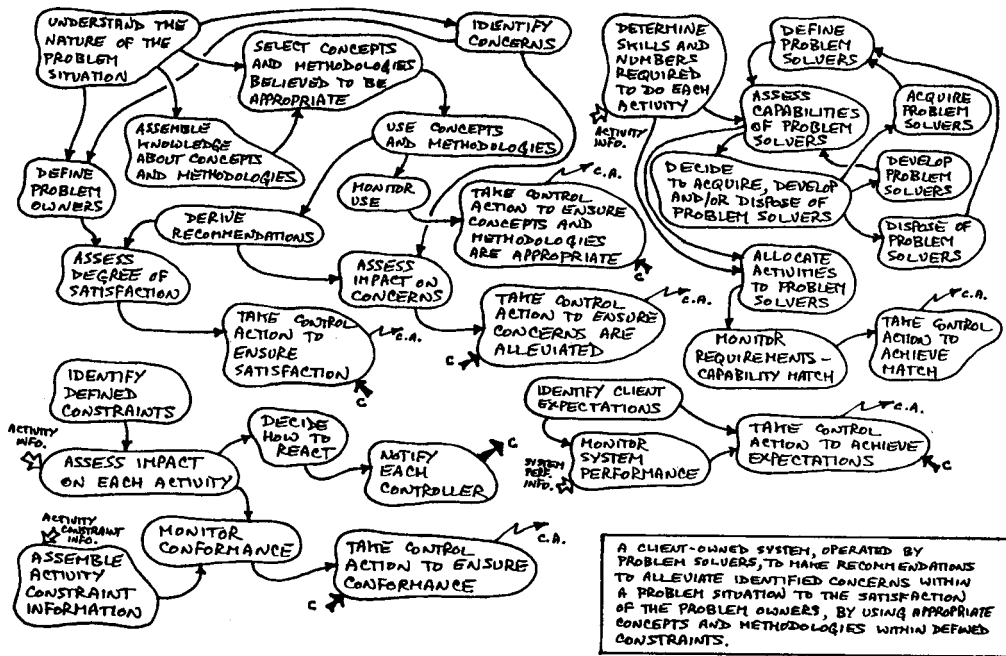


Figure 3.7 A problem-solving system

ISSUE-BASED/PRIMARY-TASK SYSTEMS

The distinction between issue-based and primary-task systems has been discussed previously (Checkland 1980; Wilson 1984, 1990) and will not be repeated here. However, a summary of the distinction is provided. As the name suggests, an issue-based system is one used to explore an issue such as a company role exploration system, a decision-making system, etc. It is a characteristic of such systems that should they map onto reality, they are unlikely to be institutionalised through some kind of department or section. Primary-task systems, on the other hand, would be expected to map onto some organisation unit. Thus a system to convert raw material into products (i.e. a primary task system) would be expected to map onto a Production Department. The distinction between 'issue-based' and 'primary task', however, is a grey (not precise) one. To make the distinction more positive we could add that issue-based systems have *temporary relevance* whereas primary-task systems have *permanent relevance*.

Thus the problem-solving system of Figure 3.7 is an issue-based system, which is relevant as long as the particular problem-solving activity continues. The root definition that led to this system (Figure 3.6), however, represents the primary tasks of the problem-solving group, though this group, of course, has a temporary existence.

It is useful to make the temporary/permanent relevance distinction in order to initiate thoughts about choices of system following the rich picture assembly. An issue-based system that it is always useful to consider is the problem-solving system, itself, for the particular situation.

Other choices of system come from an identification of potential problem-owners. Taking the analysts to be a problem owner results in the problem-solving system being an initial relevant system. Consideration of other problem owners will lead to other choices of relevant system, which could be either primary task or issue-based.

For the publishing company example in Appendix 2, a series of problem owners could be considered. These are listed in Figure 3.8 together with the names of potentially relevant

POTENTIAL PROBLEM OWNER	CHOICE OF RELEVANT SYSTEM
• PUBLISHING COMPANY	A SYSTEM TO DIVERSIFY JOURNAL RANGE IN ORDER TO INCREASE INCOME.
• EDITOR	A SYSTEM TO MAKE QUALITY PAPERS AVAILABLE TO A WIDE AUDIENCE
• POTENTIAL AUTHOR	A SYSTEM TO PROVIDE ACCESS TO A PEER GROUP IN ORDER TO ENHANCE REPUTATION
• POTENTIAL AUDIENCE	A SYSTEM TO PROVIDE CURRENT 'STATE OF THE ART' SOURCE MATERIAL IN A SPECIFIC AREA OF INTEREST
• POTENTIAL ADVERTISER (MANUFACTURER)	A SYSTEM TO PROVIDE PROMOTIONAL OPPORTUNITIES FOR A RANGE OF ALLIED PRODUCTS
• POTENTIAL ADVERTISER (SERVICE PROVIDER)	A SYSTEM TO ASSEMBLE POTENTIAL CLIENTS IN A RANGE OF AREAS OF EXPERTISE
• ANALYST	A SYSTEM TO USE H.A.S. CONCEPTS WITHIN AN I.R.A.M. IN ORDER TO DERIVE INFORMATION REQUIREMENTS TO SUPPORT THE PRODUCTION OF A NEW TECHNICAL JOURNAL

Figure 3.8 A publishing company (Appendix 2)

systems. Note that these are *not* RDs but merely the names of systems that it might be worth considering.

The selection of problem owners and relevant systems must be particular to the specific situation. Examples only can be given to illustrate the process.

Appendix One gives a fairly complex example and describes a situation in which a Managing Director has brought in some SSM consultants to tackle a specific problem. As an example of these initial stages in relation to problem-solving activity let us examine this case. It is based upon a real project but the name and the technology have been changed.

THE ALBION GROUP

The reader is referred to Appendix One in order to read the unstructured case material. Although this book is about conceptual model building to support a soft systems-based analysis of complex organisational situations it is useful to continue the analysis to show how the resultant models were

used. In this instance Albion is being used to illustrate the first stages of system selection. However, most analysis requires multiple system selection during the course of a project. Thus some selection may rely on the outcome of preceding analysis.

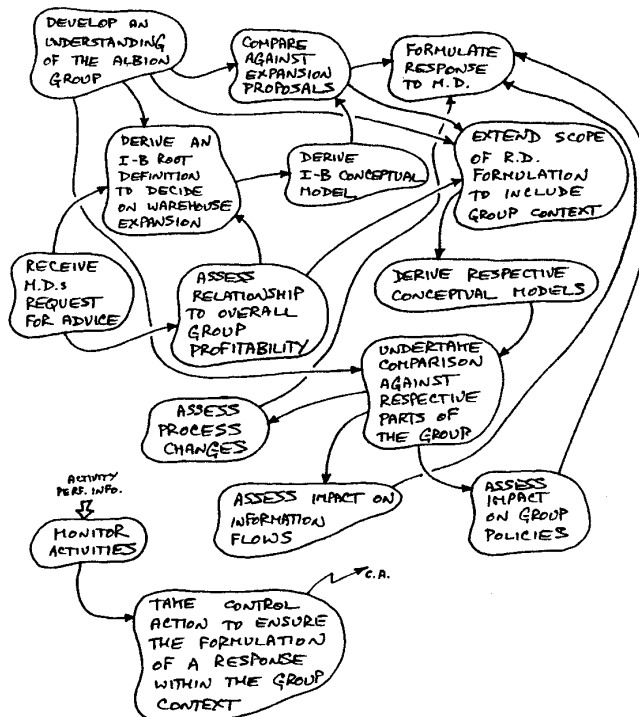
This case study is therefore taken through to recommendations to illustrate progressive systems choices.

We (as the SSM Consultant, Clark Kent) have received a very specific request from the Albion Group Managing Director (MD) to advise him on a warehouse expansion proposal, supported by relevant correspondence. However, he requires more understanding of the situation and in his second letter he talks about 'assessing the group, with particular reference to improving our overall profitability'.

If we initially take ourselves to be a problem owner we can derive an issue-based system to represent our problem-solving system.

Clearly we have to respond to his request for advice but, given his second letter, not in the context of Surface Stockists but in the context of the Group as a whole and Group profitability. Within this wider context our analysis could lead to suggestions for change to the Albion processes wherever they are located, to changes to information collection and dissemination and even to changes to Group policy.

A RD which builds on these ideas is given in Figure 3.9 with an accompanying CM. The CATWOE analysis of the RD is as follows:



R.D.
A SYSTEM TO RESPOND TO THE M.D.'S REQUEST FOR ADVICE CONCERNING WAREHOUSE EXPANSION, WITHIN THE CONTEXT OF THE GROUP AND GROUP PROFITABILITY, BY DEVELOPING RELEVANT SYSTEMS MODELS AND UNDERTAKING COMPARISON AGAINST RESPECTIVE PARTS OF THE ALBION SITUATION IN ORDER TO ASSESS CHANGES TO THE ALBION PROCESSES, INFORMATION FLOWS AND GROUP POLICIES.

Figure 3.9 Albion Group problem-solving system

- T—to respond to the MD’s request
- W—developing relevant models and undertaking comparison within the context of the Group and Group profitability *will* provide advice to respond to the MD’s request
- C—MD
- A—not specified
- O—not specified
- E—not specified

The model represents the intellectual process that we could adopt to tackle the Albion project. Thus we need to *do* each activity. If time was a constraint (which would be usual) we would need to convert the intellectual process of Figure 3.9 into a schedule.

A possible schedule, assuming five time periods, is given in Figure 3.10. The monitor and control activities in the conceptual model of Figure 3.9 represent the project management task.

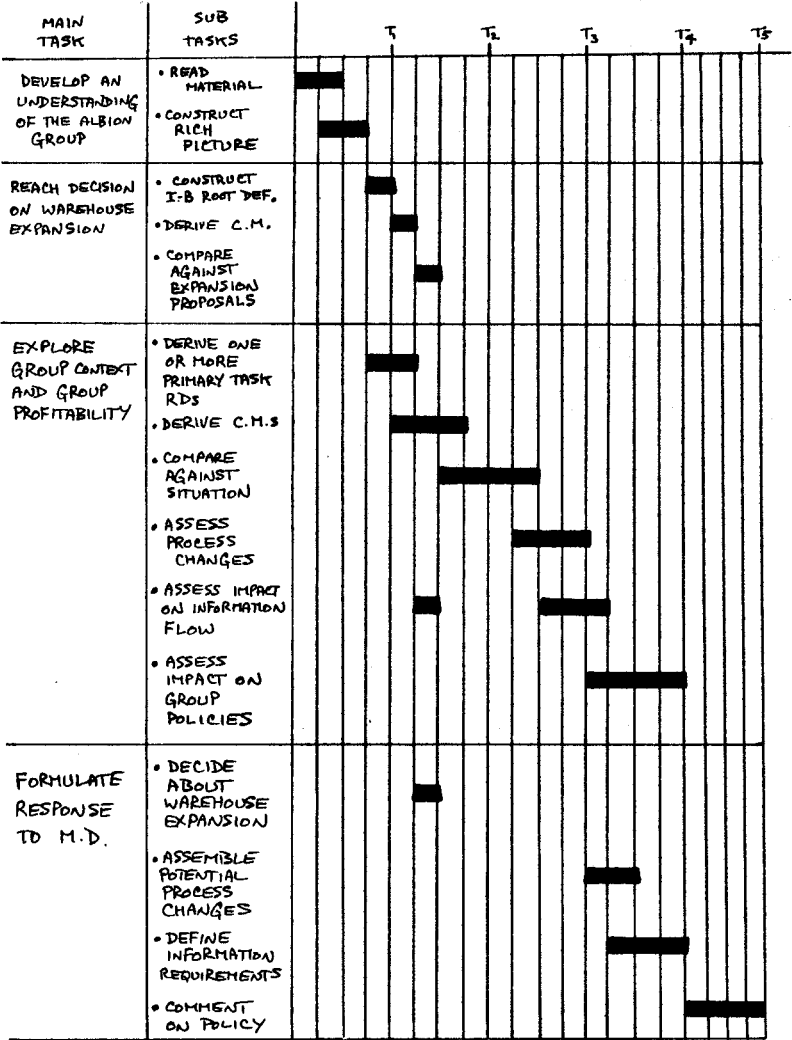


Figure 3.10 Problem-solving schedule

These are on-going activities for the duration of the project and hence do not appear in the schedule.

The activity performance information that the project control role requires (through the monitor activity) will include the quality of the deliverable produced by each activity (subtask), the degree to which the time taken adheres to the schedule and the resources consumed. This last measure (efficiency) would be particularly significant if cost was also a constraint.

Thus, taking each time period to be one hour, three quarters of an hour has been allocated to developing an understanding through reading and rich picture construction. This means that the degree of detail used in the picture cannot be excessive.

Figures 3.11 to 3.13 represent the construction of a picture within this time scale. It starts at the macro level (Figure 3.11) and, through progressive elaboration, the picture represented by Figure 3.13 was derived and used.

This picture is at a macro level and contains broad indications that more detailed data exist (which we can access if there is a need to know them). Further detail can be explored as the need to do so is generated by the analysis, in particular, the comparison.

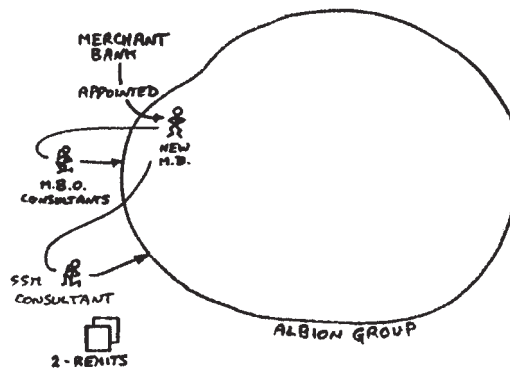
It is always the case, when contemplating potential problem owners, to consider the client as a significant choice. That choice had already been made in deriving the RD for the problem-solving system and, in this case, it leads directly to the choice of an initial relevant system. It can be argued to be relevant since it is directly related to our terms of reference. This is another issue-based system to reach a decision about whether or not to expand the Surface Stockists warehouse.

The RD taken is as follows:

A managing director-owned system to decide whether or not to expand the Surface Stockists warehouse based upon the implications of this decision for the group as a whole.

The CATWOE analysis is:

- T—to decide whether or not to expand the Surface Stockists warehouse
- W—basing the decision on group implications *will* lead to a decision in line with the MD's expectations
- C—not specified
- A—not specified



PROBLEM SITUATION EXPRESSED (1.)

Figure 3.11 Relationships external to the MD

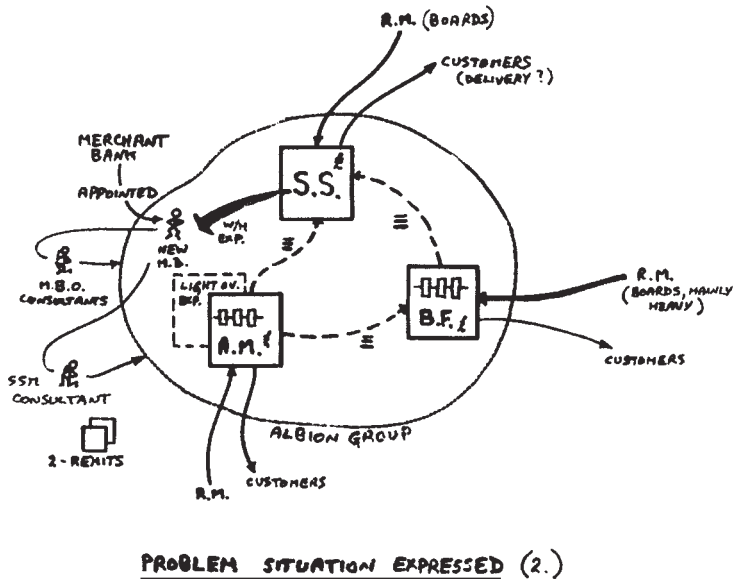


Figure 3.12 Internal/external group relationships

O—MD
E—not specified

The conceptual model derived from this RD is contained in Figure 3.14.

The part of the real world relevant to the comparison of this model is the proposals for expansion (since this is what the MD was expected to base his decision on). Thus a simple comparison table can be constructed. See Figure 3.15.

The comparison tells us that considerable deficiencies exist in the support material for the proposed expansion and therefore the only recommendation to the MD, at this stage, is not to

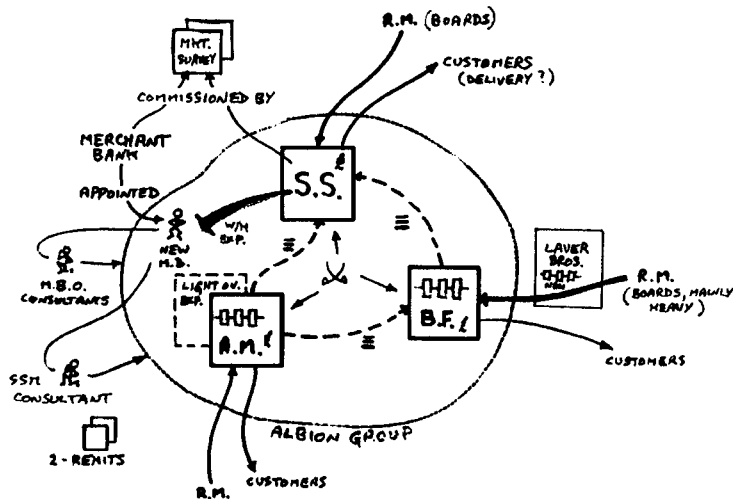


Figure 3.13 Problem situation expressed

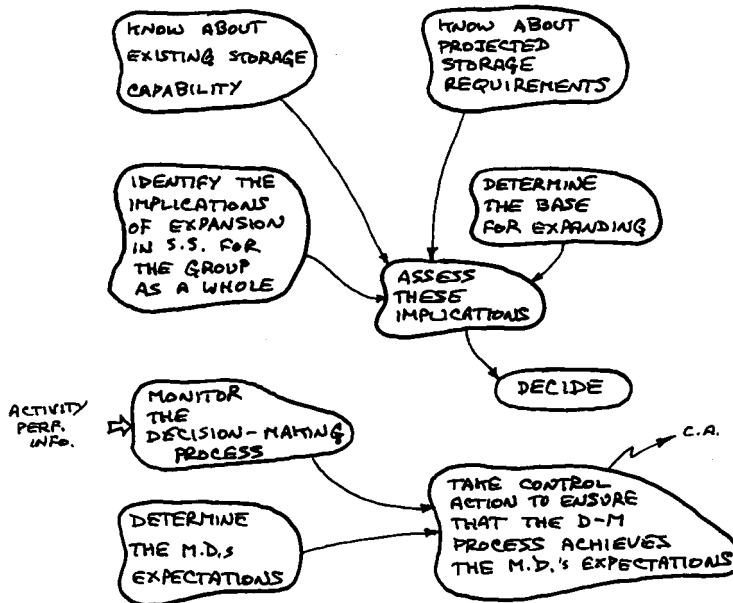


Figure 3.14 Decision-making system

make a decision until the information lacking is provided. We could specify the information requirements now but the schedule of Figure 3.10 delays this until time period 3, i.e. when we have completed further analysis. Thus the question arises as to what analysis to undertake.

The conceptual model of Figure 3.9 (our problem-solving system) and the schedule of Figure 3.10 require us to increase the scope of the investigation to assess group and group profitability aspects. Thus who could we take to be potential problem owners? The stockists' manager would be

ACTIVITY	COMMENTS ABOUT PROPOSALS
• KNOW ABOUT EXISTING STORAGE CAPABILITY	NO INFORMATION IS GIVEN ABOUT WHAT IS STORED NOW, HOW, STOCK TURNOVER RATE ETC.
• KNOW ABOUT PROJECTED STORAGE REQUIREMENTS	NO INFORMATION IS GIVEN ABOUT MARKET TRENDS OR FUTURE DEMAND PATTERNS
• DETERMINE THE BASE FOR EXPANDING (i.e. COSTS AND POTENTIAL RETURNS)	SOME COSTS ARE GIVEN RELATED TO ALTERNATIVE SCHEMES BUT GIVEN THE LACK OF THE ABOVE INFORMATION NO ESTIMATE OF POTENTIAL RETURNS CAN BE MADE
• IDENTIFY THE IMPLICATIONS OF EXPANSION FOR THE GROUP	NO RELATING OF STORAGE AT SURFACE STOCKISTS TO THE ACTIVITIES OF THE OTHER TWO MEMBERS OF THE GROUP HAS BEEN DONE
• ASSESS THESE IMPLICATIONS	WITHOUT THE PREVIOUS ACTIVITIES THIS CANNOT BE DONE
• DECIDE	GIVEN THE ABOVE DEFICIENCIES THERE IS LITTLE TO BASE THE DECISION ON.

Figure 3.15 Comparison table

an obvious choice given that it was his request for warehouse expansion that led to the SSM consultancy intervention. However, this would lead to a limited focus on Surface Stockists and not the group. As an alternative we could take the MD again to be the problem owner but with a group profitability concern. This would lead to a system relevant to the following CATWOE analysis:

T—to transform raw materials into finished boards

W—transforming raw materials into finished boards can lead to increasingly profitable sales

C—customers

A—component parts of the Albion Group

O—Tyzacks

E—competition from other suppliers

A Tyzacks-owned system, operated by the component parts of the Albion Group, to transform raw materials into finished boards of various grades in order to achieve increasingly profitable sales to customers while recognising the competition from other suppliers. (Note: 'Finished' boards includes both 'surfaced' and 'unsurfaced'.)

This is a primary-task RD which would be expected to map onto the group as a whole. Thus it would take us into the maximum complexity of analysis immediately but would ignore our *actual* terms of reference, i.e. the advice on warehouse expansion.

This, of course, is modified by the MD's second letter, but we could interpret his concern here as one to do with the impact of the request on 'storage' within the group as a whole. Hence a system which examines the reason for storage might be a useful choice and would serve as a link between the specific warehouse expansion request and improvements to group profitability. All three parts of the Group supply customers and hence it could be useful to take the actual customers (internal and external) to be the problem owner.

If we take the reason for storage to be a mismatch between supply and demand we could construct the following RD:

An Albion Group-owned board transfer system to match the supply of finished board to both long- and short-term demand at a continuing level of service that is acceptable to customers, in relation to other sources of supply and with a performance that is beneficial to the group. (Note: 'Finished' board has the same interpretation as in the previous RD.)

The inclusion of the term 'board transfer' limits the scope of the system to exclude the board production processes. This is a primary-task model which can be mapped onto the real world of the Albion Group.

T—to match the supply of finished board to demand

W—matching supply to demand at an acceptable level of service will lead to benefit to the group

C—customers

A—not specified

O—Albion group

E—not specified

The conceptual model that results from this RD is given in Figure 3.16.

One of the major features of the real world which impacts upon the comparison with a primary-task model is that some form of structure always exists. Within a conceptual model the only structure is one based upon logic. Thus a comparison will yield comments about the real-world structure that may turn out to be problematic and part of the major findings from the analysis.

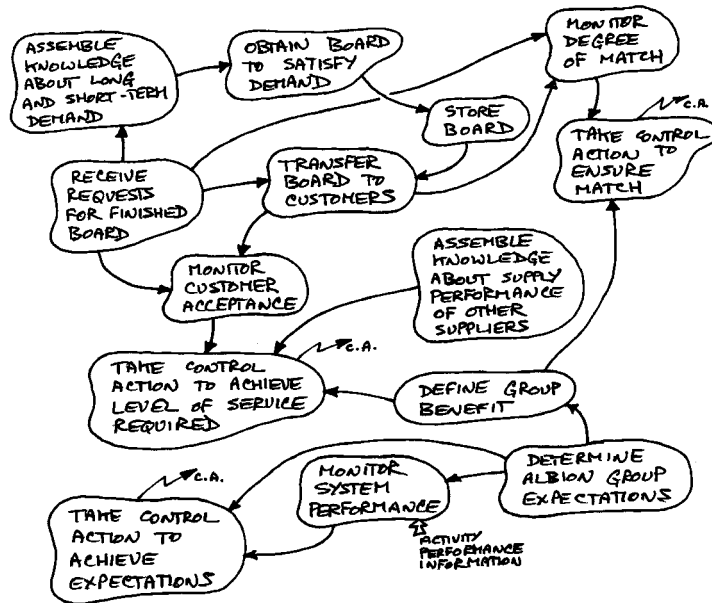


Figure 3.16 A board transfer system

In the case of the Albion Group not only is there an organisational structure within each element but the Group as a whole is geographically structured. Thus for comparison at the level of the Group it is the geographical structure that is taken to be of initial concern.

The conceptual model describes the processes (activities) that must go on to achieve some defined purpose (defined by the RD), irrespective of how and where they take place. It is in the comparison that these features become important. Thus, for Albion, the comparison could be of the form of Table 3.1.

Although not as explicit as this, the comparison tables of Figures 3.17(a) and 3.17(b) still recognise the real-world structure at the Group level.

These comparison tables lead to the following major conclusions:

- (1) Material flow control both within and external to the Group has a number of deficiencies as indicated within the table.
- (2) The base for Group contribution calculation needs to be chosen so that the heavy gauge becomes preferential. This will aid the flow control requirements in (1) above and help to move all Group members towards the future trend in demand.

Table 3.1 Comparison table

Conceptual model Activity	AM	BF	SJ	Real world Consequences of separation
Identify customer demand	Believe it to be light gauge expanding light ovens	?	Market survey shows heavy gauge on increase	Inconsistency in view of future demand
Obtain board to satisfy demand	Pulp is output	No problems with light gauge, heavy gauge obtained from Laver	Problems with heavy gauge	Future problems will exist if supply internally is not sorted

ACTIVITY	COMMENTS ABOUT THE ACTUAL SITUATION
ASSEMBLE KNOWLEDGE ABOUT LONG AND SHORT-TERM DEMANDS	SURFACE STOCKISTS ARE AWARE OF THE FORECAST DEMAND PATTERN, IT IS NOT APPARENT THAT THE REMAINDER OF THE GROUP ARE. THE FORECAST SHOWS AN INCREASING TREND FOR HEAVY GAUGE AND A DECREASING TREND FOR LIGHT GAUGE YET ALBION MILLS ARE CONSIDERING EXPANSION FOR LIGHT GAUGE OVENS
OBTAIN BOARD TO SATISFY DEMAND	ALBION MILLS DO NOT DO THIS; THEIR RAW MATERIAL IS PULP. BOTH BETTERFINISH AND SURFACE STOCKISTS HAVE DIFFICULTY IN OBTAINING HEAVY GAUGE BOARD. BOTH ALBION MILLS AND BETTERFINISH ARE RELUCTANT TO SUPPLY HEAVY GAUGE. BETTERFINISH GET THEIRS FROM LAVER BROS. GIVEN THE FORECASTS THIS SITUATION MUST CHANGE.
STORE BOARD.	NOTHING IS KNOWN ABOUT STORING FACILITIES AT ALBION MILLS AND BETTERFINISH. NO ANALYSIS HAS BEEN DONE ON THE EFFECT OF CHANGING DEMAND PATTERN ON INTERNAL MATERIAL FLOW. THIS IS CRITICAL TO THE DECISION ON WAREHOUSE EXPANSION.
TRANSFER BOARD TO CUSTOMERS	COMPLAINTS HAVE BEEN RECEIVED ABOUT DELIVERY PERFORMANCE IN RELATION TO HEAVY GAUGE (SEE N.B.35) AND THERE ARE LONG LEAD TIMES WITH INTERNAL SUPPLY (N.B.32). THE NEED FOR IMPROVED DELIVERY PERFORMANCE IS RECOGNISED BY SURFACE STOCKISTS (N.S.11) BUT GIVEN PRESENT ATTITUDES TO HEAVY GAUGE LITTLE IS BEING DONE
RECEIVE REQUESTS FOR FINISHED BOARD	INTERNAL ORDERING IS PROBLEMATIC. THERE ARE DIFFICULTIES WITH SMALL ORDERS PLACED ON BETTERFINISH (N.B.32) AND AN ARBITRARY ORDERING PROCEDURE AT SURFACE STOCKISTS. (N.S.34)
MONITOR CUSTOMER ACCEPTANCE	SURFACE STOCKISTS SEEM CONCERNED ABOUT CUSTOMER SATISFACTION (N.S.11) AND HAVE EMPLOYED CONSULTANTS TO DO THE ASSESSMENT. THERE IS NO EVIDENCE THAT THE OTHER MEMBERS OF THE GROUP TAKE THIS SERIOUSLY

Figure 3.17 (a) Comparison table

- (3) Storage requirements are secondary to material flow control and are determined by it.
- (4) Autonomy within the Group appears to be exacerbating the material flow problems, and the policy of 'internal competition is good for us' needs questioning.

The next stage in the analysis of Albion, with reference to the schedule in Figure 3.10, is to assess the impact of the analysis so far on information requirements.

In relation to the analysis of the decision on warehouse expansion, the information requirements are essentially things to find out. Since this was the result of the issue-based analysis and therefore of temporary relevance, there would not be a requirement for on-going information systems design.

The information deficiencies are therefore:

- Current state of storage and patterns of use
- Future storage requirements
- Costs and potential returns
- Inter-company storage (capacity and requirements)

ACTIVITY	COMMENTS ABOUT THE ACTUAL SITUATION
ASSEMBLE KNOWLEDGE ABOUT SUPPLY PERFORMANCE OF OTHER SUPPLIERS	THERE IS NO EVIDENCE THAT ANY MEMBERS OF THE GROUP DO THIS AS AN ON-GOING ACTIVITY.
DEFINE GROUP BENEFIT	THIS IS NOT DONE IN RELATION TO THE GROUP AS A WHOLE. CONTRIBUTION ASSESSMENT IS DONE BY EACH GROUP MEMBER, BUT AS THIS IS RELATED TO DIFFERENT BASES (i.e. per board, or per cu. ft.) THEY ARE NOT COMPARABLE. DEPENDENT UPON THE BASE CHOSEN AND ON HOW OVERHEADS ARE ALLOCATED, HEAVY GAUGE COULD BE EITHER THE HIGHEST OR THE LOWEST CONTRIBUTOR
MONITOR DEGREE OF MATCH TAKE CONTROL ACTION TO ENSURE MATCH TAKE CONTROL ACTION TO ACHIEVE LEVEL OF SERVICE REQUIRED MONITOR SYSTEM PERFORMANCE DETERMINE ALBION GROUP EXPECTATIONS TAKE CONTROL ACTION TO ACHIEVE EXPECTATIONS	 BECAUSE OF THE AUTONOMOUS NATURE OF THE GROUP THESE ACTIVITIES ARE NOT DONE IN ANY CONSISTENT WAY.

Figure 3.17 (b) Continued

The outcome of the primary-task analysis will lead to a requirement for on-going information support. These will be classified as inter-company support (to ensure consistency of within-company information) and external information. Thus information will need to be provided on:

- Market demand (inter-company and external)
- Delivery performance (inter-company)
- Contribution (inter-company)
- Customer response (external)
- Competition intelligence (external)

The analysis of the board transfer system also led to a questioning of the current Group policy on individual member autonomy. This was anticipated in the problem-solving system and remains to be examined.

The significance of this aspect of Group policy can be examined by conceptualising two systems with opposing Ws, to map onto the Group as a whole. As an illustration we can take two simple systems as defined by the following two RDs:

ments to bring about Albion Group product flow management. Within this analysis there has been a progressive development in system scope as a means of expanding the context of the investigation.

It would have been possible to have chosen the overall Group-oriented RD but, in my view, this would have been less convincing to the client (the MD). The systems chosen can be argued to represent a logical extension, i.e. warehouse expansion (storage) leads to material flow control (of which storage is a significant part) which leads to an investigation of internal competition (of which material flow control is a significant consideration). Thus the development of the analysis can be argued to stem from the initial terms of reference guided by the comments in the MD's second letter.

The example illustrates the significance of including yourself (as problem solver) within the rich picture together with your relationship to the client. Not only does this clarify your terms of reference (remit), and hence help in the interpretation of 'relevant', it also limits or extends the scope of the analysis. Clearly, if our client had been the Stockists manager, concerns at the Group level would have been totally inappropriate. Since the client was the MD, he has the authority to take action on any of our recommendations.

LESSONS FROM ALBION EXPERIENCE

The Albion case has been used extensively as a case study, both within the MSc course at Lancaster and within short in-house courses for a number of companies. It has proved to be a rich learning experience. It is worth quoting a few examples as a means of extending the 'RD – CATWOE' pitfalls at the end of Chapter Two.

Example 1. A RD was quoted as: '*A system to seek to satisfy market demand...*' The conceptual model had in it activities concerned with producing and delivering a product. This was inappropriate modelling since to deliver a product customers are required. The RD was in terms of *the market*, not customers.

Seeking to satisfy a market must be about ensuring that a capability exists so that the system can supply what the market wants if called upon to do so (by actual customers). Actually doing the supplying is a different system.

Example 2. On one occasion a complex RD was produced along with the CATWOE analysis. These are as follows:

A shareholder-owned system, managed by a newly appointed MD 'who is recruited to maximise growth and profitability' of a Group 'that consists of three autonomous companies that import raw materials to produce and distribute prefabricated boards to meet market needs' whilst recognising time and resource constraints. (Note: inverted commas have been added: they were not in the original RD.)

C—shareholders and customers of Albion Group

A—MD of the Group and employees

T—maximising profit and growth of the company

W—the Group can only survive in a competitive market if it is profitable

O—shareholders

E—time, resources, customer needs

First, the RD, as written, is not a RD. It is more a *description* of the situation. The first set of inverted commas contains a description of the MD and the second set a description of the Group. Thus we are told what the MD does and what the Group does but we are not told what *the system does*. Hence there is no transformation process. In the CATWOE analysis the T quoted is a definition of the responsibility of the MD. The W might well be a reasonable belief but not one contained in the RD. There is nothing about survival or about competitors. Since there is no T there cannot be any customers (C). In any case, 'shareholders' are only mentioned as 'owner' and 'customers' do not get a mention at all.

Actors are only included in the RD in the phrase ‘managed by a newly appointed MD’; ‘employees’ do not appear and finally, with reference to the E, ‘customer needs’ do not appear in the RD as constraints.

This RD and CATWOE analysis is a good example of the difficulty of translating a concept in the head into an explicit and defensible written statement. It is probable that neither the RD nor the CATWOE elements quite represented what the student had in mind and hence the lack of consistency was not apparent.

Example 3

A solution-oriented RD and CM are generally not useful. The RD chosen as an example began:

A system to remove the competitive internal market throughout Albion Group by introducing a change programme.

Since, in the current situation, Albion are not introducing a change programme there will be nothing to compare the resultant conceptual model against. Hence nothing will be learnt about the situation. In general, during an investigation of a problematic situation, a solution-oriented RD has already made an assumption about ‘the problem’. It is only useful to develop RDs and models of this kind if the investigation has already been undertaken and implementation of a desired change has been identified.

Example 4

Don’t be casual about the way words are expressed even though they are precise. *A system to produce recommendations to improve profitability . . .* is not the same as: *a system to improve profitability*.

Example 5. Maintain consistency in choice of words

During the construction of a conceptual model and the preceding RD the verb used to describe the transformation changed as its use went from RD to CATWOE to CM. The verb ‘convert’ in the RD became ‘assemble’ in CATWOE and ‘produce’ in the associated part of the CM.

The student may have interpreted the three words in the same way but there are subtle differences in meaning. Using the same word throughout will avoid possible misinterpretation.

Example 6. Avoid ambiguity in the structure of the RD

A student began a RD in the following way: *A manager-run system staffed by SS personnel . . .* It is probable that the use of the word ‘staffed’ indicated Actor but the word ‘run’ could be either Owner or Actor. This ambiguity makes modelling difficult. On the other hand, ‘A manager-owned system, operated by SS personnel . . . is not ambiguous’.

Example 7. As a final illustration, in a RD don’t use ‘e.g.’ as a means of elaborating some of the words. ‘RD . . . while operating under constraints (e.g. time, money)’. It immediately raises the question, if these are examples then what else is there? It is essential that the RD should be specific.

SERVING SYSTEMS/SYSTEM SERVED

The Albion example has served to illustrate the use of the distinction between issue-based and primary-task systems in making the choice of those systems taken to be relevant. There is a further distinction that it is useful to consider whether the nature of the problem-solving task is related to a certain class of concerns. These concerns can be described broadly as those related to service, or support provision.

Thus, information provision, training, manpower planning, general resource planning are examples of service, or support, provision. None of these are an end in themselves, they are all required to

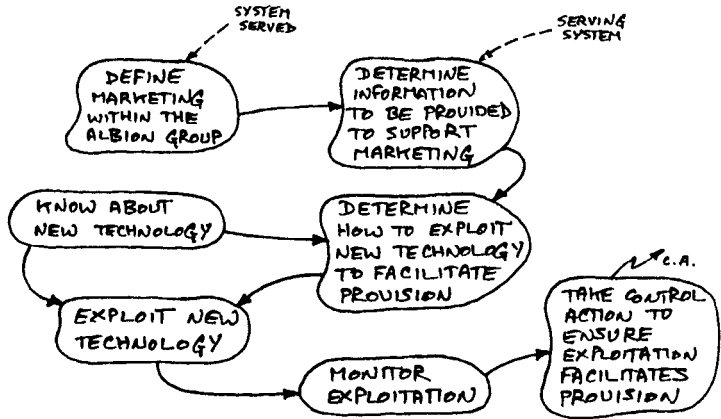


Figure 3.20 Marketing information support

enable other activity to take place. If this is the nature of the analysis to be undertaken the choice of relevant system becomes very clear.

The choice is based upon the following rule:

If the concern is with a service system always conceptualise the system served.

Suppose that we are required to determine the information systems needed to support marketing activity in the Albion Group. We might take the relevant system to be:

A system to facilitate information provision to support marketing within the Albion Group by exploiting new technology.

- T—to facilitate information provision
- W—exploiting new technology will facilitate information provision
- C—marketing (personnel)
- A—not specified
- O—not specified
- E—not specified

This is a rather sparse definition but it will serve to illustrate the need for the above rule.

The conceptual model in Figure 3.20 can be defended in terms of its logical relationship to the words of the RD. However, it is not very useful.

The information needed to support marketing is *dependent* upon the definition of what *marketing within the Albion Group is taken to be*. Thus we cannot elaborate this model any further until the definition of marketing is produced. Once this is known ‘the information to be provided’ can be determined. The top two activities in Figure 3.20 represent this relationship and, as illustrated, the ‘serving system’ is logically dependent upon the ‘system served’. Thus the ‘system served’ must be produced first.

Clearly, there will be as many service systems as there are systems served. Therefore, if our concern is for a single service, like information support to a single organisation unit, we need to derive a single description of the system served. This provides us with a fundamental problem since, if we accept that W is an important variable in all organisational analysis, how do we take W seriously and still produce a single model? The answer to this question is the subject of Chapter Five.