DIVISION OF COMPUTER SCIENCE

The Problem Area of Invoice Matching at Neon Electrical - A Case Study of SSM in Business Systems Analysis and Design.

C Pascoulis

Technical Report No.254

May 1996

The Problem Area of Invoice Matching at Neon Electrical: a Case Study of SSM in Business Systems Analysis and Design.

Chris Pascoulis

Abstract

Today's business systems analysts deal with problem areas which can be diverse in size and complexity. The tools they use to clarify these problem areas are traditionally 'hard' systems methodologies such as Structured Systems Analysis and Design Method (SSADM) (Downs, Clare & Coe 1988). These methodologies help the analysts define 'what' needs to be done in order to solve a problem. When problem areas are too fuzzy to be able to identify what the problem is, analysts may use a method such as Soft Systems Methodology (SSM) to clarify 'why' a system exists by defining its ultimate objectives. This report outlines the various stages of SSM and illustrates how the methodology can be employed by use of a case study. It investigates how business analysts tackle problem areas at a national electrical wholesaler known as Neon Electrical. The report gives an account of the problems faced by staff and management at Neon when trying to clarify various problems caused by their purchase invoice matching system. It shows how SSM is applied to their areas of concern in order to clearly define the problems and to subsequently recommend viable solutions. Throughout the case study the value of SSM as a tool for business systems analysis is considered. The report concludes the investigation by reflecting on the various strengths and weaknesses of SSM.

1. Introduction - Context of the Report.

The purpose of this report is to investigate the application of Soft Systems Methodology (SSM), at first hand, in the context of business systems analysis and design. This is carried out using a rich case study to document how business analysts used SSM in a practical way within a typical real life business environment. Although the situations described in the report are genuine, the names of the companies and people mentioned throughout the study are fictitious, apart from that of Chris Pascoulis who is carrying out the investigation.

Pascoulis is a part time Computer Science research student, working as a business analyst within the DP Department of a national electrical wholesaler called Neon Electrical. His experience of SSM was gained through academic study and by attending a professional course for SSM analysts. SSM as a method is not generally used by other analysts within Neon and its adoption as a tool is primarily for academic purposes. In this respect, the business area in which the methodology is applied is sufficiently involved to provide a viable proving ground.

SSM is a systems approach which is often used to clarify problems which are complex and fuzzy in nature. It is particularly appropriate at tackling messy ill-structured problems and provokes discussion by taking into account different views of a problem situation (Checkland & Scholes 1990). This report describes how problems are overcome by applying the seven-stage process of SSM to the problem area of Invoice Matching within Neon Electrical Wholesalers. It is appropriate as a method for addressing these problem areas because of its well documented suitability at dealing with situations which are dominantly affected by people.

2. What is SSM ?

2.1 An overview of SSM.

The concept that 'system' is not simply a term as used in everyday language, but a view of a problem or situation of interest is one of the defining principles of systems approaches (Flood & Jack son 1991). Also of relevance is the fact that a system has certain constituent properties which can be thought of as greater than the sum of their parts; if we think of a house as a system we could also describe it as a home, which is meaningless when applied as a description of the constituents bricks and mortar. Soft Systems Methodology (SSM) is a systems approach which can help in dealing with today's diverse management problems (Checkland & Scholes 1990). It is a powerful methodological approach whose theory is based on systems thinking, and is particularly appropriate when looking at 'soft' or unstructured messy problems (Checkland 1981). A systems approach uses different perspectives of a problem to resolve it. Instead of reducing the problem into its constituent parts, different views of it are treated as systems (Rosenhead 1989). Systems approaches can be divided into those which deal with problems where the purpose and objectives are clearly defined, but the issue is 'how' are they to be solved (Hard Systems), and those where the purpose is unclear and objectives a re ill-defined and the issue is 'what' needs to be done (Soft Systems). One of the main determining factors when trying to decide whether a problem is soft or hard is to establish if people are dominantly involved in the problem situation. It is in these cases that SSM can help to identify social problems of culture and politics.

2.2 Different Interpretations of SSM.

SSM was developed at Lancaster University by Professor Peter Checkland (Checkland 1981). Since its origin it has developed as a method and different accounts of its use have been documented over the years. The more academic view pioneered at Lancaster's Department of Systems is described practically by Brian Wilson (Wilson 1984) and with the benefit of hindsight by Checkland (Checkland & Scholes 1990).

The Central Computing and Telecommunications Agency of the UK Government's Civil Service (CCTA) developed a version tailored to meet their specific needs and integrated SSM into their COMPACT approach as a front end to SSADM in order to support the business analysis stage of the methodology (CCTA 1989). It is easy to deduce that Checkland, as a purist, expresses disapproval for the COMPACT approach. He calls it "mechanical" and describes the alteration of the CATWOE mnemonic to VOCATE as seeming "strange, if not hilarious" to the readers of his book (Checkland & Scholes 90). Both mnemonics and their differences will be explained in later sections. Despite the drawbacks described by Checkland the version developed by CCTA has a number of advantages as explained by Raymond Oakes (Oakes 1994). Firstly, it provides a framework which includes specific milestones enabling the analysis to be carried out with more confidence by an inexperienced user. Secondly, it ensures that the 'ultimate vision' (Viewpoint or Worldview) of the system being modelled is measurable. Finally, the mechanical approach makes it easier to follow for computer oriented people with a hard systems background. During the study being undertaken the SSM business analyst has used an amalgam of the methods as well as contributing some of his own styles and preferences. In fact, freedom of expression is one of the stated advantages of the method by academics and business consultants alike.

2.3 The Seven Stage Process.

The methodology is often described as a seven stage process. It is at its most powerful when users move freely between the stages as part of a cyclic enquiry. Here is an outline of the different stages as described by Checkland (Checkland & Scholes 1990) also known as the learning process of soft systems methodology. There is a great deal of overlap with the CCTA version. Some specific differences between the versions are explained for Stage 3.

Stage 1: Situation considered problematic
Stage 2: Problem situation expressed
Stage 3: Formulate Root Definitions of relevant systems
Stage 4: Build conceptual models of systems named in RD's
Stage 5: Compare models with real world
Stage 6: Define systemically desirable & culturally feasible changes
Stage 7: Take action to improve problem situation.

These stages are outlined in more detail in the following sections.

2.4 Stages 1 & 2: Finding Out.

A cultural enquiry process designed to highlight 'people problems' is employed during these two stages (Rosenhead 1989). This consists of three analyses:-

(1) Analysis of Intervention - The fact that a study is taking place is testament to the fact that the 'client(s)' recognises a problem exists. This problem has a 'problem owner' and a 'problem solver'. This stage identifies these roles.
(2) Analysis of social system - People in a problem situation have 'roles' which entail certain 'norms' of behaviour and are assessed by certain 'values'. This stage shows how these elements define each other. The above labels should be applied to shed further light on the problem.
(3) Analysis of political system - In an organisation the way power is wielded will always have an impact on the way that organisation operates. This stage is intended to examine that impact with discretion. These cultural aspects can help to provide a 'Rich' picture of the problem situation. This is simply a diagrammatic representation of the problem without any strict rules governing its use. Techniques such as 'mind maps' can also be used in place of, or, in addition to rich pictures. They can be used to identify the areas of concern and are preferred by some people as an aid to brain-storming.

2.5 Stage 3: Formulate Root Definitions.

Within each problem area there are a number of systems which are relevant to the problem. These can be sub-divided into 'primary task' and 'issue based' systems, which are best explained using examples relating to an invoice matching system at a branch of an electrical wholesaler. The following examples were formulated during draft stages of the Neon case study discussed later in the report :-- A related primary task for the branch staff could be to match invoices to advice notes.- an issue based task
could be a system which resolves resource conflicts by allocating the time of branch staff to fit in with their busy schedule. Furthermore Checkland's CATWOE mnemonic can be used to ensure that nothing is missed from the definition.

C = 'Customers' : (Victims/beneficiaries of T)
A = 'Actors': (Those who would do T)
T = 'Transformation Process' : (The conversion of input to output)
W = 'Weltanschauung' : (Worldview making T meaningful)
O = 'Owner(s)' : (Those who could stop T)
E = 'Environmental Constraints' : (elements outside the system taken as given)

It is not necessarily the case that all the elements of CATWOE will be present. However, the two which must always exist are the Transformation T, and the Worldview W, which respectively de scribe what the system does and why. The VOCATE mnemonic used by the CCTA, simply replaces the term Weltanschauung (or Worldview) with Viewpoint which is defined as follows:-'The viewpoint must be rich, in that it should express the ultimate vision for the systems existence, but it must also be measurable'(Oakes 1994). It is this requirement of a measurable objective for the system which is the main difference between the two mnemonics. In addition, the order of the elements has, of course, been rearranged.

2.6 Stage 4: Building Conceptual Models.

The conceptual model is developed from the root definitions in stage 3 and as such show what an ideal system must do to meet the requirements of the definition. A rule which must be followed is that the conceptual model must represent the root definition exactly, ensuring that nothing is missed from or added to it. In other words the model must correspond directly to the main components of the root definition and confirm that the process of enquiry addresses the ultimate objective of the system.

2.7 Stage 5: Compare Models and 'Reality'.

After the conceptual models are built in stage 4 they are compared with the 'real' situation as established in the finding out stages 1 & 2. This can be achieved by asking these questions:-- 'Is the activity done at the moment ?' and 'If so, how is it done ?'

2.8 Stage 6: Defining Changes.

As a result of the comparisons outlined in stage 5 in order to define the changes necessary to obtain the ideal, the following questions must be asked:-- 'How might the activity be done ?', 'Is the change being defined systemically desirable ?', 'Is this change culturally feasible ?'. The important point here is to ensure that the changes are acceptable to the people who are deciding on whether to adopt them.

2.9 Stage 7: Taking Action.

Once the changes defined are accepted as 'systemically desirable' and 'culturally feasible' then these changes can be implemented, thus completing this cycle of SSM. The process of enquiry does not end here. The impact of the changes can form the basis of another process of enquiry, and so the cycle can continue 'indefinitely', or least until the area being examined is no longer perceived to be a problem.

3. Case Study: SSM at Neon - Context.

Neon Electrical is a wholesaler of electrical goods to the construction industry. It buys goods from suppliers and sells them on to customers, in theory at a profit. There are one hundred and twenty branches throughout the country, and head office is located at Potters Bar. Each branch is run by a branch manager with on average five or six branch staff, though branch size can vary greatly. The branches are split into regions which are run by sales directors. Each director is responsible for ensuring that his region meets its sales target at a predetermined margin. The culture which permeates through the company is one which encourages branch staff to concentrate on sales and margin by providing them with individual bonuses as an incentive if they meet these targets.

The company business is extremely dependent on its computer system. It runs an IBM mainframe system which is located at head office and supports approximately one thousand terminals throughout the country. Application systems are developed in -house by the DP department. The applications are mainly stock control at the branches and management information systems at head office. The computer system as a whole has a good reputation within the industry, which is largely due to the high quality of the Sales Order Processing application system.

System design and development is usually undertaken at the request of Branch Managers and Sales Directors. The resource allocation is undertaken by the DP Manager. He produces a prioritised application development plan for the year and agrees it with the Finance Director. At the time of the study recognised weaknesses of the computer system were perceived to be the Purchasing system, and the Invoice Matching and Approval system, which had both been in existence for almost a decade. Shortfalls in the performance of the computer system were attributed to changing business needs and new system requirements. In addition, the two systems mentioned looked dated when compared to the recently revamped Sales Order Processing system.

The basic principles of the Invoice Matching and Approval System at Neon Electrical are fairly straightforward. The process of buying goods is usually initiated by the branches either to replenish their stock or to supply a customer with specially ordered goods. The goods are delivered to the branch along with the supplier's advice note which is checked and verified as the goods are booked in. The supplier then sends a purchase invoice to the Bought Ledger Department at head office in Potters Bar. The invoice relates to goods delivered to one particular branch. The total value of each invoice is entered onto the computer system which then posts the amount to the ledger. The invoices are then batched and sent to the appropriate branches for the branch staff to match them to their suppliers' advice notes and purchase orders. The branch manager should then approve these invoices and return them to Bought Ledger at Potters Bar. If branches are unhappy about a particular invoice, then they can raise a debit note, which has the effect of withholding a payment. Within the system, this is the only way of withholding a payment to a supplier since the invoice approval is simply used as an internal control procedure.

This report highlights the problems which arise when the branches attempt to match these invoices to supplier's advice notes, and how time constraints limit their checking procedures. Branch Managers have to manage a number of different problem areas including resource conflicts mainly caused by a sales driven culture within the company. The Bought Ledger Manager is faced with problem situations caused by branches not approving their invoices properly, thus causing him to

intervene and override the system to withhold payments. Subsequently, he has to deal with irate suppliers, who have not been paid.

4. Case Study: Use of SSM at Neon.

4.1 Framework of the Study.

The aim of the study was to clarify problem areas within Neon's operational procedures and related systems when dealing with purchase in voices. The study and subsequent system review were instigated by external auditors commissioned . by Neon's parent company the French owned Electrique Francaise (ELFR). A much 'publicised' report was issued by ELFR detailing a number of areas of concern at Neon. Their recommendations encouraged the formation of a steering group to examine some of the areas more closely. These areas were Neon's Invoice Matching, Purchasing and Goods Received systems and procedures.

The steering group consisted of the following members:-

> Victor Broom (Ipswich Branch Manager),
> Pete Champion (Internal Auditor),
> Geoff Carver (Bought Ledger Manager),
> Abel Hoffmann (Internal Auditor) acting as chairman,
> Rita Hayworth (Leicester Branch Manager),
> Chris Pascoulis (Systems Analyst),
> Tim Rice (DP Manager),
> Jamie Slim (Systems Analyst).

The steering group through Abel Hoffmann reported to Jim Laycock (Finance Director) who set up the study and was the driving force behind it. He also attended the group's meetings from time to time. The steering group met initially to establish the terms of reference for the study, and then subsequently met once a month to review its progress and objectives. The main analysis work was being carried out by Chris Pascoulis and Jamie Slim, with help and advice also provided by Tim Rice. Pascoulis applied SSM throughout the analysis in two different ways. Firstly, he used it to make sense of the information which was being gathered from the meetings, interviewing and background reading. This provided a framework within which to represent the problem area. Secondly, he used it to stimulate discussion and to provide a focal point thus enabling him to remind the steering group members of the ultimate objectives of the study as defined by them. The method was concealed from the other steering group members, although Slim and Rice were aware of its use.

From this point a number of sections are written in italics which represents reflective comment on the case study as seen by Pascoulis; therefore distinguishing the comment from the main description. These sections enable the investigation to outline what the case study means in terms of the use of SSM in business systems analysis and design. As already mentioned, the decision to use SSM was an academic one, in an attempt to assess its relative merits in a real world business environment. It was thought at the time that it would merely chart the analysis taking place in the study.

However, it became evident to Pascoulis that SSM was an invaluable tool when drawing together a large amount of information. This was particularly the case with the interview notes, which largely consisted of people's opinions, which often conflicted. It was the different conflicts, which were evident from the outset, that convinced Pascoulis not t o 'come clean' about the use of the methodology when dealing with people in the problem situation. He felt that these people would be less willing to describe the true situation if this meant that they were being portrayed as causes of the problem. By and large this decision was vindicated by

the openness of the steering group meetings, during which members freely spoke of themselves as being part of the problem area without any concern about having to take the blame.

4.2 Finding Out.

The initial finding out phase consisted of two steering group meetings, a large number of interviews and reading up of system literature and procedures. During this phase Pascoulis applied Analysis One (systems analysis of intervention), Analysis Two ('social system' analysis) and Analysis Three ('political system' analysis) in order to shed light on the information being documented. As already mentioned a large number of interviews took place. Some of these were carried out by Pascoulis and Hoffmann during a week long period of visits to branches throughout the country. The remaining interviews involved other members of the steering group being interviewed individually by Pascoulis and Slim. The members were also given a briefing of what to expect at each subsequent meeting. Here are some extracts from the minutes of these meetings and from interview notes. During the initial meetings and interviews a large number of system problems were expressed by the team in a variety of forms.

Most of the views expressed were in effect done so as system requirements, based on the experiences of those putting them forward. Both meetings were attended by all the members of the group, with Laycock also attending the second meeting. Carver felt that the Bought Ledger Department was being put in a very difficult position by the branches. He was worried about invoices not being properly approved and returned by the branches. This meant that he had no confidence in the information he was receiving from the branches, though he was able to use his own judgement in deciding which of the branches were the 'good' ones. His recurring problem with the 'bad' branches was that he never knew which payments to withhold in t he absence of specific instructions. Since he had no access to the branch system he could not even attempt to search for the information himself. In view of this he would usually err on the side of caution which inevitably caused conflict with suppliers. This resulted in a particular branch, or even Neon as a company, being put 'on stop ' with certain suppliers. This sometimes meant that branches throughout the country were unable to buy from these suppliers. Carver then had to resolve the non-payment very quickly and as such was forced to contact the offending branch in person and instruct them to track back through the order's history or risk losing the company money.

The two branch managers in the group, were widely regarded as coming from quite good branches. In fact Leicester branch was to go on and win Electrical Wholesaler of the Year. They were generally quite happy about checking and approving their own invoices. Although they felt the task was time consuming they were in agreement with Carver that it was vital to get it absolutely correct. As Hayworth succinctly put it, 'if payments are wrong, then margin will be affected, and margin means bonus'.

Pete Champion, an internal auditor had a different view of things. Champion who was responsible for the running of stock takes which took place twice a year felt that a large number of the branches put the checking of invoices to the bottom of their list of things to do. The whole group agreed with him when he said that he felt it was the attitude of all the branches to put sales first. He was particularly worried about a newer division of the company, Safe Security Services (SSS), which dealt with a very profitable niche market for security products. Since they were producing excellent margins already these branches were not too worried

about losing a small amount of money to the suppliers. The results at stock take were therefore often distorted for these and other disorganised branches.

Although Pascoulis, Slim and Rice were in effect carrying out the study, they also had their own experiences of branch procedures through their overall knowledge of the computer system and through manning the user help desk. They also had further experience of the problem area through supervising stock takes twice a year. This was a task often carried out by Head Office staff who were sent to different branches throughout the country. The problems they encountered in both these roles, were that branches often 'bucked' the system by omitting to put order or receipt details through the system in the proper way. Orders were often written out manually without any indication of the expected cost. Goods were booked in through a 'Stock Adjustment' screen not in tended to be used for anything other than maintenance. They all agreed with Champion that something needed to be done to ensure that branch staff followed procedures laid out by head office. Hoffmann acting in his role as chairman of the group attempted to keep the meetings focused on what he saw as the ultimate objective. This was to provide accurate stock take figures thus giving a clearer picture of how much the company owed at each of its cut offs. He was particularly concerned about this aspect because it was Laycock's main concern and he personally reported to Laycock with the progress reports of the group.

Laycock attended the second of the two initial meetings as already mentioned. He had a different view of the problem. He blamed the auditors for being unable to provide him with accurate information relating to the company's purchased reserve. He was also unhappy about only having the information available twice a year after stock take. Although he had limited understanding of the system, he made a number of valid points. This included posing the question as to whether it was felt that the branch staff simply needed training in following the procedures, or if it was a deliberate circumvention of the system in order to save time.

There was surprisingly little contrast between the things that group members said at interviews, and the things they said at meetings. The biggest contrast happened whenever Jim Laycock attended a meeting. His powerful position and personality seemed to leave everyone in awe and the discussions were far less open and less useful. The meetings tended revolve around him personally as opposed to serving his objectives, with people fearful of admitting that problems existed. It is probably appropriate to mention that a wave of redundancies had just been experienced at Head Office. It was the ability of SSM to enable documentation of these types of 'people problems' that Pascoulis found most useful. He had up until this point not really experienced having to deal with messy ill- structured problems revolving around the culture of the organisation. As a person coming from a 'hard' programming background he found it reassuring to be able to document these 'soft' problems. The other tools that he had used up until this point were not rich enough to be able to represent these types of conflicts of interest. The theory of the invoice matching and approval system as it was at the time was found to be logically correct when it was being documented using data flow diagrams and entity relationship models. SSM was far better than these analysis tools at documenting the problems within the system, since most of them stemmed from the failure of branch staff to follow procedures. One thing that did become evident early on was that SSM was easier to use once the Pascoulis' know ledge of the system increased. It seemed much easier to embark on an area of analysis by first using hard systems tools to outline the theory of what procedures were being carried out, even before the interviewing of group members took place. With SSM so geared towards the discussion of ultimate objectives, and people problems, it was difficult to use when attempting to document the current physical and logical

systems. This was a surprise at the time since he had expected it to fit into the problem definition and early analysis phases of the traditional system life-cycle. In a sense it did fit into these stages, but it did so retrospectively.

The interviewing of branch staff, carried out jointly by Hoffmann and Pascoulis, was done so at the explicit request of Laycock at the second meeting. The 'Purchasing Tour' as it became known, involved visits to eight branches around the country. Typically the staff interviewed at the meetings were the branch manager and the bought ledger clerk at the branch. Most of the responses fell into a familiar pattern. As far as the branch manager was concerned, there was no real problem with the system as it stood, but given the incentive of freeing up some of the valuable time of his/her staff to do other things he/she would be willing to adopt a new system, if necessary. The main reasons cited for not following certain procedures, were that there was not enough time and that the branch was short of staff. All branch managers were adamant that their branch was not losing any money, and that their invoice approval was up to standard 'on the high value items'. Bought ledger clerks at the branch were far more resistant to change, and preferred the system to remain as it was, probably because they were worried about their own job security.

Once Pascoulis and Slim had gained an understanding of the existing company procedures and systems dealing with Invoice Matching and related systems, they documented them using hard systems techniques as mentioned earlier. The interviews and meetings followed, and then Pascoulis used the three analyses from SSM to carry out a political and cultural process of enquiry. The analyses yielded the following results

Analysis 1 (Analysis of intervention).

1.1   Client: J.Laycock, Finance Director.

1.2   Client's aspirations: To develop a way of ensuring that reliable information
on   how much the company owes is available at any time. : To develop a way of
        checking invoices accurately.

2.   Problem solvers: V.Broom, P.Champion, G.Carver, A.Hoffmann,
        R.Hayworth, C.Pascoulis, J.Slim, T.Rice.

3.   Problem owners: J.Laycock, the Bought Ledger department, Branch
Managers   and Staff, the Auditors (internal and external) and the steering group
members.

Analysis 2 (Analysis of social system).

Roles, norms, values as described by Pascoulis.

Role: in the Purchasing and Invoice Matching system within Neon
Norm: expected behaviour
Value: what constitutes 'good' or 'bad' behaviour in role.

Roles in Invoice Matching.-

The role of Bought Ledger Manager was to make payments to suppliers and
oversee input of invoices.
The role of the branch manager was to allocate a member of his/her staff to check
invoices, and to subsequently approve them.
The role of branch bought ledger staff was to check invoices to advice notes.
The role of the internal auditors was to devise stock take and invoice matching
procedures.

Norms.

The expected norms of behaviour of the Bought Ledger Manager were to deal with
suppliers in an effective manner, liaise with branch staff in overcoming problems,
and manage the day to day processing of invoices.
The expected norms of behaviour of the branch manager was to ensure approval of
invoices takes place and allocate the time of his/her staff effectively.
The expected norms of behaviour for the branch bought ledger staff was to
conscientiously check invoices and raise debit notes whenever any sort of
discrepancy arose.
The expected norms of behaviour for the auditors was to maintain a knowledge of
current procedures, to be aware of problems which arose within the matching
system and to react to these problems.

Values.

The values expected to be exhibited by the Bought Ledger manager were :-
        To be a tough negotiator
        To be firm with branch staff
        To be able to communicate problems clearly
        To be cautious but decisive

The values expected to be exhibited by the Branch Manager were :-
      To be responsible (for invoice approval)
      To be well organised
      To enforce branch operational procedures
      To be accountable for actions of his/her staff
The values expected to be exhibited by the Branch Bought Ledger staff were :-
      To be thorough
      To be accurate
      To be numerate
      To be conscientious
The values expected to be exhibited by each internal auditor were :-
      To be a creative problem solver
      To possess very good written and verbal communication skills
      To be pro-active and self-motivated
      To be thorough

Analysis 3 (Analysis of political system).

Disposition of Power-

Held by the Finance Director, who is one of only three genuine directors within the company. He has strong support from the Managing Director in ensuring the running of this system meets his aspirations.-
Hidden influence from the parent company ELFR is brought to bear down on the directors, through their own commissioned auditors.-
Sales Directors are responsible for many of the actions of the branch managers. This power is largely a reflection of the company's culture.

Nature of Power-
The Finance Director has the power to influence all parts of the company including the Sales Directors and the Bought Ledger Manager. He has the ability to define company policy on all relevant issues.-

ELFR has the ultimate power. It can remove the three main company directors which includes the MD. It can instruct changes to company procedures through auditors and consultants that it appoints.-
Sales Directors have the power to influence the actions of their branch managers in the day to day running of the company.

Process by which power is:

(i) obtained -
'grabbed' or 'enhanced by' or 'obtained through' previous professional credibility or success

(ii) exercise
Finance Director exercises his power by issuing instructions to internal auditors and Bought Ledger Manager for overall objectives of the system.
ELFR exercise power through their own auditors and consultants producing reports. No explicit instructions are given by them. Although it is probable that ELFR directors instruct Neon directors behind closed doors. Regardless of this the threat of ELFR's ultimate power hangs over the whole company.
Sales Directors exercise their power over a region in day to day conversations, memos and visits with Branch Managers.

(iii) preserved or passed on

power is preserved through continued success throughout Neon. The culture is one which ensures that power is only given to those who are prepared to use it. Power is passed on through delegation or promotion.

The use of the three analyses was useful in a number of ways. Analysis 1 was useful in identifying how the success of the study would be judged. The carrying out of this analysis was found to be relatively straightforward. It was particularly appreciated as it provided the focal point of the study, and was used by Pascoulis in ensuring that the ultimate goals were not lost in the detail of the information being gathered. Analysis 2 was particularly useful as a first indication of what the problems were from a system point of view. This showed how the behaviour for various roles did not meet with what constitutes expected 'good' behaviour. This was where the shortfalls of the system and procedures at Neon were at their most pronounced. This was also exactly the sort of information that had been missed during the hard systems study documenting the way the system was supposedly working in theory. Analysis 3 allowed Pascoulis to appreciate what was at stake for those in a position of power, and to understand the structure of the company better. The most important point to become evident from it was fairly obvious already. This was that the study was not merely serving the source of power at Neon, but more importantly it was serving the sources of power at Neon's parent company ELFR. However, it did prove to be the most artificial of the analyses, as Pascoulis was unable to gain access to the thoughts of any of the main sources of power in connection with their role. This essentially meant that the results of the analysis were largely hearsay and guesswork.

The rich picture drawn (Fig 4.1) relates to the problem area of Invoice Matching and Approval within Neon Electrical. The process of enquiry identified the main problem

areas for the bought ledger department as having arisen from inadequate attention being given to the matching and approval of invoices by the branches in general. The main reason for this arose from pressure to put sales first in order to meet targets, and a culture which treated the checking of invoices as the least of their priorities.

The process of drawing the rich picture was found to be useful as a hidden tool used by Pascoulis. The situation could be represented and assessed objectively since he was not involved in the difficulties occurring. By not visibly documenting the findings of the analysis the managers were a little more open in identifying themselves as being part of the problem cause. It was found that the process driven by the three analyses provided a number of insights into problem areas which may not otherwise have been considered.

The process forced Pascoulis to establish the relative motives of the people involved in the situation and to identify the ultimate aims of the systems within the problem area, from different viewpoints. As a result, it helped clarify the objectives of Invoice Matching and Approval and what obstacles existed to its perceived success. (see separate sheet)

4.3 Formulate Root Definitions

Once the finding out stages were complete Pascoulis then began to formulate root definitions based on the information gathered from the interviews and meetings. The group members were always very forthcoming in putting forward their view of

what systems they regarded as relevant. Although, most of them documented their own system requirements, some of them were very detailed and specific. At one of the meetings Pascoulis tried to broaden the study using SSM in a concealed form, in order to stimulate discussion about the perceived ideal systems connected with invoice matching. Hoffmann, in particular was more than happy to adopt this agenda, since he obviously felt it was a way of reiterating his own ultimate objectives as mentioned in the finding out stage. When the analysis was carried out there were a number of relevant systems which were prevalent, and were represented in some form or other by the interested parties. Here is a summary of the most important ones grouped together as general areas of concern.
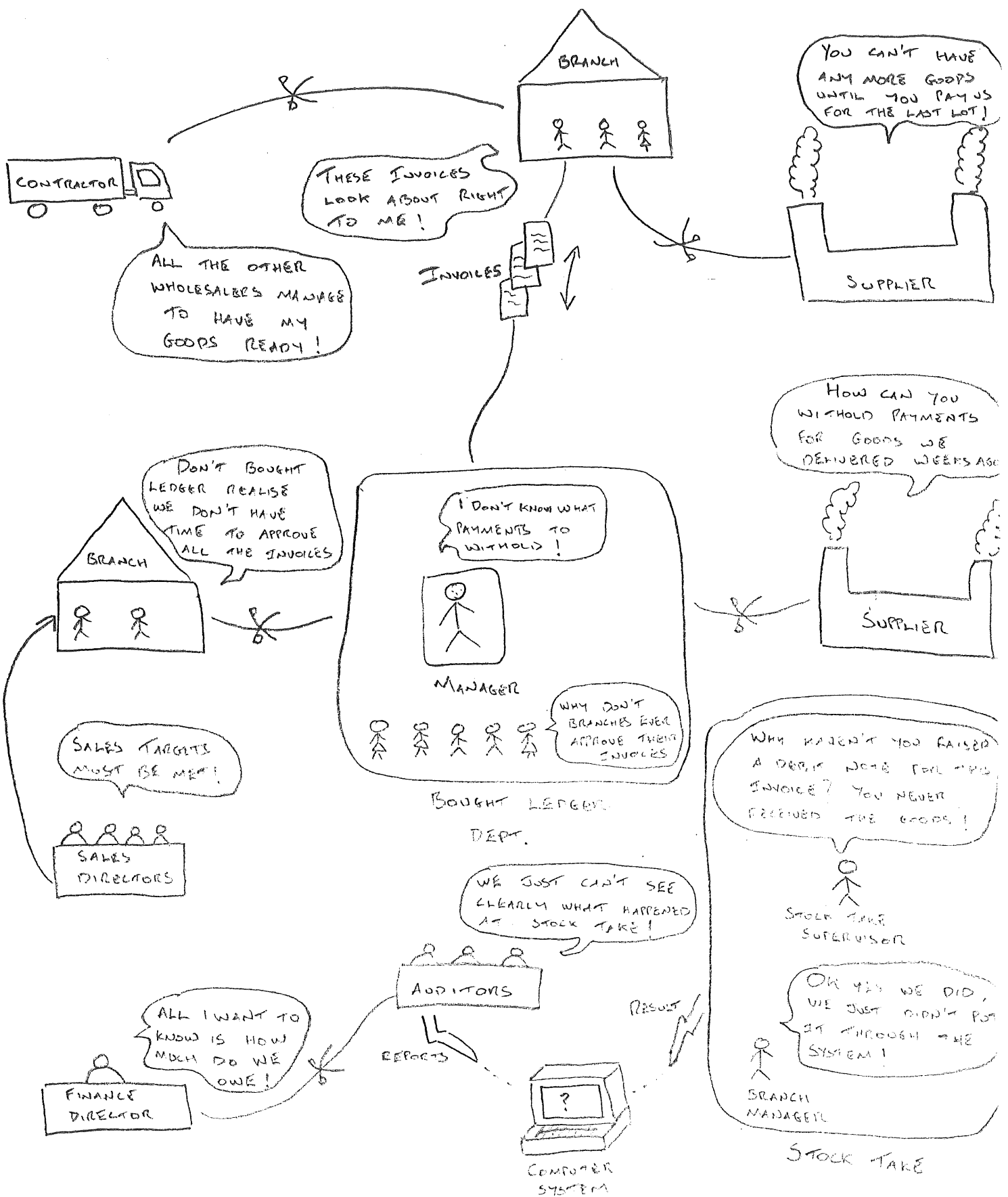
Fig 4.1 - A Rich Picture of the Problem Area of Invoice Matching

Primary Task Systems.

1. A system to Match Purchase Invoices to Supplier's Advice Notes.
2. A system to approve payments to suppliers.
3. A system to report on how much the company owes.
4. A system to provide an audit trail of purchases.
5. A system to communicate information between Bought Ledger and the Branches.

Issue Based Systems.

1. A system to resolve customer oriented commitments with those of dealing with Invoice Approval, at each branch.
2. A system to monitor the cost of invoice matching and approval.
3. A system to plan the day to day ledger posting, matching and returning of invoices.
4. A system to improve procedures at stock take.
5. A system to maintain a working relationship with suppliers.

In order to further explain the analysis the following root definitions have been selected as a typical primary and issue based task respectively.

RD1.

A branch owned and manned system to ensure that bought ledger can pay suppliers correct amounts by matching Purchase Invoices accurately to Supplier's Advice Notes, taking into account the number of invoices to be checked and whether they have been received through EDI or by post.

C	=	Bought Ledger Staff, Branch Staff
A	=	Bought Ledger Department
T	=	Match Invoices
W	=	Accurate Invoice Matching will safeguard against incorrect payments.
O	=	Bought Ledger Department
E	=	Number of Invoices Method of receipt of invoices (EDI or by Post) Number of branch staff available.

RD2.

An Auditor owned and manned system to make stock take better organised and more accurate, by continuously reviewing procedures, taking into account the availability of supervisors, the expertise of staff and the time allocated for it.

C	=	Branch Staff, Stock Take Supervisors, Finance Director.
A	=	Auditors
T	=	Review procedures for each stock take.
W	=	Reviewing procedures can make stock take better organised, and provide more accurate figures.
O	=	Auditors
E	=	Number stock take supervisors available. Amount of time allocated to carry out stock take. Quality and experience of staff available.

For the purposes of this report, only two of the relevant systems have been documented in detail. However, as part of the original study an attempt at formulating definitions was carried out for all ten relevant systems. The formula

ion of definitions was at times found to be a little hit and miss. There was uncertainty when choosing some elements of the definition. For instance, the original choice of the Invoice Matching system being owned and manned by Bought Ledger is strictly speaking incorrect. It was the branch staff who actually matched invoices. Additionally, if incorrect payments were made by the Bought Ledger it was the margin of the branch which was affected, and therefore it can be argued that the system was owned by the branch. However, SSM was capable of supporting more than one owner of a system.

This in effect showed that SSM was able to provide a way of documenting the different perspectives of people in a problem situation. Depending on whether the Branch Manager or the Bought Ledger Manager owned the system, the ultimate objective of it was bound to be different. Therefore there would be two different systems and two different sets of aspirations for them. Overall Pascoulis found that formulating the root definitions was useful in provoking him to think about the problems being encountered in a number of different ways. As a result this improved his understanding of the problem situation.

4.4 Building Conceptual Models.

Once the root definitions were formulated conceptual models were built for all the definitions, reflecting what the ideal systems within the invoice matching and purchasing systems must do in order to meet the requirements of the definitions formulated by the group. Pascoulis carried out this task without any input from the other members of the group. He then checked that the model s were correct using three criteria, efficacy, efficiency and effectiveness. Taking the two root definitions documented earlier the resulting models built can be shown.

The primary task definition produces the diagram in (Fig 4.2) which was checked using these criteria:-
a) Efficacy -   Is the matching or checking being done adequately?
b) Efficiency -   Are the resources used the minimum possible?
c) Effectiveness - Are the payments made to suppliers correct?

The issue based task definition could have been a primary task in its own right were the main problem area being considered that of stock taking. However, here it was being viewed from the perspective of what impact did stock take procedures have on invoice matching (Fig 4.3). The same kind of criteria were applied here also :-
a) Efficacy -   Has the review of procedures for stock take been done adequately?
b) Efficiency -   Are the resources used to review stock take procedures the minimum possible?
c) Effectiveness - Are stock takes better organised and do they provide more accurate figures?

Once the models were built and checked, he presented them to the group, in a more simple form which he felt they would be more comfortable with. He did this as a list of points which the group members all generally agreed with.

Pascoulis found the building of the conceptual models to be straightforward so long as the rules were followed. The task was not one which required great thought or imagination. The presentation of the results to the group was in retrospect probably a mistake. The models built were fairly high level models and as such it was not very easy for the group members to identify with them, even though in principle they all agreed with the points mentioned. SSM does support

the expansion of models, and in this case this would have been an appropriate thing to do. The expansion of all the activities on each model would have proved cumbersome and unnecessary, but some key activities identified as being part of the problem area should have been expanded. Some useful results were obtained from the models nonetheless, as will be explained in the next section. N.B. The diagram shown for the primary task model actually takes the branch staff as owning and manning the system.
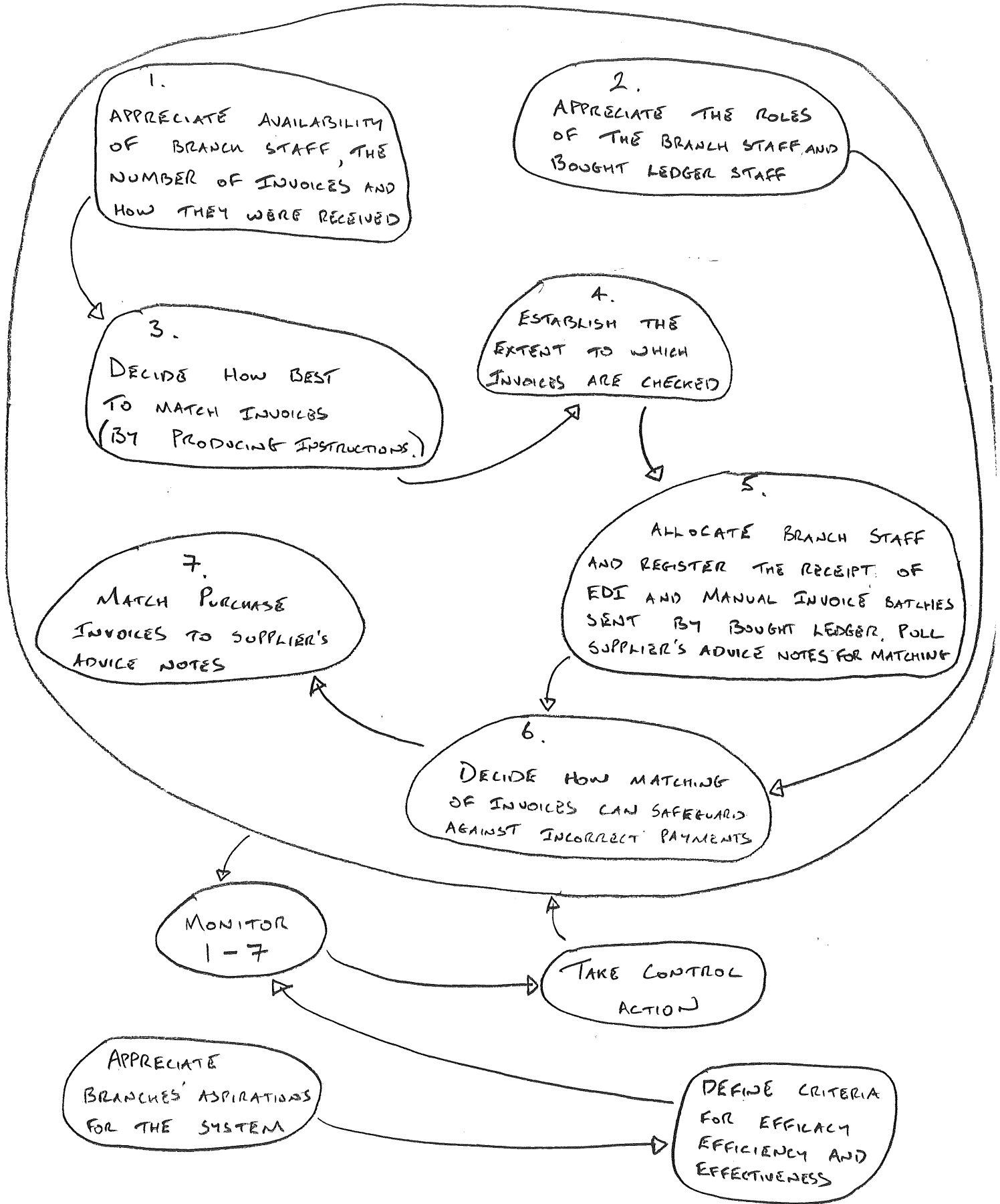
1.
APPRECIATE AVAILABILITY OF BRANCH STAFF, THE NUMBER OF INVOICES AND HOW THEY WERE RECEIVED

2.
APPRECIATE THE ROLES OF THE BRANCH STAFF AND BOUGHT LEDGER STAFF

3.
DECIDE HOW BEST TO MATCH INVOICES (BY PRODUCING INSTRUCTIONS)

4.
ESTABLISH THE EXTENT TO WHICH INVOICES ARE CHECKED

5.
ALLOCATE BRANCH STAFF AND REGISTER THE RECEIPT OF EDI AND MANUAL INVOICE BATCHES SENT BY BOUGHT LEDGER. POLL SUPPLIER'S ADVICE NOTES FOR MATCHING

7.
MATCH PURCHASE INVOICES TO SUPPLIER'S ADVICE NOTES

6.
DECIDE HOW MATCHING OF INVOICES CAN SAFEGUARD AGAINST INCORRECT PAYMENTS

MONITOR 1 - 7

TAKE CONTROL ACTION

APPRECIATE BRANCHES' ASPIRATIONS FOR THE SYSTEM

DEFINE CRITERIA FOR EFFICACY EFFICIENCY AND EFFECTIVENESS

Fig 4.2 - A Conceptual Model of a System to Match Invoices
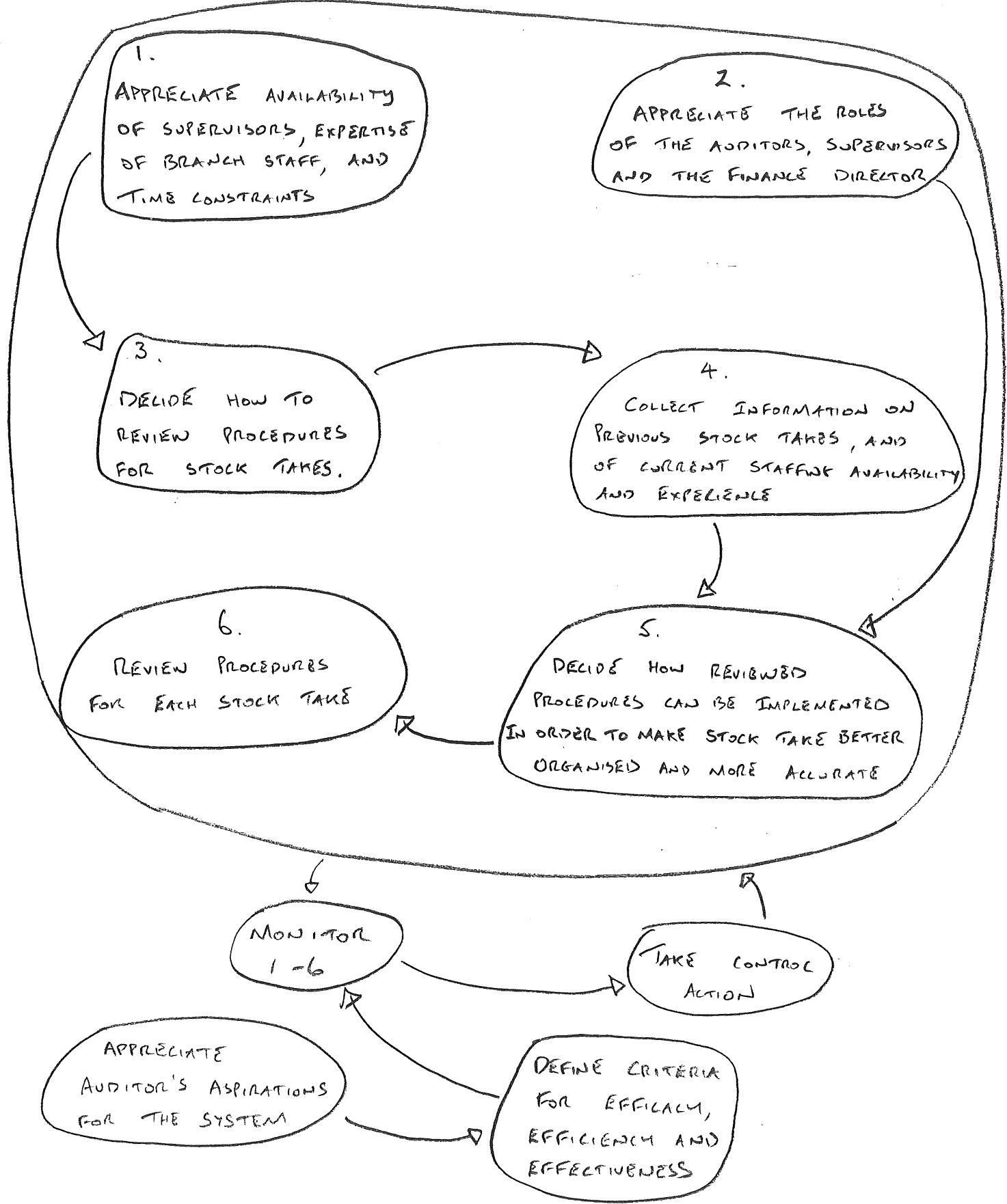
Fig 4.3 - A Conceptual Model of a System to Review Stock Take Procedures

4.5 Comparing Models With 'Reality'.

The conceptual models built were then compared with reality. This was done by Pascoulis, who then chose to discuss certain key activities with group members during a further round of interviews. He also conducted telephone interviews with a number of branch managers and branch staff. He chose to speak to branches which were having problems. He used system statistics to select the branches as well as the perceptions of the group. When asking the questions to the branch staff, he made sure that he did not to show any reaction at some of the poor procedures that they were describing. He always attempted to be sympathetic to their problems, in order to extract as much information from them as possible.

In the case of the primary task model it was deduced that most of the activities were carried out in some form or other, but none was done particularly well. After considering activity 3, it was clear that the best way of matching and checking invoices was by following a rigorous checklist of procedures consistently. The checking and matching procedures described by the branch staff were fairly haphazard. Activity 6 which decided how payments could be safeguarded, could have been best achieved if debit note raising was somehow linked to invoice checking whereby an automated process made the decision of whether to withhold payment. Branch staff were not following procedures in this area, and on a number of occasions debit notes were not raised at all. Another shortfall between the real situation and the ideal, was that the invoices were not being checked straight away . In the worst case the invoice checking was left to mount up over a number of months and was only carried out just before stock take. This led to considering that activity 7. was probably best not carried out branch staff.

The issue based system dealing with reviewing stock take procedures seemed to hold up fairly well to examination by SSM. Slim and Pascoulis interviewed Champion at head office and they discussed his current methods for carrying out the task. According to him the activities were all being carried out, and were being done reasonably well. However, the main problem came with activity 5. when he often met with resistance to some of his procedures being adopted by branch managers. In addition some of the procedure changes that he had recommended in the past would have required large scale development by the DP department which were thought not to be cost effective. This lead to the alteration of the model slightly to include the DP Department's time as one of his constraints in activity 1, allowing him to better appreciate the impact of his procedure review.

The problems mentioned when building the conceptual models did not impede the comparison between the ideal systems and reality. The main reason was that although the activities had not been broken down on paper, Pascoulis was now knowledgeable enough about the systems to be able to understand what each activity comprised. During this stage of interviewing both Slim and Pascoulis knew exactly what sort of questions they wanted answers to. The answers they received from the branch staff at this stage largely vindicated the study. They provided the study with details of the shortfalls in the 'real' system from first hand sources. However, one weakness of this stage was highlighted when interviewing Champion. Since he was a member of the group, and the model he was being asked about was only performed by him personally, it was difficult to find a way of independently assessing 'reality' for this activity, since no-one other than him had the expertise to do so.

4.6 Stage 6: Defining Changes.

By the time the stage at which changes were defined, was reached, a number of solutions had been arrived at through other means. From day one of the study all the members of the group exhibited an over eagerness to resolve the problem areas by putting forward system requirements. Members of the group had, in effect, already defined a number of changes. Part of the reason for this was that they were so familiar with their own area of the problem, that they had been resolving it in their own minds for the past few years. Pascoulis and Slim had by this time begun to outline a system design using 'hard' systems techniques. At this point Pascoulis felt that SSM could work alongside other tools in clarifying the problem areas. So he began using Logical Data Flow Diagrams, Entity Relationship Diagrams, Normalisation and a number of other 'hard' tools and techniques to define the changes. He felt that the most useful component of SSM at this stage was to ensure that the systemically desirable changes being defined using hard methods were also culturally feasible. Both he and Slim considered the impact of their proposed changes on the various interested parties. They were particularly concerned about whether the impact of their changes would be acceptable to Laycock.

As a result of the comparisons outlined, the most important change to be defined arose from the primary task invoice matching and checking system. In answer to the question- 'How might the activity be done ? 'The answer was that it was possible to define a systemically desirable activity or system which would be far more rigid than was the case at the time. This would include easily measurable and achievable goals and an invoice matching and checking system which would provide the basis for safeguarding against incorrect payments being made, whilst making optimum use of time and resources. It was decided that this would be best served by handing over the matching and checking to a computer system, and thus not requiring this task to be carried out by branch staff at all.- Is this culturally feasible ? The branches were only too pleased to give up this arduous task, and the Bought Ledger Manager also agreed that this task should be taken away from them. If the time could be allocated to the DP department to treat this project as a priority, there was no reason why such a change should be unpopular. The next step to be taken was to implement any desirable changes identified. Pascoulis used SSM and other tools to de fine the changes described along with Slim. These changes were documented in a proposal document, and subsequently presented to the group by them at a meeting. The group approved the proposals and agreed a timeframe for their implementation. Hoffmann reported the details of the proposal and the meeting to Laycock who also agreed to them.

5. Conclusion.

This report shows how SSM can document relevant systems within the real life environment of an electrical wholesaling business. It shows how areas of concern can be highlighted and how problems can be overcome in spite of cultural conflicts and differing priorities. The analysis also gives the opportunity for a further process of enquiry to be undertaken once the main recommendations of this process have been implemented. The most important problem areas identified were those referring to the need for the matching and checking of invoices to be done by a computerised system, and the need for auditors stock take recommendations to be implemented as soon as was feasible. The problem situation should have improved significantly once the changes outlined have been adopted. The next cycle of the investigation will follow once the impact of these changes have taken shape.

Some main conclusions can be drawn about SSM within business systems analysis and design by considering how the case study might have differed had SSM not been adopted. One main difference paradoxically would have been the lack of structure in the investigations carried out by the analysts. The large amount of information and conflicting suggestions would have been more difficult to classify and clarify had SSM not been used. Additionally, problem situations where people were dominantly involved, were conceptually easier for non-computer oriented members of the steering group to relate to. The analysts using 'hard' systems methods could not easily define how 'people' caused problem situations in spite of the overall system logic being theoretically 'correct'.

SSM helped them come to terms with this. SSM in general performed very well in the case study. However it did have some weaknesses. It was difficult to verify some of the assumptions being made particularly with respect to issues of power and politics where the sources of power could not be interviewed. Some other weaknesses were that the relative complexity of the method made Pascoulis uncertain about whether he had applied it correctly. This leads on to considering, that perhaps it may have been better to allow the other members of the steering group to use the method also. This would have provided truer definitions from the people whose perspectives were being expressed. Although, the reason stated for not doing so still holds true. That is the fact that the people in the problem situation would have been less open during interviews and meetings if they feared that they were identifying themselves as being part of the problem cause. One solution would have been to observe a policy of 'confidentiality of information' instigated with the full backing of the sources of power. This would have ensured that Pascoulis, Slim and Rice were regarded as the custodians of all sensitive information. Other conclusions reached include the fact that the method proved to be easier to use once Pascoulis had gained knowledge of how the Invoice Matching and Approval system was intended to work. This meant that traditional 'hard' techniques were found to be more appropriate in some of the earlier stages of the 'Finding Out' phase. The three analyses provided direction in terms of ensuring that the investigation aimed to achieve the ultimate goals of the Invoice Matching system. It also identified short falls in expected good behaviour, which were not evident when 'hard' systems methods were used.

As a final conclusion, it is clear that SSM did perform very well as a tool for business systems analysis. Its ease of use varied depending on the stages and the problem area being considered. The root definition stage proved to be a little hit and miss since Pascoulis was never totally sure that he was following the 'rules' of SSM. The building of conceptual models was shown to be fairly straightforward once the definitions were complete. In fact Pascoulis considered this stage to be a little laborious and repetitive. When the models were compared with reality,

Pascoulis found that the activities of the auditors proved difficult to assess, due to his lack of accounting knowledge. This highlighted the fact that expert knowledge may not always be available to judge some activities and that this relies on self-assessment the people carrying out the activities. When changes were being defined Pascoulis found it appropriate to use hard methods alongside SSM. At this stage he found SSM to be particularly useful in helping him to consider whether his proposed solution was culturally feasible.

The main strength of SSM proved to be its ability to help identify and document problem situations which were caused by people behaving in way that was considered to be less than the perceived ideal. Its main weakness was found to be the way in which its complexity and flexibility generated uncertainty about whether it was being used correctly. Overall, as already stated, it was an invaluable tool in dealing with the messy, ill-structured problems encountered throughout the case study.

References.

1. CCTA (1989). 'Compact' Manual, Version 1.1, No. 1, Central Computer and Telecommunication Agency, Norwich.

2. CHECKLAND, P.B. (1981). Systems Thinking, Systems Practice, Wiley, Chichester.

3. CHECKLAND, P.B., and SCHOLES, J. (1990). Soft Systems Methodology in Action, Wiley, Chichester.

4. DOWNS, E., CLARE, P., and COE, I. (1988). Structured Systems Analysis and Design Method, Prentice Hall.

5. FLOOD, R.L. and JACKSON, M.C. (1991). Creative Problem Solving - Total Systems Intervention, Wiley, Chichester.

6. OAKES, R. (1994). Soft Systems Analysis - A Practitioner's Guide, University of Ulster & BCS.

7. OU - OPEN U NIVERSITY. (1984). Soft Systems Analysis: An Introductory Guide, Open University Press, Walton Hall, Milton Keynes.

8. PASCOULIS, TAGG, BENNETT - University Of Hertfordshire. (1994). the Problem Situation of the Research Student.

9. ROSENHEAD, J. (ed.) (1989) . Rational Analysis for a Problematic World, Wiley, Chichester.

10. WILSON, B. (1984). Systems: Concepts Methodologies and Applications, Wiley, Chichester.