Navigating the Gap between Purposeful Action and a Serving Information System

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Abstract

This work has been directed at the problem of developing practical means of supporting those involved in a problem situation, in designing their own information systems.

The research is underpinned by an interpretive stance, and assumes that information systems are created to support purposeful action in continuously socially constructed organizational settings. It is argued that the initial phase of information system design necessitates undertaking *sense making* to create a shared *appreciation* of the situation amongst those involved. One of the main difficulties of designing technology-based information systems is that the methods suited to *sense making* in social situations are entirely different to the methods and techniques that have been employed to marshall knowledge into a suitable format to facilitate software design.

The work offers the notion of *navigating* an inquiry process from a focus on creating ideas for purposeful action, to creating a logical specification for a technology-based information system. To facilitate this shift in focus, some explicit intellectual devices, or *navigational* devices, are offered, to structure and support further debate. These *navigational* devices enable those involved in the situation of concern, the clients, to

conceptualise how purposeful action might unfold in the real world, so that some ideas for a *serving* system can be considered.

Previous work addressing this problem area has been criticised for failing to provide a coherent movement from any ideas for purposeful action, to a logical specification for a supporting technology-based information system. By regarding the process of *Client Led* information system design as a collaborative *sense making* effort, the design process can be regarded as a learning system, or an *appreciative system* in Vickers' sense. By employing the same principles of inquiry throughout the design process and by using devices that maintain a similar view of any potential action, it is argued that a sense of coherence can be maintained and this is supported by experiences from practice.

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Introduction

Chapter 1
Challenges and Foundations

1.1 A Unified Mechanism for Information System Definition

The work presented in this thesis has been undertaken as part of a research project called "A Unified Mechanism for Information System Definition" (UMISD, 1998). UMISD is one of thirty projects funded within the Engineering and Physical Sciences Research Council (EPSRC) managed research initiative called "Systems Engineering for Business Process Change" (SEBPC, 1996). The stated intention of investing in the SEBPC initiative is to find means of releasing "...the full potential of IT [Information Technology] as an enabler of business process change" (Henderson, 2000). Researchers working on projects within the SEBPC initiative have, in the main, a background in software engineering and researchers connected with the initiative meet at regular EPSRC workshops to exchange views and to debate ideas. The SEBPC programme has resulted in £4.5 million being used to fund these thirty projects and this represents a considerable investment of public money in addressing the issue of supporting action in a changing environment, through the provision of technology.

Most researchers working on SEBPC funded projects have focused on the development of flexible information technology (IT) architectures to support rapidly changing business processes. (See Brooke et al, 1998; Bustard et al, 2000; Eatock et al, 2000; Edwards et al, 2000; Henderson, 2000; Lauder and Kent, 2000; Lycett and Paul, 1999; Mitleton-Kelly and Papaefthimiou, 2000; Rank et al, 2000; Warboys et al, 2000). Indeed, the choice of title for the UMISD project, with the emphasis on information system *definition*[1] rather than on the *design* process, reflects the focus of most of those involved

[1] See Glossary for explanations of the terms: 'information system definition' and 'information system design'. Also see p. 3 of this thesis.

in the SEBPC initiative on the problem issues encountered during the construction of software applications. There is a pressing need perceived by those funding this research, to develop new engineering techniques that will enable the construction of flexible IT architectures (Henderson, 2000, 2001). It will be argued in this thesis that a focus on finding new ways of constructing flexible software is only a part of the problem. New software development approaches will be an inadequate response in the face of the complexity of human affairs, without a clear *appreciation* (Vickers, 1965), shared amongst those involved in the problem situation, of the relevance of any technological support within the context of use.

The work undertaken for the UMISD project has attempted to address the SEBPC research area from a different perspective. The effort has been directed at devising *practical* means of supporting those involved in a problem situation in designing their own information systems. In this thesis, information system *design* is considered to comprise the whole process of *creating ideas* for technology-based information systems. This process will encompass an initial phase of exploration and problem identification undertaken by those involved in the situation of concern to reach some accommodations on what purposeful action might bring improvement, *before* moving on to consider the creation of a set of ideas for any technology-based information support. This approach builds on the ideas of Checkland and Scholes (1990) and Winter et al (1995) and these ideas are discussed later in this chapter.

The work on the UMISD project has been undertaken as a joint venture between researchers choosing an interpretive approach to inquiry and software engineers, who employ a mathematical (formal) approach to specifying (or *defining*) software applications. The research described in this thesis, which forms a part of the UMISD research, focuses in particular, on finding means to support those involved in a problem situation, in moving

from their ideas for purposeful action, to creating a logical specification for a technology-based information system to support that action. The research has built on the work of others, notably Sir Geoffrey Vickers and Professor Peter Checkland from Lancaster University and these foundations are discussed later in this chapter.

The UMISD research begins from the premise that those involved in the situation of concern (referred to as the *clients*), are more likely to perceive a technology-based information system as supporting the action they wish to undertake, if they are able to lead the design process for that information system. This idea of so-called *Client Led Design* has been proposed by Stowell and others (Liang et al, 1998; Stowell, 1991, 1995a, 2000a; Stowell and West, 1994) and is discussed below.

1.2 Client Led Information System Design

Stowell (1995a, p. 127) suggests that one of the main weaknesses in most information system design approaches is the lack of attention to *appreciating* (Vickers, 1965) what problems and issues are perceived by those involved in the situation. Stowell and West (1994) argue that the need to manage the multiple viewpoints within organizational settings creates an obligation on the part of those undertaking information system design to build a *shared appreciation* (Vickers, 1965) of the situation of focus. The work on *Client Led Design* is underpinned by the premise that only those responsible for undertaking purposeful action within the problem situation can grasp the finer nuances of the possible consequences of using technology to support any action to be undertaken. In contrast, the developers have experience of what functionality the technology can provide and what logical designs are reliable and robust. The lack of a *shared appreciation* (Vickers, 1965) between potential 'users', or clients, and the developers, has been cited as one reason for the prevalence of information systems failure (Lyytinen and Robey, 1999;

Wilson, 2000). In February 2001, an article was published in The Times newspaper on the scrapping of a technology-based information system to help civil servants deal with asylum seekers, at a cost of £80m (Morris and Travis, 2001). In this article, David Davies[2] is reported as saying that there was "a horrible interface" between the civil servants who understood asylum seeking, but who knew little about designing technology-based information systems and "the technicians who knew just the reverse". Davies suggests that the main difficulty appears to be that insufficient time is spent "at the start of a project explaining where they are both coming from" (Morris and Travis, 2001). This is not an isolated incident, in August 2000, an Editorial in The Times, entitled "Bugs in the System", commented on several cases of failed information system design for the Benefits Payment Scheme, the Passport Office, the Child Support Agency and the National Insurance Records Office. Davies is again reported as commenting that although the Civil Service managers were expert in their particular policy area, this group of staff had inadvisably left the design of the technology to the developers, due to insufficient understanding of the complexities of the technology (The Times, 2000). The expense of information systems failure coupled with the inflexibility of so-called *legacy systems*[3], have been major factors leading to the public spending on the SEBPC initiative (Henderson, 2000).

It will be argued in this thesis that, despite the call for the clients to be more involved in the design of their own information systems (Beyer and Holtzblatt, 1998; Kensing and Blomberg, 1998; Kensing and Munk-Madesen, 1993; Kristen, 1996; Peppard, 2001; Stowell, 1991, 1995a, 2000a; Stowell and West, 1994; Winograd and Flores, 1987) designing technology-based information systems seems to have remained in the hands of the technical *developers*. (The term *developers* will be used in this thesis to describe those who build any technological parts of an information system, including any

[2] Then Chairman of the Public Accounts Committee.
[3] See Glossary.

software applications). The reason for this unsatisfactory state of affairs seems to be the constraints imposed by the need to eventually develop some new software, or adapt some currently used software, when creating a technology-based information system. It will be argued that this situation has shaped information system design approaches into being useful from the perspective of the developers, rather than from the perspective of the clients. One consequence of this emphasis on the technology, is the drive toward constructing some sort of *detailed* description *of* the business processes (see Glossary) to be 'optimised'. Chapter 2 provides a review of current approaches to information system design that purport to offer client involvement, the rest of this chapter sets out the founding concepts that underpin the research presented here and also explains the structure chosen for the thesis.

1.3 Modelling and the Concept of Organization

It will be argued throughout this thesis, that most information system design approaches begin with an attempt to construct a detailed model, or description, *of* the current situation, or current business processes. Such models, or descriptions, are then regarded as *representing* part of the real world situation (Checkland, 1995a; Checkland and Scholes, 1999) and much effort is given to demonstrating that the resulting model is a 'correct' representation. (See Graham, 1998; Henderson, 2000; Kristen, 1996; Pooley and Stephens, 1999; Pressman, 1997; Sommerville and Sawyer, 1997; Warboys et al, 2000; Zedan et al, 1999). The creators of such models seem to assume, knowingly or unknowingly, that the world is made up of systems that exist independently of any observer and that such systems can be identified and modelled accurately. This approach to the world is often referred to as 'hard' systems thinking (Checkland, 1995a; Jackson, 2000; Miles, 1985; Stowell and West, 1994).

In order to create models that can be regarded as *representing* the situation, it is necessary to assume a simple concept of 'organization' (Checkland, 1995a; Checkland and Holwell, 1998a; Ciborra, 1984). An enterprise is thereby often regarded as being a recognisable entity, comprising a set of people attempting to achieve a number of objectives, or goals (Checkland, 1981; Vickers, 1965). Regarding an enterprise as being a rational "goal-seeking machine" does provide some advantages in that such a clear and uncomplicated view of any particular organizational setting facilitates "coherent discussion of the information requirements at different organization levels" Checkland and Holwell (1998a, p. 70). There are disadvantages in such a simplified view of organizational settings. Holwell (1997) suggests that such a view will tend to emphasize the "formal, technical and functional aspects" of any social setting. Ciborra (1984) has criticised goal-seeking models of organization for assuming a single individual goes about making a series of decisions, situated in an apparently unproblematic context with no other conflicting views evident. Vickers (1965, 1970, 1983) provides a thorough critique of such goal-seeking models of organization, arguing that goals once attained, disappear, and that what is actually sought by human beings is an opportunity for a relationship (also see Vickers 2000, pp. 46-47).

Checkland and others argue that the attempt to create a model *of* parts of the real world and test the robustness of that model is based on a scientific approach to inquiry (Checkland, 1981, 1983, 1985a, 1995a; Checkland and Holwell, 1998b; Tsoukas, 1993). Scientific knowledge is created when an inquirer states a hypothesis and tests it through experimentation and also through refutation by other scientists until eventually, a set of repeatable rules becomes established (Bullock et al, 1988; Burrell and Morgan, 1979; Checkland, 1981, pp. 50-58, 1995a; Checkland and Holwell, 1998b; Keynes, 1938 in Moggridge, 1980; Popper, 1959). Such approaches to inquiry are underpinned by the assumption that it is possible to stand outside a situation as an impartial observer and construct a model untainted by any particular

beliefs, or mental viewpoint (Boland, 1985; Checkland, 1981, 1995a; Gadamer, 1989; Susman and Evered, 1978; West, 1990; West and Stowell, 2000). An inquirer adopting this approach to the world, referred to as a positivist stance, would look for causal explanations and also for rules that can be applied to situations that can be used for prediction (Bullock et al, 1988). Applying this approach to inquiry when attempting to make sense of complex human social settings, is problematic (Checkland, 1981, 1983, 1985a; Reason, 1993; Tsoukis, 1993; Winograd and Flores, 1987). Real world situations are much more complex than such an approach would suggest, with multiple viewpoints existing amongst all those involved (Checkland, 1981; Ciborra, 1984; Winograd and Flores, 1987).

It has been argued in the academic literature that many of the approaches that have been created for developing technology-based information systems are founded on a scientific approach to inquiry and underpinned by a rationalistic, goal-seeking concept of organization (Boland, 1985; Checkland, 1985a; Checkland and Holwell, 1998a; Doyle and Wood, 1991a; Doyle et al, 1993; Hirschheim and Klein, 1989; Holwell, 1997; Lewis, 1991, 1993; Miles, 1985; Myers, 1994; Orlikowski and Baroudi, 1991; Prior, 1990; Stowell and West, 1994; Winograd and Flores, 1987). It will be argued in this thesis that approaches to information system design created by authors employing a scientific approach to inquiry tend to direct the inquiry effort toward marshalling knowledge into a suitable format for the application of the tools and techniques for software development. Such approaches can be considered to be concerned with providing step by step instructions for the completion of a logical specification and will be referred to as technique-oriented approaches in this thesis (Stowell and Champion, 2000). The authors of such technique-oriented approaches suggest employing a set of techniques, usually stated as a systematic list of 'things to do', to reduce the complexity of what is known about any situation of focus to a manageable description. Some authors have argued the relevance of an alternative interpretive stance when

attempting to make sense of our world before undertaking the design of a technology-based information system (Boland, 1985; Checkland and Holwell, 1998a; Klein and Myers, 1999; Lee, 1989; Myers, 1994; Stowell and West, 1994; Winograd and Flores, 1987).

1.4 Foundations: An Interpretive Stance

Whilst inquirers adopting positivist approaches to inquiry have sought to explain and predict outcomes, those choosing an interpretive stance have argued that searching for causal relationships and laws governing the social world is futile, as one can never stand outside a situation as an objective observer (Checkland, 1983; Gadamer, 1989; Oquist, 1978; Tsoukis, 1993). Further, inquirers choosing an interpretive approach to the social world, place the perspective of those involved in a particular situation as being of prime importance (Bullock et al, 1988; Burrell and Morgan, 1979; Checkland, 1981). The underpinning approach toward social reality of interpretive thinkers, is to behave as if organizational settings do not exist in any 'hard', tangible form, but are "an abstraction: [...] a social collectivity concerned with some collective action"(Checkland and Holwell, 1998a, p. 80). Such a view of organization is a much richer concept than that of a simple goal-seeking entity (Checkland and Holwell, 1998a; Lewis, 1991) and also underpins Vickers' ideas, where he suggests that the task of managing within organizational settings consists of maintaining, or eluding, relationships according to standards that arise from past experience (Vickers, 1965). Vickers argues that the core management activities comprise debating possible action that might be undertaken and making judgements with due consideration as to which relationships such action might affect; Vickers (1965) refers to such judgements as *appreciative* judgements (discussed further in the next section).

Adopting an interpretive stance, means acting according to the idea that reality is continuously socially constructed with each human actor creating his or her own individual meanings and possessing his or her own viewpoint (Boland, 1985; Bullock et al, 1988; Burrell and Morgan, 1979; Checkland, 1981; Gadamer, 1989; Hirschheim and Klein, 1989; Holwell, 1997; Stowell and West, 1994). If an inquirer is to act within a situation in accordance with such beliefs, any guide for inquiry (or methodology) employed must support an exploration of a problem situation from the perspective of those involved in that situation (Checkland and Scholes, 1999). Crucially, regarding social reality as being continuously constructed by the actors involved, means that when undertaking information system design, the clients' needs are not assumed as having some *pre-existence* waiting only to be discovered by the developers (Boland, 1985). Any requirements for a technology-based information system will be created during the design process (Boland, 1985; Winograd and Flores, 1987). Approaches to information system design underpinned by such assumptions can be regarded as being exploration-oriented, as the concern is to make sense of the situation from the point of view of actors in the situation. This contrasts sharply with an attempt being made to describe reality and define an optimal technical solution to any perceived difficulties, as is the aim during information system design approaches underpinned by a scientific approach to inquiry (Checkland, 1983; Stowell, 1991, 2000a). The work of Sir Geoffrey Vickers is particularly relevant when attempting to understand, what he called "the world of human affairs" (Vickers, 1983).

1.5 Foundations: Vickers' Appreciative Systems

Vickers (1965) argued that action within the social world could be considered as being concerned with managing relationships and that this approach to the world is distinctly different to the more pervasive model of managing being concerned with "goal attainment via decision-making". Vickers (1965) uses

systems ideas to try to make sense of the richness of human affairs and argues that one of the difficulties of undertaking inquiry within social settings is the tendency to concentrate on "problem solving", rather than on the more difficult issue of "problem identification" (Vickers, 1965, 1983). He argues that in the effort to provide a 'solution', there is a tendency to simplify the problem so that it can be presented clearly and this simplified version is then addressed as if it were the whole problem (Vickers, 1965). As Churchman (1988) suggests, when undertaking inquiry in human situations the opposite occurs in that it is "usual" to move "from the simple to the complex".

Checkland and Casar (1986) suggest Vickers' work on *appreciative systems* was an attempt to "provide a *description* of what [Vickers] regards as the actual social process which characterises human communication and action" (p. 4, authors' italics). Vickers (1983) argued that each individual has a predisposition as to what he, or she, regards as relevant and Vickers referred to these as "readinesses to notice particular aspects of our situation". These "readinesses to notice", conditioned by an individual's *appreciative settings*, create a "pattern of concerns" (Vickers, 1983). Vickers (1965) describes the act of "*appreciation*" (present author's italics) as involving "making judgements of fact" concerning what is or has been in the past, or so-called "reality judgements", and also making judgements concerning "the significance for these facts to the appreciator", or "value judgements". Through making these judgements, each individual creates a personal *appreciation* of what is relevant in the world (Vickers, 1983). Personal "appreciative settings" in turn, condition how an individual experiences the world and these settings can be modified by new experiences (Vickers, 1970; see also Casar and Checkland, 1986; Lewis, 1991; West, 1990, 1995).

Vickers' notion of *appreciation* (Vickers, 1965, 1970, 1983) as an expression of human communication and action underpins the work in this thesis and the word *appreciation* is italicised throughout to denote this

founding concept and acknowledge the debt to the work of Vickers. Other authors have argued the relevance of Vickers' ideas on *appreciation* and *appreciative systems* to the field of Information Systems (Checkland and Holwell, 1998a; Checkland and Scholes, 1990; Lewis, 1991; Stowell and West, 1994; West, 1990, 1995). Notably, Vickers' ideas on *appreciative systems* have influenced the development of a guide to inquiry underpinned by interpretive assumptions: Soft Systems Methodology.

1.6 Foundations: Soft Systems Methodology

The set of ideas usually referred to as Soft Systems Methodology (SSM) has influenced many researchers working in the area of information system design (see Checkland and Holwell, 1998a; Checkland and Scholes, 1990, 1999; Forbes, 1989; Holwell, 1997; Stowell, 1995b; Wilson, 1984). In the *Thirty Years Retrospective*, Checkland argues that SSM "can be seen as a systemic learning process which articulates the working of an *appreciative system* in Vickers' sense" (Checkland and Scholes, 1999, p. A41). It will be argued in this thesis that the process of information system design is essentially a process of collaborative social inquiry (Checkland and Holwell, 1998a; Lewis, 1991; Stowell and West, 1994; West, 1990). Using Vickers' notion of *appreciative systems*, Checkland and Scholes (1990) assume the social world to be "a continually changing interaction between three elements: roles, norms and values" (p. 49). They suggest that roles can be considered to be "a social position recognised as significant" by those in the problem situation and that roles are "characterised by expected behaviours [...], or *norms*", with the "actual performance in a role, judged according to local standards, or *values*" (Checkland and Scholes, 1990, p. 49, authors' italics). Building on these ideas, it will be argued that by following the constitutive rules of SSM Mode 2 (Checkland and Scholes, 1999; Holwell, 1997) a practitioner, or group of people, are provided with a guide for *sense making* in complex human situations and also for facilitating those involved in an inquiry process in

leading a design process to create information systems to *serve* (Checkland and Scholes, 1990) any desired purposeful action.

The constitutive rules of Soft Systems Methodology offered by Holwell (1997) have been used as a guide for inquiry throughout the work presented in this thesis and SSM as a guide for inquiry is discussed in Chapter 3. Regarding the social world as being continuously socially constructed by the actors involved also has implications concerning the perceived role of an information system within complex human social situations.

1.7 Foundations: The Role of an Information System

The experience of undertaking the research on the UMISD project has revealed the necessity for a clear definition of words such as *data*, *information* and *knowledge* as such words can be used carelessly, or just plain differently, causing much confusion. Checkland (1981) and Checkland and Scholes (1990) define *information* as "data with attributed meaning", where meaning attribution is argued to be "a uniquely human act" (Checkland and Scholes, 1990, p. 55). Checkland and Holwell (1998a) are more specific and distinguish between *data*: "the great mass of facts", and *capta*: "the sub-set [of facts] we select for attention". They suggest that as humans we relate capta to "other things [...] and put it into context" and that this attribution of meaning converts selected data (or capta) into information[4] (Checkland and Holwell, 1998a, p. 88-92). *Knowledge* is then taken to be "larger, longer-living structures of meaningful facts" (Checkland and Holwell, 1998a). Audi (1998) suggests that knowledge is "familiarity gained by experience" which implies a practical connection with the subject that seems particularly relevant to undertaking inquiry within social settings and to the role of an information system.

[4] Also see Glossary

Land (1985) argues that information systems involve people interacting with a real physical artefact, where "even simple messages will be interpreted differently by different individuals" (p. 212). The problem situation when undertaking information system design though seems more complex. As individuals, each of us have our own personal *appreciative settings*, but there will often be overlap with others and exploring these shared meanings will be an essential part in reaching accommodations concerning what purposeful action might bring improvement to a situation. These shared meanings will also condition what information support is deemed appropriate if any purposeful action is to be undertaken. From this, the purpose of an information system can be regarded as being to "*serve* real-world action" (Checkland and Scholes, 1990, p. 54, present author's italics). Checkland and Scholes (1990) argue that, regarding reality as being socially constructed would suggest that those involved in a process of information system design first undertake "sense making" (italicised henceforth) to explore the meanings those in the situation of concern attribute to their world. Such meanings will condition any accommodation reached concerning what purposeful action to take and this makes it essential that such exploration and *sense making* takes place before any required support for purposeful action is envisaged. Winter et al (1995, p. 132) expand upon this idea and suggest that an information system can be regarded as a "system which supports, or serves, purposeful action" within a situation. They also argue that before undertaking the design of such a system, it is necessary to begin from a "declared account of the human action served" (Winter et al, 1995). This concept of an information system as *serving* purposeful action from the work of Checkland and Scholes (1990) and Winter et al (1995) underpins the work presented in this thesis, though in the initial stages of the research a different definition of an information system was adopted.

Stowell and West (1994) suggest the following definition for an information system:

> *"An information system can be taken to be the notional whole through which the provision, manipulation and use of appropriate data to enable decision-making to take place is managed".*
>
> (p. 22, authors' italics)

This definition of an information system as being a system to support the decision-making process undertaken by those involved within a particular situation (also discussed in Stowell, 1995a, p. 125) is criticised by Holwell (1997), who argues this is too limiting. For Holwell, regarding the purpose of an information system as being to support decision-making has developed from the work of Herbert Simon. Simon (1977) offered an approach to problem solving aimed at reaching previously defined goals, or objectives, via a process of decision-making. Simon's approach to decision-making has been criticised for assuming a limited, rationalistic goal-seeking model of organization (Checkland, 1981, 1983; Ciborra, 1984) and Vickers (1965) criticises Simon's work for ignoring the more difficult undertaking of problem identification. Lewis (1991, p. 41) attempts to integrate Vickers' idea of an *appreciative system* with Simon's decision-making model to provide a "richer view of the decision-making process". He argues that the work of Vickers provides the notion of a "complex, cyclical and social learning process" that is lacking in the work of Simon (Lewis, 1991). Indeed, Stowell and West (1994) also *reject* Simon's model of decision-making as being too limiting, though they do not expand on their concept of decision-making and so the basis for their definition remains unclear.

Stowell (2000a) remains active in research to develop new ways of supporting a *Client Led* approach to information system design. Indeed the UMISD project has arisen directly from this work. The research presented in this thesis consciously builds on the contribution of Stowell and others (Liang

et al, 1998; Stowell, 1985, 1991, 1995a, 2000a; Stowell and West, 1994), but, to denote the *different* definition for an information system that underpins the work presented here, rather than *Client Led Design*, the phrase *Client Led* information system design is used throughout this thesis.

Regarding the role of an information system as being to *serve* action is not uncontroversial. In Chapter 2 it is argued that, at present, when constructing the logical specification for a technology-based information system, the methods and techniques available have been created by authors who employ a scientific approach to inquiry. It is also argued that if employing such methods and techniques, the suggested starting point for information system design is usually the creation of a model that is considered to *represent* some part of the real world, (Checkland, 1995a; Checkland and Scholes, 1999; Lewis, 1993). The purpose of constructing such models is so that the required functionality of the software application can be determined and the necessary computer program constructed. Such an approach to information system design has resulted in some software engineers regarding information systems as being composed only of software components (see Zedan et al, 2000, 2001) (discussed in Chapter 6). To enable *Client Led* information system design however, a means of facilitating participation in the IS design process, in a manner that is accessible to all and not overly technical must be found (Savage and Mingers, 1996; Stowell, 1998, 1999, 2000a)

1.8 The UMISD Research Aim

The research aim for the UMISD project, was to "investigate ways of enabling client-driven IS design" (Stowell and Champion, 2000). Stowell (1998) describes the UMISD project as attempting "the translation of the [clients' own information system] definition into a technical specification". Stowell (2000a, p. 178) regards the difficult 'gap' in a process of information system

design to be "...the space between the natural language description [model] of client needs and the technical specification". In the initial stages of the research presented here, it was envisaged that conceptual activity models, constructed during inquiry guided by SSM, could be used to express the clients' information system requirements. For the author of this thesis, using conceptual activity models to express information system requirements, as is suggested by Stowell and West (1994), Stowell (1998, 1999) and also Liang et al (1998), is fraught with difficulty.

During SSM guided inquiry, conceptual activity models, or holons, are constructed that express ideas about purposeful human action, from the perspective of a declared worldview, or Weltanschauung (Checkland and Scholes, 1990). These models are intended to be relevant to debate and should not be regarded as representing any part of the real world (Checkland, 1995a). An expression of information system requirements is intended to be an articulation of what the information system is required to *do,* or the *functionality* of the information system (Sommerville and Sawyer, 1997). In the case of a technology-based information system these requirements must be sufficiently detailed for the developer to build any necessary software application. It is argued in this thesis that moving from some ideas for purposeful action created through SSM guided inquiry and expressed through one, or more, conceptual activity models, *directly* to describing some ideas for information support, is too vast a leap. Making such a vast leap in thinking leaves many assumptions and meanings unexplored. In Chapter 2, it is argued that most current information system design approaches encourage a rapid move toward specifying the technical requirements. For example, Stowell and West (1994, p. 35) argue the need for exploration during the initial phase of inquiry, but once a shared *appreciation* has been created amongst the clients, they move quickly to *describing* the requirements for a technology-based information system. What is needed is further exploration and debate so those involved are aware of the necessary *shifts in thinking* that they are

undertaking. These *shifts in thinking* become apparent if the process of information system design is regarded as a move from using methods suited to *sense making* in social situations to using methods and techniques suited to constructing logical specifications for technology-based information systems. In Chapter 4, it will be argued that such a view follows from applying the definition of an information system as *a system to serve purposeful action* (Checkland and Scholes, 1990; Winter et al, 1995). Only once some accommodations have been reached concerning what purposeful action *might* bring improvement, is it relevant to begin *thinking about* how to support that action with a *serving* information system. Finding ways to *navigate* the necessary *shifts in thinking* is the focus of the work presented in this thesis.

The research has entailed not only a move away from the definition offered by Stowell and West (1994), but also a move away from the idea of creating some sort of *bridge* from purposeful action, to some support in the form of a technology-based information system (Champion and Stowell, 1999a; Peppard, 2001; Stowell, 1998, 1999, 2000). The word *navigation* was eventually chosen to describe the process of inquiry suggested in this thesis as this word conjures up an image of *finding a way through* the limitless possibilities available within human situations. The imagery intended by using the word *navigation* is not one of a 'helmsman using a compass' as is the case in a cybernetics model of inquiry (see Weiner, 1948) and rejected by Vickers (1983, pp 22-23). Nor is the imagery intended to convey a picture of an inquirer choosing between known alternatives in the attempt to reach a pre-determined destination, as described by Churchman (1971). Ancient navigation, before charts and the compass, was an art, where every journey was filled with risk and often took months to accomplish due to the inability of sailors to know their position (Taylor, 1956). Designing information systems that *serve* purposeful action also involves a precarious inquiry process where the problems are unknown at the start, as is any concept of a specific

destination; such concepts are created through the interactions of those involved as they learn a way through.

It is important to state clearly that acknowledging there is no pre-determined destination does not suggest that the inquiry process is an aimless wandering. It is argued in this thesis that intellectual devices (referred to as *navigational* devices) can be used to facilitate those involved in a process of information system design, in managing, or *navigating*, the *inquiry process* to *create* a route toward practical and relevant learning outcomes. Crucially, the constitutive rules of SSM are used as a guide throughout the inquiry process. The aim is to accomplish the movement from thinking about ideas for purposeful action to thinking about support for that action, in a logically coherent manner, and in such a way as to *necessitate* the clients leading the inquiry process. The so-called gap in information system design can be regarded as the gap between conceptualising the system to be served and conceptualising the serving system. It is argued throughout this work, that this gap between a *served* system and a *serving* system (Checkland and Scholes, 1990; Winter et al, 1995) is made more difficult to cross by the fundamentally different means employed to tackle these different problems.

1.9 The Structure of this Thesis

Checkland (1985a, p. 758) suggests that to make sense of any area of interest, (A), the framework of ideas created, (F), can be applied via a set of principles that guide the inquiry, (or a methodology, M), and that F, M and A must all be declared in advance. Such a declaration not only enables those involved in the inquiry to make sense of the emerging experience, but also enables other interested individuals to scrutinise the learning outcomes and so make judgements concerning the credibility of the results (Checkland and Holwell, 1998b; Checkland and Scholes, 1999). These ideas have guided the progress of the research presented here and the 'F, M, A' model is discussed within the thesis (Chapter 3). The 'F, M, A' model has guided not only the research

process, but also the structure of this thesis, although for reasons of flow and exposition, it has been reversed in the opening chapters to become A, M and F.

This introductory chapter has set out to introduce the reader to the founding concepts that underpin the work presented in the thesis and provide a brief overview of the ideas expressed within. Chapter 2 elaborates on the problem area of concern (A) for the UMISD research, by providing an overview of approaches to information system (IS) design that are claimed by the creators of these approaches, to facilitate client involvement. These approaches are critically evaluated to ascertain what is currently offered to those attempting *Client Led* information system design. Most information system design approaches can be considered to be technique-oriented approaches, where the emphasis is on providing tools and techniques (or a set of procedures) to facilitate a practitioner in undertaking the systematic construction of a description of current processes. Such descriptions are then used to construct a Requirements Specification for a technology-based information system. Within Chapter 2, these design approaches are contrasted with exploration-oriented IS design approaches, that do provide support for *sense making* and creating ideas for purposeful action. These approaches are often criticised for not providing sufficiently detailed views of purposeful action to facilitate the construction of logical specifications for technology-based information systems and this is also discussed in Chapter 2.

In Chapter 3, the problem of undertaking research within social settings is discussed, as are the difficulties associated with establishing a public perception of the validity of any research outcomes. It is argued that choosing an interpretive stance to the social world and attempting to create a shared *appreciation* of the situation from the perspective of those involved implies the researcher must become involved in the situation of focus (Boland, 1985; Checkland and Scholes, 1990; Heron and Reason, 2000; Stowell and West, 1994; Stowell et al, 1997; Whyte, 1991). Action Research is chosen as a

framework that offers a researcher a means of becoming involved in the situation, whilst employing theory to guide practice (Checkland, 1983, 1991; Reason, 2000). Within that framework, the principles of Soft Systems Methodology are discussed and adopted as a guide for the inquiry process (or the methodology, M). In order to gain experience of undertaking inquiry within an Action Research framework, a small local study was completed before the main field study and the learning outcomes from this study are evaluated and reflected upon.

Chapter 4 sets out the framework of ideas, F, created during the UMISD research. These ideas emerged from reading the literature, undertaking the small local study described in Chapter 3 and also from undertaking a trial in a simulated work environment. The idea of a *navigational* phase of inquiry (originally termed the Unifying Layer[5]) is offered, as a device to support those involved in a process of information system design in moving from ideas for purposeful action to contemplating support for that action. Within this *navigational* phase of inquiry, intellectual devices based on methods of modelling Conversations for Action (Harris and Taylor, 1998; Winograd and Flores, 1987) are employed. These intellectual devices are intended to be debating tools, to provide support for those involved in the inquiry process to consider *how* the ideas for purposeful action (resulting from inquiry guided by SSM) might be operationalised. It is argued that debating *how* the ideas for purposeful action *might* unfold is essential if the clients are to move forward and begin thinking about any *support* that might be required to undertake action in the real world situation of concern. Hence the purpose of undertaking an extra phase of debate is to facilitate all those involved (the clients and developers) in *creating a route through* the gap between ideas for purposeful action and ideas for support for that action. These ideas for support are expressed in the form of a logical specification for

[5] See Glossary

a technology-based information system. It is suggested that *navigating* through these shifts in thinking from *action*, to *support for action*, in a manner that is both theoretically rigorous and useful in a practical sense, is essential if *Client Led* information system design is to be facilitated.

Once the framework of ideas had been created and tested through a trial, a full field study was undertaken in the Credit Card Debt Management Operations of Abbey National plc. Chapter 5 describes the planning and preparation for the field study, the work undertaken in Abbey National and the manner in which the intellectual devices were used to support the inquiry process. The models reproduced in Chapter 5 are those chosen to explain the inquiry process to the reader, so that the learning process is "recoverable" (Checkland and Holwell, 1998b). Appendix 1 contains sample pages from the field notebook and further models created during the field study.

Once some accommodation concerning ideas for purposeful action had been reached, the models created during the field study were used to inform the construction of some logical specifications for potential *serving* technology-based information systems. In the first instance, an object-oriented approach known as SOMA (Graham, 1998) was chosen and the reasons for this choice are elaborated upon in Chapter 6. In addition to using SOMA, work was undertaken with a researcher from the Software Technologies Research Laboratory (STRL) at De Montfort University, Leicester to evaluate how useful the *navigational devices* were in informing the construction of a Class Diagram and Collaboration Diagram, both of which are devices often used in software design. Chapter 6 describes this phase of the research and also comments on the attempt to link up with the body of work created by the software engineers working on the UMISD project at STRL.

Chapter 7 reflects on the learning outcomes from the research and attempts to relate *practice* to *theory*. To present such reflections in an easily

digestible form, the learning has been divided into four logical strands. First, an attempt is made at describing the internalisation that occurs through the use of the constitutive rules of SSM as an Action Researcher during social inquiry. In particular, comments are made concerning the difference between Mode 1 use of the ideas underpinning SSM (Checkland, 1981) and Mode 2 use of the ideas underpinning SSM (Checkland and Scholes, 1990, 1999). Second, the framework of ideas applied in the field study, and described in Chapter 4, is reflected upon and the learning gained through the practical application of these ideas is evaluated. The learning about the framework of ideas emerged in many ways and on different levels and is emerging still, and so this reflection is presented through sections on language, on *navigating* the gap and also on the specific *navigational* devices used in the field study. Third, the practical outcomes in the situation of focus in Abbey National are reflected upon and some of the longer-term effects, of the work carried out, are discussed. In the fourth logical strand, the difficulty of establishing a public perception of the *validity* of a social inquiry process is re-examined. It is suggested that even by using an Action Research framework with a declaration of F, M and A in advance, the *manner* in which the inquiry was undertaken is still elusive to interested individuals who wish to scrutinise the results.

The final chapter of this thesis revisits the notion of *navigating the gap* and the use of so-called *navigational* devices. The purpose of this *navigational* phase of debate is argued to be necessary to facilitate the clients in making the *shifts in thinking* that are involved when moving from thinking about purposeful action, to thinking about supporting that action with a technology-based information system. It is also argued that a sense of coherence can be maintained through employing the same principles of inquiry throughout the design process. This idea of moving more carefully and perhaps more slowly toward a logical specification, is not in keeping with the current impetus to provide information technology rapidly (see Bell and

Wood-Harper, 1998; Benyon et al, 1999; Graham, 1998; Lycett and Paul, 1999; Pooley and Stephens, 1999). It is argued that this extra phase of debate is essential if those involved in the problem situation (the clients) are to lead the design process and *appreciate* the consequences of implementing technology-based information systems. Likewise, such debate is essential if the developers are to *appreciate* the problem situation sufficiently to create technology-based information systems that *serve* purposeful action. The present author fully concurs with Stowell (1995a) that only by creating such shared *appreciation* will information systems begin to meet the expectations of those requiring them for support in the purposeful action they undertake.

1.10 A Note on the Writing Style

A note is required here concerning the style of writing chosen for this thesis. The overwhelming success and influence of the scientific method has resulted in most research in the academic literature being written in the 'third person' and as such it is often argued to imply "...a self-imposed distance from the world of action" (Dash, 1999, p. 479). To overcome such distance, Somekh (1995) suggests that the personal involvement of the researcher in a situation can be better reflected by the adoption of a writing style using the 'first person'. She reasons that when undertaking Action Research, the practitioner reflects upon his, or her, own role within the situation, upon behaviour and also on relationships, and that it is through this process of reflection that the potential value and benefit of Action Research is to be found (Somekh, 1995). The difficulty in writing a report using the 'first person' is that such an approach can to lead to a more anecdotal narrative (Checkland and Holwell, 1998b), and so end up resembling a personal therapeutic undertaking, rather than a serious intellectual endeavour.

For this author, the difficulty in reporting on research in the 'first person' also lies when bringing in support from the academic literature. In

referring to other work, it becomes almost impossible to maintain a consistent, coherent writing style, hence the report dissolves into narrative and the impact of any implications for future research, might be lost. Although writing in the 'first person' emphasizes the nature of the personal learning and reflection, such a style fails to expose any potential usefulness in the research, which is one of the aspects most vital in gaining public acknowledgement of any learning outcomes. Adopting a 'third person' writing style does not diminish in the slightest degree the responsibility of the researcher for the manner in which the work has been conducted. Nor does such a style place any real distance between the researcher and the action, that responsibility remains entirely with the author. The purpose of research is to create new knowledge and to share that knowledge with interested others and so clarity of expression must be uppermost in the mind of any author. For this reason, the author of this work has chosen to use the 'third person' throughout.

In the course of undertaking this research, differences in the use of language have caused many difficulties (as is reflected upon in Chapter 7). The intended audience for this work includes those funding the research from the EPSRC, the practitioners in Abbey National plc and the other industrial collaborators, and also the respective research communities in the fields of Information Systems and Software Engineering. The need to express these ideas to others from widely diverse professional, cultural and educational backgrounds, each with their own unique experience and "readinesses" (Vickers, 1965), has lead to the attempt to use as few complex terms and acronyms as possible. A final note is that, in keeping with the emphasis on practical outcomes emphasized in the SEBPC initiative, every effort has been made to establish the practical relevance of any philosophical ideas or arguments that are introduced.

Part 1

A Declaration in Advance

Chapter 2

Client Involvement in Information System Design

2.1 Introduction

The motivation for undertaking the UMISD project was to develop means of enabling those involved in the situation of focus, the clients, to lead the design process for their own information systems (IS) to support any desired purposeful action. The first phase of the research for the UMISD project was to embark on an evaluation of current approaches to information system design purporting to offer client involvement, to ascertain exactly what such approaches offered to clients. In particular, it was important to establish how each approach supported clients in undertaking *sense making* (Checkland and Scholes, 1990) and also in reaching some accommodation concerning what purposeful action might bring improvement. Further, it was necessary to evaluate what guidance each approach offered the clients in thinking about and conceptualising how to support their desired purposeful action through the provision of an information system. As stated in Chapter 1, the role of an information system is taken to be to *serve* purposeful action, as proposed by Checkland and Scholes (1990) and expanded upon by Winter, Brown and Checkland (1995).

The speed of innovation of new technological devices has offered a vast array of opportunities for new ways of working and communicating (Callon, 1991), but approaches to designing technology-based information systems to support purposeful action seem to have lagged far behind. Throughout this chapter it will be argued that the first step suggested by the creators of most approaches to information system design is the construction of a description of the current business processes. From such a description, the impetus is often only to update the current processes, by finding the 'optimal solution', or the most seemingly efficient alternative, and then to implement this solution, an approach criticised by Checkland (1983) and Winograd and

Flores (1987). Underpinning this sort of approach to information system design is a limited definition of an information system as being little more than the technological provision (Stowell, 1991, 1995a, 2000a; Stowell and West, 1994). Hence there can be a fixation with specifying only the functional aspects considered necessary to operationalise the technological components (Galliers, 1987; Lewis, 1995; Mingers, 1995; Savage and Mingers, 1996). It is rare that support is provided for a wider investigation into the difficulties actually faced by those involved in the situation of focus, or problem situation. Almost all the information systems design approaches that do suggest an exploration of the problem situation use ideas from the literature on Soft Systems Methodology (SSM) (Checkland, 1981; Checkland and Scholes, 1990, 1999; Holwell, 1997; Stowell, 1995b; Wilson, 1984). These approaches will be discussed later in this chapter. First, approaches to information system design that are underpinned by an impetus to develop the technological support, or technique-oriented approaches, are critically evaluated.

2.2 Technique-Oriented Approaches to IS Design

Personnel from the company Kristen Information and Software Services, (KISS[6]), suggested that their approach did facilitate client involvement during information system design, enabling the clients to describe their own information system requirements (Kristen, 1996). KISS was founded in 1990, with the express aim of overcoming the "communications chasm between the organization and its computing specialists" (Kristen, 1996, p. vi). Kristen's concern is to facilitate interaction between the developers and the clients to find a means of defining real world problems without reference to the approach used to construct any desired software. He argues that many commercial approaches to information system design are concerned only with implementing a standard package of information technology "...as a crowbar

[6] Personnel from the company KISS have collaborated with researchers on the UMISD project.

to force change in the current situation" (Kristen, 1996). He suggests a more fruitful approach is to "match the logistical processes" to the "information architecture" of the technology to be provided (Kristen, 1996, pp. v-vii).

To support the client and the developer, in undertaking dialogue concerning the problem situation, the game KISS DOMINO has been developed (Kristen, 1996, pp. 445-453). Domino pieces that represent actions, actors, messages and documents from the real world situation are employed to facilitate participants in the inquiry process, in creating a textual description of a real world process. This is followed by a grammatical analysis of the description, orienting the design activity toward specifying what words can be used as 'objects' (see Glossary) for the purpose of software construction. Identifying words that can be used as objects simplifies the process of designing software, as from this point the emphasis is on describing "...the life of an object based on the sequence in which actions on it can be performed" (Kristen, 1996). This focus on identifying *objects* essentially grounds the design of the information system at the level of software design.

In the descriptions of KISS (Kristen, 1996) there is no suggested support for those involved to undertake *sense making* in the situation of concern, or for acknowledging the different viewpoints and underpinning beliefs (or Weltanschauungen) amongst those involved (Checkland, 1981). There is certainly no support for learning what *different* action might bring improvement. So although Kristen (1996) acknowledges the importance of not permitting the intended "implementation environment" to place any constraint on the initial thinking, the KISS approach only provides support for the construction of a description of what appears to occur in the situation at that moment in time. Following the construction of this description, client involvement is then limited to identifying key words that can be used as objects in the design of new software.

Indeed, most authors of approaches to information system design begin with a focus on constructing a full *description* of the current situation and then suggest tools for specifying a logical model of the technological provision. Such tools are used to construct a logical specification of the suggested technology-based information system that is considered desirable from the developer's point of view. For example, using patterns of domain knowledge (Amin et al, 2000), Jackson System Development (JSD) (Jackson, 1982), Functional Analysis of Office Requirements (FAOR) (Schäfer et al, 1988), Information Engineering (IE) (Martin, 1991), Requirements Engineering (Sommerville and Sawyer, 1997) and Dynamic Essential Modelling of Organizations (DEMO[7]) (Dietz, 2001; van Reijswoud et al, 1999) all offer IS design approaches that suggest constructing some sort of description of the current real world processes as a starting point. SSADM (Structured Systems Analysis and Design Methodology) developed by the Central Computing and Telecommunications Agency (CCTA) (CCTA, 1990; Weaver et al, 1998) has also been criticised for encouraging a focus on the technological support for data processing, with no provision for first making sense of the problem situation (Checkland and Holwell, 1998a; Mingers, 1995; Stowell, 1995a; Winter et al, 1995). This is despite a feasibility study into using Soft Systems Methodology prior to the focus on the design of the technology (CCTA, 1993). Checkland and Holwell (1998a, p. 113) acknowledge such an addition is much needed, but criticise the use of the ideas underpinning SSM in the CCTA study as being "mechanistic".

Using a description of the current processes as an initial starting point for information system design activity overlooks the importance of first exploring the situation from the perspective of those involved. The design process for the information system is then focused on improving current business processes and data processing rather than on thinking about what

[7] DEMO (discussed in Chapter 4) employs a type of conversation modelling as a starting point for IS design and should not be confused with DEMOS, a Participatory Design approach.

action those involved consider might bring improvement to their situation. Many authors have argued the deficiency of such technique-oriented approaches and suggest that such approaches to information system design offer a limited perspective to those who employ them (Checkland and Scholes, 1990; Doyle et al, 1993; Galliers, 1987; Lewis, 1993; Mingers, 1995; Stowell, 1991, 2000a; Stowell and West, 1994; Walsham, 1995; Winograd and Flores, 1987).

A further difficulty with technique-oriented approaches to information system design is that they are often created by authors who employ a scientific approach to inquiry and a rationalistic approach to the concept of organization (Checkland and Holwell, 1998a; Holwell, 1997; Mingers, 1995; Stowell and West, 1994; Winograd and Flores, 1987). The difficulties of using a scientific method of inquiry within organizational settings are discussed in Chapter 3 of this thesis. Briefly, the *advantage* of assuming that human organizational settings can be treated in a rational manner, where cause leads directly to effect, is that such an approach opens up the possibility of constructing a 'complete' description of the decision-making opportunities available to those involved in the situation. Checkland (1995a) argues that constructing a complete description of any problem situation, particularly in social situations, is not possible, as the real world is far more complex than can ever be represented in a model. Developers persist in such effort, as building an information system to support the situation as *represented by* a structured description of decision-making situations is reasonably straightforward enabling the developer to compile "...a clear description of the system for design and implementation" (Sommerville and Sawyer, 1997, p. 191). As discussed in Chapter 1, decision-making models of organization are severely limiting as the focus is placed on decisions being taken by a single individual in a situation with apparently no other conflicting views evident (Ciborra, 1984; Winograd and Flores, 1987).

Graham (1998) argues that his approach to Requirements Engineering does address the issue of acknowledging the different viewpoints amongst those involved in a problem situation. SOMA (Semantic Object Modelling Approach) is an object-oriented approach to Requirements Engineering, that has been developed by Graham[8] and others at Bezant Technologies. Graham (1994, 1998) advocates client involvement during information system design and provides support for "user and developer dialogue" (in Graham's terminology) in the form of a case tool called *SOMATiK*. As a starting point, Graham (1998) suggests organizing workshops that involve both users and developers to establish the project's mission and also suggests that practitioners of information system design may wish to undertake inquiry into the wider issues supported by an approach such as ETHICS[9] (Mumford, 1995) or SSM (Checkland and Scholes, 1990). Indeed, he argues that "the SSM requirements engineering process is remarkably similar to SOMA" (Graham, 1998, p. 38). This is a serious misconception and his argument requires some discussion.

Graham (1998, p. 38) argues that the Agent Object Model device from SOMA is similar to a rich picture constructed during SSM guided inquiry, in that the intention of constructing both devices is to "express the situation". On closer examination though, this statement reveals a lack of comprehension concerning the different nature of so-called Agent Object Models to that of the rich pictures sometimes used during SSM guided inquiry. In Graham's own words, an Agent Object Model is used to model "the concrete, real-world business" (Graham, 1998, p. 87) and describes the *tasks* undertaken by the various people who will use the technology. A model describing tasks does not express either a person's viewpoint, or the problem situation. A SOMA model describing the tasks a particular Agent undertakes is an attempt to describe how a person doing a particular activity interacts, or will interact,

[8] Graham is one of the industrial collaborators on the UMISD project.
[9] ETHICS is discussed later in this chapter.

with the technology. Creating a rich picture during SSM guided inquiry is an attempt to provide a rich account of the issues and difficulties perceived by those involved in the situation of focus and is employed to structure a debate around these issues (Checkland and Scholes, 1990). As the debate continues, a shared *appreciation* emerges amongst those involved and any rich pictures constructed during the inquiry may require redrawing, or adapting, as the perceptions about the problem situation change.

Graham (1998) then compares Agent Object Models to the conceptual activity models, or holons, constructed during inquiry guided by SSM. This is also a mistake, as holons are models that express a human activity system from a particular Weltanschauung and are constructed to be purely *relevant to debate* (Checkland and Scholes, 1990). The Agent Object Model from SOMA is intended to *represent* real world activity, in that the model is constructed to describe how the technology will operate in actuality. Although Graham states that he has read Checkland and Scholes (1990) which provides a description of the more fluid SSM Mode 2, Graham uses the seven stage model from Checkland (1981) in a rather mechanical manner to argue SOMA matches SSM in each step of an inquiry process (Graham, 1998, p. 38). Graham's incomplete understanding of SSM as a guide for inquiry is found in a great deal of the secondary literature on SSM (see Holwell, 1997, for an overview). It is not simply this lack of comprehension on Graham's part that reveals SOMA to be inadequate for the purposes of supporting a whole approach to information system design; by constructing an Agent Object Model, the problem to be addressed is neatly bounded by various "goals, objectives, measures, assumptions [and] exclusions" (Graham, p. 38, Table 2.1). From such a description, various techniques for constructing a logical description of the technological parts within an information system can be easily employed. Indeed, SOMA has been designed with the *sole intention* of facilitating an object-oriented approach for constructing any required software (Graham, 1994, 1998), hence the early emphasis on obtaining a simple description of the

problem that can be encapsulated by an Agent Object Model. Such an approach falsely simplifies the problem situation, as the description of that situation is then regarded as the whole problem (see Vickers, 1965). Attempting to extend the application of the SOMA approach to supporting inquiry in complex human situations reveals a lack of understanding concerning the differences between inquiry undertaken to support *sense making* in social situations and scientific methods of inquiry used to organize knowledge into a suitable format for software development (this is discussed in Chapter 3).

Most object-oriented approaches to designing the technological components within technology-based information systems, such as the approach suggested by Booch et al (1999), or that suggested by Wirfs-Brock et al (1990) and also the Rational Unified Process (Krutchen, 2000) offer no explicit support for problem identification at all. Leffingwell and Widrig (1999) employ the Rational approach in their book: *Managing Software Requirements*. Leffingwell and Widrig (1999) acknowledge that the "problems to be addressed" must be thoroughly discussed with clients, but the tools suggested for *sense making* are limited to questionnaires, storyboards and also Use Cases (Jacobsen et al, 1992) that focus immediately on what the computer system is to do. The impetus is again on building software rapidly, rather than on problem identification and in undertaking an effort to create some ideas for purposeful action that might bring improvement.

One of the advantages of object-oriented design approaches is that such approaches are considered to facilitate Rapid Application Development (RAD) and prototyping methods (Bell and Wood-Harper, 1998; Benyon et al, 1999; Graham, 1998; Lycett and Paul, 1999; Pooley and Stephens, 1999). These approaches have been developed to provide technology-based information systems quickly, but such approaches can result in scant attention being paid to *appreciating* the problem situation and to the possibilities that

those involved might perceive for taking action to bring improvement to the situation.

2.3 Prototyping and Rapid Application Development

In today's business environments there can be an impetus to implement new technologies quickly and various approaches have been developed in response to this perceived need, including the component assembly of software applications (Lycett and Paul, 1999). Although prototyping can be employed to facilitate new ideas and new ways of working (Alavi, 1984), there are some inherent restrictions with this approach to designing technology-based information systems. Component-based architectures for software design are built on the premise that it is possible to remove, reconfigure and replace components, without disturbing other parts of the system, (Nierstrasz and Meijler, 1995; D'Souza and Wills, 1998). The advantage of such approaches is deemed to be the speed with which new software can be pieced together to operationalise a new computer system or adapt an existing one (Bell and Wood-Harper, 1998; D'Souza and Wills, 1998; Lauder and Kent, 2000). Such component assembly for software construction entails an engineer dividing any perceived problems into discrete parts, or sets of needs. Each segment is then tackled separately and individual technological solutions are designed, these are then connected together to form larger technological solutions (as suggested by Lycett and Paul, 1999). Checkland (1983) argues that if practitioners attempt to make sense of human situations as an aggregate of smaller individual elements, the holistic sense of that situation is lost, and with this reduction, meaning and relevance are also lost. He argues that the concept of "emergence", where there are "...properties which are meaningful in relation to the whole entity, not in relation to its parts" is particularly relevant to complex social situations and that such situations do not divide into individual, discrete and easily defined elements (Checkland, 1983, p. 669).

Component-based approaches to information system design seem suited to organizing knowledge in order to construct software and computer programs.

An approach known as "Extreme Programming" (Beck, 1999) is underpinned by similar assumptions to those found in the work of Lycett and Paul (1999). Beck (1999) suggests that clients can be involved in the process of building prototypes by starting the design process with the clients constructing so-called "user stories". These stories are written by the clients and are intended to provide a description of what the customer wants the *computer* system to actually *do*; stories are commonly "about three sentences long", with releases of prototypes being based on around 80 such stories (Beck, 1999). Again, the effort is directed at attempting to provide an information system by amalgamating all the individual *tasks* that the computer-based components might perform. Such approaches to information system design are focused entirely on the process of building *software*, rather than on creating an information system to *serve* purposeful action (Checkland and Scholes, 1990; Winter et al, 1995).

A great deal of new technology today is provided in incremental stages, with a basic prototype being implemented and functionality being gradually added in following releases (or so-called evolutionary prototyping) (Benyon et al, 1999; Pooley and Stephens, 1999). "Throwaway prototypes", where an initial prototype is used by the clients during a trial period and is then discarded, might also be developed as a first step "...for the purpose of checking there is a common understanding about requirements" (Pooley and Stephens, 1999, p. 228). Although the learning that accumulates from the clients experimenting with prototypes is valuable (Checkland and Holwell, 1998a), such approaches can only be employed where there is already some developed concept of the purposeful action to be served (Winter et al, 1995). Prototyping seems useful to support clients and developers in experimenting with different technologies and interfaces, but the focus is on deciding how

the *user* interacts with the *technological provision* and not on making sense of the problem situation, or on deciding what action to take to bring improvement. Benyon-Davies et al (1999) note this tendency for prototyping methods to concentrate on improving the "user interface" and van Reijswoud et al (1999) criticise such approaches for lacking flexibility when attempting to address issues concerned with making changes to business processes and the application of such approaches as an initial design step seems to be somewhat limiting. The so-called Participatory Design approaches developed mainly in Scandinavia, also rely on prototyping and scenario building to enable those affected by the implementation of new technology to participate in information system design.

2.4 Participatory Design

In an overview of Participatory Design approaches, Kensing and Blomberg (1998) suggest that practitioners advocating such approaches have three main concerns. First, to undertake a consideration of the politics of information system design, second, to reflect upon the nature of participation and third, to employ methods, tools and techniques to enable participation (Kensing and Blomberg, 1998). Clement (1994) argues that the prime objective of practitioners using these approaches is to avoid "deskilling" and "dislocation" and to understand the relationships between the people involved in the situation and the technology employed. Within the literature on Participatory Design, there seems an underpinning concern that technology can be used to increase management control (Clement, 1994; Kensing and Blomberg 1998). Some Participatory Design approaches even recommend the exclusion of management personnel from the process of information system design entirely (Bødker, 1996). Early examples of Participatory Design approaches include the DEMOS and UTOPIA projects (Ehn, 1989); both of these projects were concerned with prototyping new information technology tools for participants.

Ethnographic methods of *sense making* are often used in the initial stages of Participatory Design and are also found in the work of Sommerville and Sawyer (1997) on Requirements Engineering. For example, such ethnographic methods might include open-ended contextual interviews, participant observation and analysis of work scenarios (Beyer and Holtzblatt, 1998; Kensing and Munk-Madesen, 1993; Kotonya and Sommerville, 1992; Rodden et al, 2000; Sommerville and Sawyer, 1997). Work on using ethnographic methods in a process of information systems design at Lancaster University by researchers associated with the SEBPC initiative has resulted in the suggestion that "ethnographic material [can] facilitate the construction of abstract models of work as part of the design process" (Rodden et al, 2000, p. 158). Again the underpinning assumption would seem to be that a detailed description of a real world situation is the most useful starting point for information system design. The difficulty with such an approach is that information system design is always concerned with future action, not current ways of working and detailed models of processes do not necessarily provide useful support for those involved in the design process.

Perhaps though the most serious criticism of Participatory Design approaches is the continued focus on scenario building, prototyping and simulation in order to determine the technological provision that is to be used by the clients. There is little concern voiced in the research on Participatory Design on how to support those involved in the situation of focus in learning about their predicament. Consequently, it often appears that the problem is assumed to be the design of the information technology *interface* and how to involve people in the process of that design.

Kensing and Blomberg (1998) criticise the field of Participatory Design, as there are few examples of approaches that offer coherent ensembles of tools and techniques. Beyer and Holtzblatt (1998) suggest that their approach, Contextual Design, does offer a complete guide to information

system design. They regard the core design problem to be how to enable the users of the IT to decide how they will work in the future (Beyer and Holtzblatt, 1998, p. 3). Again the initial focus is on constructing a description of the current business process, with an emphasis on designing how the human operator will interact with the computer interface. Contextual Design can be criticised for the same reasons as other technique-oriented approaches; the focus on current processes overlooks the process of problem identification and avoids offering support for creative, innovative thinking that may lead to completely new action being undertaken.

ETHICS (Effective Technical and Human Implementation of Computer-based Systems) (Mumford, 1995, 1996, 1997; Mumford and Weir, 1979) is another approach to information system design (and development). The authors of ETHICS place much emphasis on participation by those involved in the situation. Mumford (1995) suggests that the concern in designing information systems is to establish a satisfactory relationship between the users and the technology they employ to go about their activities. Such approaches are often termed "socio-technical" as practitioners attempt to place an equal emphasis on "...the needs of the people involved as to the demands of the technology" (Adman and Warren, 2000, p. 39).

The ETHICS approach has been criticised for not providing support for an investigation into the problem situation by Mingers (1995), though a so-called QUICKethics (Mumford, 1995, p.79) has been suggested to provide a front-end to the main ETHICS approach. QUICKethics is intended to support participants in undertaking self-reflection and deciding upon the "...essential needs which will form the basis of the new information system" (Mumford, 1995). As with other Participatory Design approaches there appears a concern only to design technological solutions for people in organizational settings and ETHICS as an approach still appears to lack a

means of support for helping people make sense of their situation and in deciding what action might bring improvement.

The difficulty with placing the emphasis on considering what technology to introduce, is the tendency to reduce the situation to a description of needs, or requirements. Often with such approaches, any context taken into consideration is only a narrow focus on the human-computer interaction and not an extensive reflection on the possible implications of undertaking some new action within the situation (Benyon et al, 1999). The idea that it may be more useful to support people in thinking about what action they might take to bring improvement *before* creating an information system designed to *serve that desired action* (Checkland and Holwell, 1998a; Winter et al, 1995) is not expressed in any of the information system design approaches described so far. To facilitate the design of information systems that *serve* purposeful action, it is necessary to enable those involved in the problem situation to first make sense of the situation (Checkland and Scholes, 1990), that is, to undertake an exploration-oriented approach to information system design.

2.5 Exploration-Oriented Approaches

The ideas underpinning Soft Systems Methodology (SSM) developed by Checkland and other researchers at Lancaster (Checkland, 1981; Checkland and Scholes, 1990; Smyth and Checkland, 1976; Wilson, 1984) are apparent in almost all exploration-oriented approaches to information systems design[10]. For the work on the UMISD project, it is necessary to focus on the advantages and limitations that a practitioner experiences when using SSM as a guide to inquiry during a process of information system design. Also, it is important to evaluate how the ideas considered to constitute SSM have been incorporated into current information system design approaches.

[10] SODA (Eden et al, 1983) is an exception and is discussed later in this chapter.

An early application of the ideas from the literature on SSM being applied to the problems associated with information system design is seen in the work of Wilson (1984). Wilson (1984) suggested that if a conceptual activity model of the intended action was created, the information inputs and outputs for each activity from the holon could be identified and categorised. Mingers (1995) argues that Wilson's approach is too narrow as the approach uses a single definition (a primary task root definition) to describe the new action to be undertaken by those involved, and so the value of undertaking an initial exploration is undermined. Mingers (1995) also criticises Wilson (1984) for not providing a link to case tools, or standard methods of constructing a logical model of the intended technology-based information system, thereby not providing a complete approach to information system design. Wilson's ideas have been criticised for being underpinned by a rationalistic view of organization and as "...being rooted in the thinking of the 1970s and early 1980s" (Holwell, 1997). Wilson's work, though now appearing dated, was ground-breaking in its time and other methods of designing technology-based information systems have been developed that build on these ideas.

Indeed, most approaches to information system design that offer support for exploration and *sense making*, build on the ideas found in the first complete description of SSM in *Systems Thinking, Systems Practice* (Checkland, 1981). In Checkland (1981), SSM is described as a seven-stage methodology that can guide users through an inquiry process to facilitate those involved gaining an *appreciation* of the problem situation. Checkland and Scholes (1990) provide a more fluid description of the methodology and they term this updated version SSM Mode 2. This later account encourages a much more innovative use of the ideas, which is emphasized again in the *Thirty Years Retrospective on SSM* in Checkland and Scholes (1999).

The support that the ideas underpinning SSM offer a practitioner in *sense making* in a problem situation and the orientation toward *action* makes the methodology particularly useful when undertaking practical activity (Checkland and Scholes, 1990). It is important though to recognize that in a process of information system design, this is only the first phase of inquiry. In addition to the activities of *sense making* and thinking of what action might bring improvement, it is also necessary for those concerned to consider the *support for the desired action*, which in today's business environment will almost inevitably entail the provision of a technology-based information system. This gap between ideas for purposeful action and designing support for that action in the form of a technology-based information system is the source of the main current intellectual challenge in the field of Information Systems and will be discussed in greater depth in Chapter 4. Multiview is one of the best known of all the information system design and development approaches based on ideas from SSM. The authors of Multiview (Avison and Wood-Harper, 1990) and the later Multiview2 (Avison et al, 1998) employ many ideas from the literature on Soft Systems Methodology.

In Avison and Wood-Harper (1990, p. 84) the authors provide guidance on how to move from a conceptual activity model using a technique that "...is exactly comparable to a process of top down decomposition [...] used in structured programming". They take the "main purpose of the system" and divide this into smaller and smaller tasks creating a hierarchical "Function Chart". Such a process is extremely useful for the engineers that wish to construct a logical model of the technology-based information system required, as using such a technique provides a detailed and structured description from which they can work. However, in moving from a conceptual activity model (or holon) to a Function Chart, Mingers (1995) argues that all sense of the original purpose is lost. Indeed, Mingers (1995) refers to this stage of Multiview as being "...singularly weak" and criticises the approach

for lacking a sense of coherence. The authors have acknowledged deficiencies with the approach and have offered Multiview2.

Multiview2 is described as being based on the "belief in the inseparability of object and subject worlds" (Avison et al, 1998) and is described as both a framework and as a methodology by the authors. There are four suggested "components of the methodology", organizational analysis, sociotechnical analysis, information system modelling and software development. Avison et al (1998) employ the ideas of Mitroff and Linstone (1993), who argue that those involved in complex problem solving must employ as many different types of knowledge (with each different aspect of knowledge underpinned by differing philosophical perspectives) as possible. Avison et al (1998) suggest that a technical perspective, organizational perspective and personal perspective are essential to any work on information system development (making the mnemonic TOP). This approach however, lacks the added dimension offered in the work of Holwell (1997) of *conceptualisation.* Holwell's ideas are used throughout this work and her COAT model (conceptualisation, organization, agents and technology) as a *sense making* device in the field of Information Systems is discussed later in this work. Further, Avison et al (1998) suggest that the Multiview2 "framework is a practical and locally-situated scheme for getting things done and improving the situation". No approach to inquiry within social situations can guarantee that improvement will follow (Checkland, 1985a), but in addition to this over-statement, Avision et al (1998) suggest that

> "within the context of the emergent methodology a range of methods and techniques might need to be brought to bear on the situation, such as requirements engineering, ethnographic studies, human-computer interface design, and so on"
>
> Avison et al, 1998, p. 135.

The authors of Multiview 2 offer no further guidance for using such methods and techniques during the complex and difficult undertaking of moving from some ideas for purposeful action to the creation of a logical specification for a *serving* information system in a logically coherent manner. Indeed, the Multiview2 approach seems more oriented toward undertaking project management, rather than the detail of the design work, which is the focus for the UMISD project.

OPIUM (Sawyer, 1992) is a commercially available approach that is marketed by the company TOPIC[11] as a "...corporate strategy planning management system" (Sawyer, 1999). *OPIUMPRO* (the accompanying software package) offers a suite of eight modelling techniques enabling the client to "...translate the mission, or vision, into clear-cut short-term plans" (Sawyer, 1999). The sales literature states that OPIUM is "...the only 'soft' to 'hard' link" and is able to support people involved in "Requirements Determination, Process Improvement and Redesign" (Sawyer, 1999). The so-called Multiview Diagram of *OPIUMPRO* can be used to record each participating individual's view and opinion with one or two sentences and this viewpoint is then explored further by asking a series of 'why', 'what' and 'how' questions. The next immediate step is to describe new processes in the form of activity models. These processes are intended to solve problems in the organizational setting. The activity models of OPIUM are regarded as being *representative* of the process, and are not the same as the holons employed by practitioners using the ideas underpinning SSM; holons are constructed to be simply *relevant to debate* (Checkland, 1995a). The OPIUM activity models seem to just appear with no real foundation in an in-depth exploration of what might bring improvement.

[11] TOPIC is one of the industrial collaborators on the UMISD project.

Sawyer (1992, 1999) does acknowledge the need to explore the problem situation and one advantage of OPIUM is that it offers the practitioner different means of becoming immersed within a problem situation. But on critical reflection, these devices are actually only a series of disjointed explorations that give the illusion of a coherent whole. Although it is possible to cross-reference a particular viewpoint appearing in the different models of OPIUM, a particular viewpoint does not necessarily offer a fruitful course of action for the future, no matter how often it is repeated by those involved. The investigation into the wider issues and concerns of those involved in the problem situation seems constrained by an overriding emphasis on defining the goals of the organization, which are then used to determine appropriate Critical Success Factors and measurable Key Performance Indicators. This approach seems to be underpinned by rationalistic assumptions of cause leading directly to effect, making it appear easy to define measurable indicators of performance in organizational settings, which can then be used to determine success, an approach criticised by Winograd and Flores (1987).

In early versions of OPIUM the real world activity model was converted to a real world "data-based model" (Mingers, 1995). In current versions of OPIUM (Sawyer, 1999), the verb-fronted descriptions in the Multiview Diagram and the verb-fronted activities from the activity model are used to construct a logical model for software in a similar manner to that employed by KISS (Kristen, 1996). Although the clients are involved in the process of constructing the Multiview Diagram and the activity models of OPIUM, from this point, the description and design of the technology-based information system remains in the hands of the developers.

Client Led Design (CLD) (Stowell, 1985, 1991, 1995a, 2000a; Stowell and West, 1994) also builds on the ideas underpinning SSM to facilitate a process of information system design. CLD is aligned with the ideas

underpinning SSM Mode 2 rather than with the much more step by step description of SSM in Checkland (1981). Stowell and West (1994) employ various intellectual devices from the body of work on 'systems', notably conceptual activity models (holons), which they suggest are suitable devices for enabling the client to describe their desired information system. Stowell and West (1994) argue that it is possible to move from such a description of clients' information system requirements to a description of a supporting information system using Data Flow Diagrams[12], such as those described by Gane and Sarson (1979). Prior (1990) also argues that that by constructing "conceptual data flow diagrams" from a conceptual activity model, it is possible to create a view of a *potential* information system from the conceptual activity model. This approach has met with considerable criticism. Doyle and Wood (1991a, b) argue that moving from models intended to structure debate (such as those used in SSM guided inquiry), to models used to describe an existing or proposed information system (such as a Data Flow Diagram) can never be a "mechanistic transformation" involving only the "manipulation of models". Such a transformation "...is the product of (often intense) intellectual effort" (Doyle and Wood, 1991a). The models constructed during inquiry guided by SSM are used to promote debate and are not intended to be descriptions of real world activity. This is very different to the function of any logical model of a technology-supported information system, which *is* intended to describe as completely as possible the real world functioning of the technology, be that model a Data Flow Diagram, or an object model.

There are other difficulties involved with moving from a conceptual activity model, or holon, to a Data Flow Diagram (DFD), in that a holon is an *activity-based* view of purposeful action that *might* be relevant to the situation of focus, whereas a DFD is a view of the flow of *data* items that are required in the information support system (Mingers, 1995). Mingers (1995) criticises

[12] Benyon and Skidmore (1987) also suggested linking conceptual activity models to DFDs.

attempts to move from a holon to a DFD as the translation from *action* to *data flows* is awkward and does not provide a smooth, coherent "translation". Stowell (2000a) acknowledges this deficiency and reports on current research into linking holons to a logical specification using object-oriented methods (Guo et al, 2000; Liang et al, 1998), and this work is ongoing.

Another approach that uses ideas from the literature on SSM during the design process for an information system is SISTeM (Soft Information Systems and Technologies Methodology) (Atkinson, 2000). The SISTeM approach incorporates two cycles of learning. Atkinson (2000) suggests that the first cycle of learning focuses on exploring the problem situation, whilst the second cycle of learning moves the focus to "operational decision-making and realisation". In discussing cycle 1 of the SISTeM approach, Atkinson (2000) acknowledges the similarity to SSM as described in Checkland (1981), that is SSM Mode 1. Indeed his diagram of the SISTeM approach (Atkinson, 2000, Figure 1, p. 106) appears to reproduce the seven-stage model of SSM except for the type of models that are constructed. In cycle 1 of SISTeM, Atkinson (2000) suggests that those involved in the inquiry first construct a rich picture. Conceptual models (similar to holons used in SSM) are then constructed except that these models describe "managed interlocking human/machine activities" (Atkinson, 2000, p. 107). In moving so quickly to identifying the use of machines, the SISTeM approach seems designed to focus the inquiry immediately on conceptualising the technology rather than on first investigating what action might be taken to bring improvement. This focus on *technological* considerations is emphasized by the use of so-called "expressive models". These "expressive models" are constructed at the same stage of inquiry as the conceptual models and are descriptions "of tasks or processes interpreted and identified by those involved as problematical" (Atkinson, 2000, p. 107).

Atkinson (2000) also suggests the use of "hybrid-matrix models", based on the ideas of Wilson (1984). The hybrid-matrix models that Atkinson (2000) suggests are actually only tables expressing the development life cycle of the information system. For example, a hybrid-matrix model is given depicting "strategically important organizational competencies" along one axis of a table and the process of information system development along the other axis, enabling clients to identify when the desired competencies will be developed (Atkinson, 2000, p. 111). Also, the SISTeM approach offers no support for undertaking social and political analysis (described as analyses two and three in SSM Mode 2) stating simply that "influential, powerful actors" can facilitate a process of deciding what potential action is "culturally feasible" (Atkinson, 2000).

In the second cycle of learning, when the focus moves to "realising" the action, the SISTeM approach seems particularly weak. Atkinson (2000) argues that SISTeM can be integrated with information system design tools such as Data Flow Diagrams and Use Cases[13]. The description of this phase of SISTeM suggests that any other devices can be used in "parallel to the soft systems activities and tools with or without linkage" (Atkinson, 2000 p. 109). But Atkinson (2000) offers no guidance whatsoever for maintaining coherence throughout the inquiry process.

Although using ideas, methods and tools developed almost exclusively from the literature on SSM, Atkinson (2000) argues that Actor Network Theory (ANT) (Callon, 1991; Latour, 1987, 1991) is the underpinning framework for the SISTeM approach. Atkinson (2000) suggests that by using the ideas of Callon (1991) and Latour (1987, 1991) it is possible to regard an information system as a "human/machine network". But the focus on human/machine networks is actually the fundamental weakness in the SISTeM approach. Without any human wishing to undertake some purposeful

[13] See Glossary

action, information systems would not be created and SISTeM offers no support for first *thinking about* what purposeful human activity might bring improvement. The SISTeM approach does not yet appear to be a sufficiently well thought out approach to be used during information system design, particularly as the intellectual underpinnings do not seem coherent.

Ledington and Ledington (1999, p. 55) acknowledge the value in using SSM as a guide to "...making explicit the various meanings associated with a situation" and also acknowledge the difficulties when attempting to use conceptual activity models in a process of information systems design. Ledington and Ledington (1999) argue that the conceptual activity models constructed when undertaking SSM guided inquiry "...often seem simplistic when compared to the actual situation" and that the "information aspects" of the human activity system being considered are not made explicit. They suggest that there may be other ways of modelling the human activity system that are more useful during a process of information system design (Ledington and Ledington, 1999, p. 56). Although broadly agreeing with this conclusion, it is important not to lose sight of the *purpose* of the conceptual activity models, or holons, in SSM guided inquiry as *sense making* devices. Creating holons is intended "to lift the thinking in the situation out of its normal, unnoticed, comfortable grooves" (Checkland and Scholes, 1999, p. A22). These models are intended to be simple, but thought provoking, holons were not designed to organize knowledge into a format suited for constructing a logical specification for an information system.

Ledington and Ledington (1999) use an approach they call Decision-Variable Partitioning (DVP) in order to create a different sort of model from a root definition written during SSM guided inquiry. They suggest decomposing the root definition into a type of decision tree that can then be used to determine all the necessary activities for accomplishing the activity system described by the root definition. This attempt to use the ideas underpinning

SSM in new and innovative ways is extremely interesting, but the resulting decision tree model seems very prescriptive and an overly structured view of a human activity system. Crucially, by attempting to "decompose" conceptual activity models into a *description* of real world activity (in this instance the described activity is decision-making) the approach suggested by Ledington and Ledington (1999) seems underpinned by a so-called hard systems view of the world. Also, by suggesting modelling the *decisions* entailed in completing described activities, Ledington and Ledington (1999) seem driven by a view of an information system as enabling decision-making, similar to the definition provided by Stowell and West (1994) and criticised in Chapter 1.

Checkland and Scholes (1990) and Winter et al (1995) argue for an information system to be regarded as a system that *serves* purposeful action and using this definition, Checkland and Holwell (1998a) provide an account of their view of what they refer to as "information system development". They expand on the account offered by Winter et al (1995) and suggest that information system development requires four stages of exploration:

1. An exploration of the purposeful action to be served
2. An expression of that purposeful action
3. An exploration of the information support
4. An exploration of the IT required.

(Summarised from Checkland and Holwell, 1998a, Figure 4.9, p. 117)

Holwell (1997) argues that the difficulty in providing a link from SSM guided inquiry to real world information systems has been due to the omission of any *conceptualisation*, C, of the three factors: organization, O, technology, T, and agents, A; these elements make up the mnemonic COAT, (Holwell, 1997, p. 407). She suggests that "sense making in IS entails *thinking about* [or conceptualising] the three elements [O, A and T] and their relationships"

(Holwell, 1997, Holwell's italics). This lack of support for conceptualisation, identified by Holwell (1997), has caused particular difficulty during the process of undertaking design work. Creating some shared *appreciation* amongst those involved in the situation concerning the meanings each individual has internalised will be an important first step in facilitating a process of *Client Led* information system design.

To support this aspect of inquiry Checkland and Holwell (1998a) offer the so-called POM model that expresses "...the *processes* in which *organization meanings* are created" (authors' italics). This model provides a view of "formally organized information systems [...supporting] organization members in conceptualising their world, finding accommodations, forming intentions and taking action" (Checkland and Holwell, 1998a, p. 105). The POM model, together with the COAT model, they argue, provides an intellectual tool to "furnish a process of inquiry for making sense of the [Information Systems] field" (Checkland and Holwell, 1998a).

This account however, evades the difficult issue of attempting to move on from ideas for purposeful action to creating *logical specifications* for the technological aspects of an information system. Holwell (1997, p. 345) acknowledges that this aspect of information system design is the missing link in the work that has emerged from Lancaster. Checkland and Holwell (1998a, p. 173-213) provide a series of case studies describing how different groups of people arrived at ideas for purposeful action in the form of *information strategies*. What is being sought in the work on the UMISD project is guidance on moving from ideas for purposeful action to ideas for a *serving* information system. The approach suggested by Checkland and Holwell (1998a) does not go far enough to address the fundamental challenge of offering support during the *design* phase.

2.6 Other Approaches

Some researchers suggest employing a so-called multimethodology approach to inquiry in order to explore different aspects of the problem situation (Bennett et al, 1997; Brocklesby, 1995; Flood and Jackson, 1991; Mingers and Gill, 1997; Taket and White, 2000) and there is some discussion in the literature concerning if it is possible to combine different methodologies that are underpinned by different philosophical stances in a theoretically sound manner, in order to explore a situation (Brocklesby, 1995; Flood and Jackson, 1991; Mingers, 1997a; Mingers and Gill, 1997a; Ormerod, 1997). Mingers (1997b) argues that there is a lack of theory available to support an inquirer in employing different methodologies simultaneously and criticises theoretical approaches to the use of many methodologies within a problem situation, for being concerned with "the *selection* of methodologies" rather than "their *combination*" (Mingers' italics).

Eden (1989) suggests a multimethodology approach in Strategic Options Development and Analysis (SODA). SODA has been proposed as a guide in the development of decision support systems (Eden, 1989; Eden et al, 1983). Cognitive Mapping (Eden, 1989) is one of various tools comprising SODA, suggested as being useful. Cognitive Maps are "representations of the various chains of argument presented" by participants during an inquiry (Bennett et al, 1997, p. 62). Such maps are employed to consider the "inter-linked decisions" that face those attempting to bring improvement to the situation. For each identified decision a practitioner attempts to construct the options available and also the preferences for action expressed by those involved. One criticism that can be made of such an approach is that the emphasis on identifying decision-making opportunities seems to limit the exploration of the situation, and such restriction may in turn limit the ideas for action created by those involved. Also the cause and effect arguments presented in the Cognitive Maps are read in the manner of 'if this happens', 'then that happens', 'or else this happens'. Such an approach seems designed

to limit what information system requirements might be suggested, in order to enable a logical specification for any technology-supported IS to be constructed fairly easily.

Bennett et al (1997) also describe an application of "conflict analysis", which is suggested by Eden et al (1983) as being a useful technique to employ within the SODA approach. The focus when undertaking conflict analysis is to identify areas of agreement and disagreement amongst the participants. Any areas of agreement are considered to form stable scenarios that then form the basis for a model from which a logical specification for an information system might be constructed. The viewpoints are not questioned further, areas of agreement are simply assumed to lead to desirable action within the problem situation. The lack of support provided in SODA for *sense making* (rather than the identification of areas of agreement) and for creating some ideas for purposeful action that may bring improvement, resulted in SODA being considered unsuited for the work on the UMISD project.

Some authors suggest the use of different tools to undertake an exploration of the situation end up throwing everything at the problem. For example, Zhu (2000) argues that Wuli-Shili-Renli (WSR) (Gu and Tang, 1995) can be used as an approach to information systems design. In a description of a study using WSR, Zhu (2000) emphasizes the need for a phase of problem exploration, but is vague about how the participants are supported in making sense of their situation and in deciding what action might bring improvement. Zhu (2000, p. 193) simply suggests that "various methods, techniques and tools were consciously introduced" and later that the CATWOE mnemonic (Smyth and Checkland, 1976) and conceptual activity models were used to explore the situation. The tools used are listed as:

> "...input-output tables, decision trees, critical path analysis, group discussions, flow charts, data-flow diagrams, entity-relationship models, structure charts, event diagrams etc."
>
> (Zhu, 2000, p. 194).

There is no reference as to *how* the group used all these different tools to create some ideas for purposeful action. Nor is there any discussion on how the group created a coherent requirements specification when using this plethora of tools and devices. As yet, there seems to be a lack of any clear guidelines for a practitioner in using WSR to make sense of a situation and to support those involved in creating a *serving* information system, though WSR may provide some interesting insights in the future.

Some software developers may argue that off-the-shelf software packages do help in showing customers what to want, and that in certain situations there are some general activities for which common tasks can be defined. The assumption that some processes can be undertaken in the same manner across different enterprises has resulted in the production of large generic software packages such as Enterprise Resource Planning (ERP) packages. Such provision of information system support cannot be considered to comprise a *Client Led* approach and this note on these packages is included here to clarify this issue. It is extremely unlikely that different groups of people engaged in similar purposeful action (such as selling mortgages) will go about their business in exactly the same way, but customers choosing such packages are expected to change their way of "doing things" to match the ERP supplier's vision of "best practice" (Curran and Ladd, 1998). When such packages are implemented, problems arise as each enterprise is made up of personnel with subtly different ways of undertaking their work and differences in the meanings they attribute to various actions (Warren, 1999). Krumbholz et al (2000) comment on the failure of ERP packages to deliver the expected functionality and also on the resulting increase in costs and the length of time

taken to implement the software due to the complexity of introducing new ways of working. The use of these software packages may be useful in inspiring new thinking in much the same way as using a prototype may provide the impetus for new ways of working with the technology. Such approaches to designing new information systems though, focus entirely on the application of technology and it would seem that more effort is still required to find means of designing and developing technology-based information systems that are regarded as *serving* some desired purposeful action, by those involved in that situation.

2.7 Summary

Although SSM as a guide for inquiry provides support for exploring the problem situation and thinking about what purposeful action might bring improvement, as yet there is no available guide for creating possible routes to thinking about support for that action. This lack of guidance is particularly problematic if this support is to include the provision of a technology-based information system and this argument will be expanded upon in Chapter 4. Indeed, it appears that there is a dearth of intellectual devices to support this movement during the inquiry from a focus on action to a focus on designing technology-based support for that action. Such a move involves inquirers using some guide to inquiry for *sense making* in complex social settings and then moving to using methods and techniques for organizing knowledge in a manner suited to constructing a logical specification for an information system. The aim of this work as part of the UMISD project was to provide a means of creating a coherent and logically sound route through the gap between ideas for purposeful action and support for that action. Chapter 4 expands upon the detail of this difficult journey. In the next chapter, the difficulty of undertaking inquiry within social situations is considered and suitable guides for such an inquiry process are discussed.

Chapter 3

Social Inquiry: Theory into Practice

3.1 Introduction

Undertaking inquiry in any field of endeavour requires careful thought concerning what will count as knowledge and how that knowledge will be created (Audi, 1998; Burrell and Morgan, 1979; Checkland and Holwell, 1998b; Gadamer, 1989; Popper, 1959; Reason, 1993). Some sort of organization of the pursuit of knowledge will be necessary to make sense of the emerging experience, particularly when creating knowledge that is intended to be useful and insightful to a wide audience (Checkland and Scholes, 1999), as is the case during a research project. The set of principles chosen to guide an inquiry (or the methodology), will influence how an inquirer sets about undertaking the creation of new knowledge and also the perception of *validity* (or 'soundness') of the learning outcomes amongst a wider audience (Audi, 1998). For example, scientific knowledge is created when an hypothesis is stated and tested through experimentation and refutation by other scientists until a set of repeatable rules becomes established and accepted into 'public knowledge' (Checkland and Holwell, 1998b; Popper, 1959; Reason, 1993; Tsoukas, 1993). Such an approach to inquiry is only possible, as the phenomena being investigated remain the same as time passes, or are "homogeneous through time" (Keynes, 1938, quoted in Moggridge, 1980, p. 28). Social situations are created amongst people with different worldviews, beliefs and cultural norms, set in a particular context and a specific time and so inquiry within such settings can never be replicated (Checkland and Holwell, 1998b).

3.2 Frameworks for Information System Research

Employing a scientific method in order to create knowledge, where there is an effort to observe the situation from a neutral stance has been argued to be inappropriate within social situations (Checkland, 1981; Gadamer, 1989; Maturana, 1978; Reason, 1993; Tsoukas, 1993; Stowell and West, 1994; Weber, 1949; Winograd and Flores, 1987). As each problem situation is unique, undertaking inquiry within complex social environments and defending the knowledge thereby gained is difficult (Checkland and Holwell, 1998b; Reason and Rowan, 1981; Tsoukas, 1993). Conducting research within social situations creates a difficult conundrum for a researcher. Recognising that any inquiry process within such situations will be unrepeatable, leaves the problem of how to organize a process of social inquiry in a manner that will be perceived by others as capable of creating valid research outcomes (Checkland and Holwell, 1998b). Klein and Myers (1999) offer a set of seven principles that they suggest can provide a framework for undertaking "interpretive field research" in the field of Information Systems. The seven principles are listed in Table 3.1 below:

Table 3.1: Klein and Myers' Principles for Interpretive Field Research

1. The Fundamental Principle of the Hermeneutic Circle
2. The Principle of Contextualisation
3. The Principle of Interaction between the Researchers and the Subjects
4. The Principle of Abstraction and Generalisation
5. The Principle of Dialogical Reasoning
6. The Principle of Multiple Interpretations
7. The Principle of Suspicion

Summarised from: Klein and Myers (1999).

In their suggested "Principle of Contextualisation", Klein and Myers (1999) attempt to express the view that "...one of the key tasks [of social inquiry, is] seeking meaning in context" and to do this "the subject matter [must] be set in its social and historical context". This Principle offered by Klein and Myers (1999) though, appears impoverished when compared to the idea of attempting to understand a situation from within, or *verstehen* (Weber, 1949), that has developed from the field of Hermeneutics. Dilthey (1961) argued that understanding is gradually achieved through an iterative cycle of learning about the perceived social world. Burrell and Morgan (1979, p. 237) summarise Dilthey's ideas as offering the notion that a "social whole cannot be understood independently of its parts, and vice versa". Hermeneutics is discussed at length by Gadamer (1989) who describes it as the "art of understanding" (p. 164) and he explains this as an attitude that places the mental constructs of those involved in the situation as being prime, rather than a world known through experimental evidence gained from scientific inquiry. Gadamer (1989, p. 301) argues "the very idea of a situation means that we are not standing outside it and hence are unable to have any objective knowledge of it".

The notion of *being involved* in a situation if one is to gain understanding is *different* to the underlying assumptions of the third principle offered by Klein and Myers (1999). Klein and Myers (1999, p. 74) suggest that the "Principle of Interaction between the Researcher and the Subjects [...] requires the researcher to place himself or herself and the subjects into a historical perspective". They apply an argument by an anthropologist, Kahn (1989), to support the inclusion of this principle and use an extract of Kahn's work where he describes how he goes about producing "an account of another culture" (Kahn, 1989, p. 16, in Klein and Myers, 1999, p. 74). Underpinning this principle seems to be the assumption that field research consists of writing up ethnographic-style reports describing a particular situation and a set of 'subjects' in depth. The difficulty with limiting research in social situations to

writing up case studies is that those involved in the situation tend to remain *subjects* of the research, rather than become *participants* (Heron and Reason, 2000). Such an approach to inquiry is certainly suggested in the title of this principle used by Klein and Myers (1999). The disadvantage of such an approach in social research is that the predicament of those involved in the situation can be ignored and these people then miss the opportunity to gain learning and new knowledge for themselves as a result of the research (Checkland, 1981; Reason, 1993; Tsoukas, 1993). Whyte (1991) in particular has argued that the participation of those in the problem situation is a moral imperative when undertaking social research.

In the "Principle of Abstraction and Generalisation" Klein and Myers (1999) suggest that learning outcomes can be "abstracted" from interpretive research and that learning can be generalised from one situation to another through the development of concepts, theory and insight (from Walsham, 1993). It is important though to be aware that learning outcomes from research within social situations will *not* have the same claim on general application as will knowledge created through scientific inquiry on natural phenomena (Checkland and Holwell, 1998b). It seems unfortunate that Klein and Myers (1999) have chosen the word *abstraction* to describe the application of knowledge created through social inquiry, and that the use of the word *generalisation* has not been discussed. Baskerville (1996) and Lee (1989) both approach the problem of generalising knowledge gleaned during social inquiry as only being possible if that knowledge has been *tested* in a number of different social situations, though such an approach ignores the uniqueness of each problem setting (Popper, 1959). The issue of generalising from a social inquiry process is implicitly intertwined with the difficulty of establishing the validity of learning outcomes from such inquiry. The problem of establishing the validity of a social inquiry process will be discussed later in this chapter.

The fifth principle offered by Klein and Myers, the "Principle of Dialogical Reasoning", requires the researcher to "...confront his, or her, preconceptions (prejudices) that guided the original research" and make the philosophical underpinnings of the research clear (Klein and Myers, 1999). Although this principle seems acceptable, Klein and Myers (1999) offer no guidelines as to how these preconceptions could be made evident to others interested in the research outcomes. Checkland and Holwell (1998b) argue that to provide "interested others" with the opportunity to "scrutinise" the research process, the problem area of interest, the initial framework of ideas and the methodology should all be declared in advance (also see Checkland, 1985a). Setting out these elements of the inquiry process seems crucial in order to establish the *validity* of any eventual learning outcomes amongst interested others and this issue is returned to later in this chapter.

In the "Principle of Multiple Interpretations" Klein and Myers (1999) suggest that the researcher should "...examine the influences that the social context has upon the actions under study by seeking out and documenting multiple viewpoints" (p. 77). The description of this principle seems underpinned by an assumption that the researcher is merely analysing the situation, rather than seeking to create a *shared appreciation* of the situation from the perspective of all those involved, as is the aim during *Client Led* information system design (Stowell, 1991, 1995a). Again it seems that those involved in the situation are being regarded as subjects of the research, rather than participants.

The last principle offered by Klein and Myers (1999) is the "Principle of Suspicion" which they adopt from Ricoeur (1976) and here the authors express a concern that the meanings created by those within the situation must be questioned. Klein and Myers (1999) argue that a researcher must reveal "socially created distortions" in the problem situation. They argue that the

work of Habermas (see Habermas, 1984, 1990) and also Foucault (see Foucault, 1977, 1986) has been influential in supporting interpretive field researchers revealing "power structures, vested interests and limited resources to meet the goals of various actors" (Klein and Myers, 1999, p. 78). To offer a practical method to reveal social distortions, Klein and Myers (1999) suggest an approach offered by Forester (1992), who sets out a means of analysing speech utterances by actors within a situation in a systematic manner. Approaches to analysing speech and conversations within social settings are discussed in Chapter 4, the important point to note is that none of the principles offered by Klein and Myers (1999) suggest that the researcher might become actively involved in the situation of focus and undertake some practical work in collaboration with those involved in that situation. Other researchers have argued for a more practical and participative approach to social inquiry and this work is usually termed: Action Research.

3.3 Action Research as a Framework for Social Inquiry

Lewin (1946), who is usually credited with first using the term Action Research (see Susman and Evered, 1976), recognised the difficulty in investigating social situations in his work on group discussion methods. He endeavoured to "...understand the laws which govern the nature of the phenomena under study, in our case the nature of group life" (Lewin, 1947, p. 151). Lewin attempted to carry out scientific experiments in an objective manner but, as argued by Gadamer (1989), such an approach is not tenable when undertaking research in human situations. Blum (1955) noted the complexity of the role of any Action Researcher as such a person is involved *in* the situation of focus and does not remain outside and detached. Churchman (1971, p. 224) commented on the difficulties of undertaking social inquiry, when even in a limited investigation it is "...no easy matter to develop suitable moral codes relative to the scientist's behaviour in society". Clark (1972) takes

up this theme and argues that the involvement of the researcher in the situation of focus must be accepted and reflected upon.

Susman (1983) suggested that Action Research as a framework for social inquiry, links theory and practice, so inquirers might achieve research objectives *and* useful practical outcomes in the situation of focus. Checkland (1983, 1985a) has also argued that thinking about the world and experiencing the world are both equal in importance and together create a learning cycle that enables the creation of new ideas, which help to make sense of new experiences. Employing an Action Research framework requires a researcher/practitioner to become involved in the situation of focus (Checkland and Scholes, 1990, p. 16) and for there to emerge, as a result of the inquiry process, identifiable practical outcomes in the situation of focus (Argyris et al, 1985). For this reason, many authors have argued that Action Research is particularly suitable for exploring research themes in the field of Information Systems (Baskerville and Wood-Harper, 1996, 1998; Breu and Peppard, 1999; Checkland and Holwell, 1998a; Checkland and Scholes, 1990; Dunning-Lewis, 1999; Holwell, 1997; Stowell and West, 1994; Stowell et al, 1990; Walsham, 1995). To help establish that an Action Research study has been undertaken with academic rigour, Checkland has argued for the intellectual framework of ideas used to be declared in advance of any work undertaken (Checkland, 1985a; Checkland and Scholes, 1990). Checkland and Holwell (1998b) extend this argument suggesting a notion of "recoverability", the idea being that an interested person ought to be able to recover the research process after the event. These ideas will be discussed later in this chapter. First, it important to be open and clear concerning the assumptions made regarding Action Research when planning the work on the UMISD project and the reasons for choosing to work within an Action Research framework.

3.4 The Characteristics of Action Research

Rapoport (1970) describes Action Research as "differing from other varieties [of research] in the immediacy of the researcher's involvement in the action process". He suggests the aims of an Action Research project ought to be:

> "...to contribute *both* to the practical concerns of people in an immediate problematic situation and the goals of social science by joint collaboration within a mutually acceptable ethical framework".
>
> (Rapoport, 1970, p. 499).

This definition has been extremely influential and ten years later Hult and Lennung (1980) offer a definition of Action Research that also places the emphasis on "practical problem solving [...] being performed collaboratively [...] aiming at an increased understanding of a given social situation" (p. 247). Argyris et al (1985) also suggest a similar focus for their concept of Action Science. They argue that research within social situations ought to be characterised by those involved in the situation participating in the inquiry process and collaborating with researchers, and by a focus on practice within the social situation through a process of inquiry and reflective learning (Argyris et al, 1985). These characteristics have become accepted in the literature, as standard elements of inquiry within an Action Research framework. For example, Co-operative Inquiry (Heron and Reason, 2000), Action Inquiry (Torbet, 1991, 2000) and Participatory Action Research (Elden, 1983; Whyte, 1991) are all approaches to Action Research underpinned by assumptions of participation of those involved in the situation, practical outcomes and reflection upon practice. Other authors have expanded upon these basic characteristics.

Eden and Huxham (1996) construct fifteen characteristics of Action Research, summarised in Table 3.2 below:

Table 3.2: Characteristics of Action Research from: Eden and Huxham.

1. The researcher becomes involved in the situation and is intent on bringing change to the situation.
2. The learning outcomes must be useful in other situations apart from the project domain.
3. Theory development is an explicit concern.
4. Any new designs for tools, techniques and methods must be related to the research design.
5. Theory emerges from the data and the original theoretical ideas.
6. Building theory is a cyclic process, occurring in small, incremental steps.
7. The style of presentation must recognise both prescription and description.
8. A systematic and orderly approach is required to establish the research to be of 'high quality'.
9. The exploration of the data and of the theory should be "capable of being explained to others".
10. Writing up is part of the reflection process.
11. The above ten points are "not sufficient" to establish the validity of Action Research.
12. Action Research is used to gain knowledge unavailable when using other methods.
13. It is preferable for findings to be supported through triangulation.
14. The problem situation history and context are regarded as being essential to the interpretation of any learning outcomes.
15. Any theory ought to be disseminated to a wide audience.

Summarised from: Eden and Huxham (1996, p. 539).

Eden and Huxham (1996) suggest each of these fifteen characteristics, or "standards" is "a test against which Action Research may be judged" and also, with refreshing honesty, state "we are not convinced that our own research has fully satisfied the standards we have set" (p. 539). In particular, Eden and Huxham (1996) argue that the insights gained through an Action Research inquiry can offer a unique perspective unavailable to a practitioner when other research methods are employed and that the knowledge created often "...cannot be gleaned in any other way" (p. 536). Eden and Huxham (1996, p. 537) also argue that any data that is collected cannot be expected to

"triangulate", but that the differences between various viewpoints held by those involved can act "... as an effective dialectic for the generation of new concepts". Nonetheless, these fifteen characteristics do not offer sufficient guidance to any Action Researcher, as they fail to provide any means of establishing the validity of any learning outcomes from an Action Research inquiry with a wider audience, such as an interested research community. Eden and Huxham (1996) simply suggest ensuring the "general value is disseminated" to a wider audience than the direct participants in the inquiry process (p. 539). The challenge for any Action Researcher is to become involved in the situation of focus and gain the collaboration of others in the problem situation, so that these others become participants. For the research to be judged as being *useful*, an Action Researcher must also establish that the research was tackled in a manner that is perceived *by others* to have been a *credible* effort undertaken with due care and attention (Checkland and Holwell, 1998b; Reason, 1993; Tsoukas, 1993).

The difficulty in establishing that an Action Research inquiry has been undertaken with due care and attention, or *rigour*, was commented on by Susman and Evered (1978) in their paper on Action Research. Susman and Evered (1978, p. 588) argue for "...a cyclic process with five phases: diagnosing, action planning, action taking, evaluating and specifying learning". They suggest that such an approach to undertaking research within social situations helps to create the "appropriate structures" to encourage "communication and problem-solving procedures" amongst those involved, such as "self-help skills" (Susman and Evered, 1978). Bargal et al (1992) also identify a continuous cyclic process of planning, action and evaluation as being central to Action Research. Although planning and preparation are essential, Susman and Evered (1978) and Checkland (1983) both argue that *predicting* the learning outcomes from an inquiry within a social setting is not possible and so inquiry within such situations ought to be *agnostic* to the outcomes of the

research. Checkland (1983) explains the concept of *agnostic inquiry* as not directing "...the learning outcomes towards some perceived to be desired end".

Checkland and Holwell (1998b) argue that planning activities and specifying learning outcomes does not necessarily permit scrutiny by an interested individual, not involved in the actual inquiry process. In order to plan an Action Research field study, it is important to consider how the researcher will establish that the inquiry was undertaken 'with rigour', amongst a wider audience. First, it is worth an examination of the contribution that the elements of *participation* and *local improvement* make towards creating a public perception of a valid inquiry process.

3.5 Participation in Social Inquiry

Participation in the inquiry process, by those involved in the situation of focus, is widely accepted as being a fundamental characteristic of Action Research (Baskerville and Wood-Harper, 1996, 1998; Borda, 2000; Breu and Peppard, 1999; Checkland and Scholes, 1990; Elden and Chisholm, 1993; Dunning-Lewis, 1999; Heron and Reason, 2000; Park, 2000; Reason, 1993; Stowell et al, 1997; Whyte, 1991). The emphasis on participation arises in part, as a move away from the methods of scientific inquiry that value 'objective observation' and 'measurable results', as such concepts are meaningless within social settings, where each person will have their own particular views concerning a situation (Checkland, 1983). Tsoukas (1993) suggests that one difficulty with a dependence on establishing the validity of the learning outcomes through participation in the learning process is that it is too easy for a single opinion to dominate. Reason (1993) also argues that participation alone is not sufficient and ought to be examined and explained. Most practitioners of Action Research do not rely only on participation to establish the value of an inquiry

process and deem the *practical outcomes* of social inquiry to be of equal importance, particularly any evidence of local improvement in the situation of concern.

3.6 Local Improvement Emerging from Social Inquiry

Many authors argue that research within social settings ought to result in identifiable learning outcomes within the situation of focus (Checkland and Holwell, 1998b; Elden and Chisholm, 1993; Elliot, 1991; Reason, 1993; Tsoukas, 1993; Stowell et al, 1997; Susman and Evered, 1978; Whyte, 1991). Elliot (1991, p. 49) argues that "...the fundamental aim of Action Research is to improve practice rather than to produce knowledge". This seems rather an extreme statement as such a view seems to overlook the usefulness of theoretical ideas in helping those involved in first making sense of a situation and of practice being improved by reflecting back on the action taken and the initial guiding ideas.

Susman and Evered (1978) and de Zeeuw (1995) have suggested that competence in problem solving and self-help skills are some of the practical outcomes of Action Research that help to establish validity in the longer term. Bødker (1996) argues that outcomes such as these will be very localised and specific to a particular group of people. She also suggests that groups gathered for specialised purposes (as is often the case in information systems design) can be disbanded at the end of a project, competent participants will disperse to other roles and so learning outcomes, such as problem solving skills, which may have emerged within a group will be uncertain in the longer term (Bødker, 1996). Dash (1999) has argued that establishing there has indeed been some local improvement within the situation of concern is still not sufficient to validate the wider usefulness of any knowledge created. He suggests that as improvement within the local situation may well cause detrimental effects

within the wider environment, it is necessary to reflect upon the long term after effects of an inquiry (Dash, 1999). Reason (1993) argues that in order to "judge the adequacy" of research reports and therefore, the validity of any generated knowledge, it is essential to discuss the epistemology applied. Indeed, Checkland has long argued for the epistemology to be declared in advance (Checkland, 1985a; Checkland and Scholes, 1990) and recent work has argued that a "notion of recoverability" is useful when undertaking inquiry within an Action Research framework (Checkland and Holwell, 1998b; Checkland and Scholes, 1999).

3.7 A Notion of Recoverability

Checkland and Holwell (1998b) argue that a "notion of recoverability" is essential when undertaking an Action Research approach to inquiry, as such a notion will support interested individuals in scrutinising the results. To achieve such "recoverability", they suggest that an open declaration of the aims of the inquiry and also of the intended research method, prior to involvement in the situation of interest is necessary and "without that declaration, it is difficult to see how the outcome of [Action Research] can be more than anecdotal" (Checkland and Holwell, 1998b, p. 14).

Checkland (1985a, p. 758) suggests that to make sense of any area of interest, a set of "...linked ideas in a framework F" can be applied by using a "methodology M" to explore an "area of concern A". By undertaking inquiry guided by a methodology it is possible to learn about the area of interest *and* "... about the adequacy of F and M" (Checkland and Holwell, 1998b). For the learning outcomes of inquiry within complex and uncertain social situations to be accepted as useful lessons, Checkland (1985a) argues that the framework of ideas, F, the methodology, M, and the area of interest, A, must all be "declared in advance". Such a declaration not only enables those involved in the inquiry

to make sense of the emerging experience, but also enables other interested individuals to scrutinise the learning outcomes and so make judgements concerning the credibility of the results (Checkland and Holwell, 1998b; Checkland and Scholes, 1999). Zmud (1998, p. 23) argues against having "...a well-defined research model" set out in advance as such an approach "...implies that a 'solution' is known *a priori* by the research team". He then contradicts himself by arguing that "practice-driven research is best served if the research team [...] bring a required expertise regarding prior research on a topic, relevant theories, and relevant research methodologies" (Zmud, 1998, p. 23). Zmud appears to confuse a "research model" with offering a "solution" to any perceived difficulties. Defining a "research model" in advance (Zmud, 1998) is *not* the same as offering a preconceived 'solution' to the difficulties faced by those involved. Indeed, the most challenging aspect of undertaking social inquiry is that the ideas concerning F, M and A, all may change as the inquiry proceeds (Checkland, 1985a). When undertaking inquiry within social settings, it is of fundamental importance to accept that "...achieving credibility, consensus and coherence does not make a 'truth claim' as strong as that derived from replicability of results independent of time, place and researcher" (Checkland and Holwell, 1998b).

3.8 Making a Choice

Stowell et al (1997) suggest that there are two different catalysts for an Action Research project. First, a project may be undertaken "...to explore an idea, or theory related to methodology" and second, "to use an existing approach to help clients learn about their problem situation" (Stowell, et al, 1997, p. 173). They suggest these different catalysts make it useful to consider two different modes of Action Research being available to a researcher in the field of Information Systems: "Field Study mode" and "Consultancy Mode" (Stowell, et al, 1997). They suggest that "Field Study Mode [...] is adopted as a [means

of learning about] ideas that have been formulated previously" and that in "Consultancy Mode [...] the prime motivation [is] to aid the clients to 'solve' their problems". An Action Research framework is adopted where the researcher is either already an intimate member of the group concerned with the problem situation, or becomes actively involved in the situation of concern through the inquiry process. This involvement means that the learning outcomes of the inquiry process will relate to the area of interest (A), the ideas applied within the situation (F) and the principles of inquiry chosen (M), in every single project undertaken. Differentiating between a focus on 'theory', and a focus on 'action' misses the point of Action Research where "neither theory nor practice is prime" (Checkland, 1985a). Whatever the catalyst for the research project, if F, M and A are all declared in advance there ought not be the intellectual need for two modes of Action Research as suggested by Stowell et al (1997).

Action Research was considered to be an appropriate framework for the purpose of undertaking the main field study for the work on the UMISD project, for three reasons. First, an Action Research framework for inquiry, employs theory to guide practice, which again in turn, through reflection on the experience gained, informs the development of any theoretical ideas employed (Checkland, 1983; Susman, 1983). Such a cycle of learning was considered to be appropriate in the research undertaken for the UMISD project as the researcher was to attempt to learn about a theoretical framework of ideas (discussed in Chapter 4) within a dynamic real world situation. Second, an Action Research framework supports a researcher becoming actively involved in the situation of focus and reflecting upon it (Checkland and Scholes, 1990; Elliot, 1991; Heron and Reason, 2000; Whyte, 1991). Practical involvement in the problem situation was considered to be essential for the field study if the researcher was to gain an *appreciation* of the perspective of those involved in the problem situation. Third, an Action Research framework supports a focus

on *practice* (Checkland and Scholes, 1990). If the created framework of ideas for supporting *Client Led* information systems design was to be evaluated in any meaningful way, it was necessary to use the framework in *practice,* to guide action in some real world situation. It was also hoped that the practical outcomes of such an inquiry would lead to some local improvement in the situation of focus and also that some of the learning outcomes would be of interest to the wider research community. To support any interested individuals in scrutinising the learning outcomes, it was decided to organise the field study by using Checkland's F, M, A model (Checkland, 1985a) and also to make a declaration of the ideas in advance.

3.9 A Declaration in Advance

Checkland's F, M, A model (Checkland, 1983) and the notion of enabling "recoverability" of the research process (Checkland and Holwell, 1998b) provided the theoretical guide for the field study. In attempting to make available to interested individuals a means of scrutinising the research process, the learning outcomes were published, as work progressed, in a series of academic papers, many of which were presented at conference (see Champion and Stowell, 1999a, b, c, 2000a, b; Stowell and Champion, 2000). The fact that these particular papers were all accepted for publication prior to the field study commencing enables this body of work to constitute a declaration of research ideas in advance. Interested individuals can follow the development of the research ideas and the emerging understanding of the researcher involved. The ideas develop through reflection and practice and these learning outcomes are discussed in Chapter 7. More recently published papers discuss the learning outcomes from the field study and form part of the reflection process that was undertaken during and after the field study (see Champion 2000; Champion and Stowell, 2001; Stowell and Champion, 2001). A selection of these papers is included in Appendix 3 of this thesis. Due to the different nature of Action

Research, it was decided that it would be desirable to gain some experience of undertaking social inquiry within an Action Research framework prior to the main field study being undertaken and so a small local study was completed.

3.10 Gaining Experience

The local study was carried out between 6th January and the 16th March 1999, in the Department of Computer and Information Sciences, De Montfort University, Milton Keynes. The purpose was to gain experience of undertaking inquiry within an Action Research framework and also to evaluate the potential use of the Appreciative Inquiry Method (AIM) (West, 1995) as a means of exploring the situation of focus in the planned main field study.

West (1995) describes AIM as an attempt to provide "a method of 'finding out' about a domain of interest". When using AIM, an initial question is entered into a central ellipse, which provides the focus for the inquiry. The client is then asked to add further ellipses describing their own perspective on the issue of focus and the resulting diagram is called a 'systems map'. To introduce the client to AIM, a simple example is constructed for the client as a demonstration in creating a systems map. The theme used for the demonstration must be unconnected to the issue of focus. Figure 3.1 below, shows the starting point given to the participants for the local study, after a demonstration of AIM concerning *buying a car* had taken place.

Figure 3.1: the starting point for the local inquiry using AIM (West, 1995), containing a central question provided by the Research Director.

The client then produces a systems map around this central question. Figure 3.2 provides an example of a completed systems map constructed during the local study.

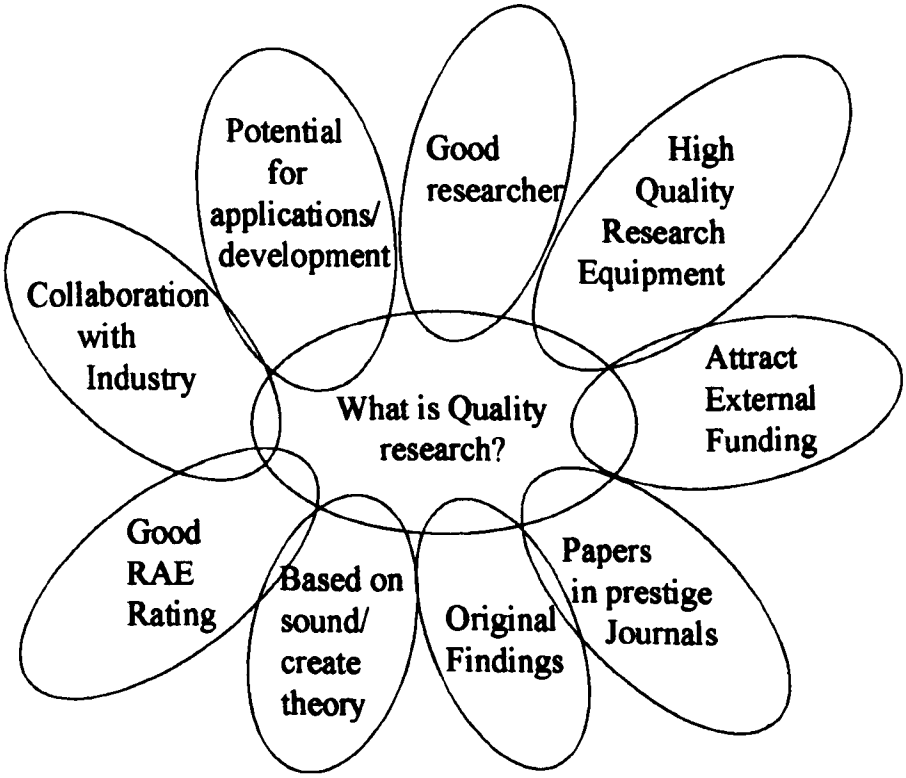


Figure 3.2: A completed systems map from the local study.

Once a systems map has been created, the practitioner then uses the mnemonic CATWOE (Customers, Actors, Transformation, Weltanschauung, Owner,

Environment) (Smyth and Checkland, 1976) as a guide to asking questions around each added ellipse. The 'CATWOE' questions are asked in natural English to avoid technical terms such as 'Weltanschauung' being used. Stowell (2000a) describes examples of phrasing for the CATWOE questions during this phase of inquiry. The practitioner then constructs one, or many, conceptual activity model(s) using the same approach as when undertaking inquiry guided by SSM. These conceptual activity models describe some action that may be relevant to the situation of focus (West, 1995).

In the initial study, it was found the process of undertaking AIM was time consuming and tedious for the client. Although drawing the initial systems map was quick and easy, following West (1995), the client was then required to think about each element of the CATWOE mnemonic for *each added ellipse*. For the systems map shown in Figure 3.2, this process took an hour and five minutes and was found to be a repetitive and almost mechanical method of discussion. Some of the time taken could be argued to be the researcher's inexperience, but if a client drew a map with many ellipses, it is possible the process could take longer even with an experienced researcher orchestrating the AIM method.

During the local study one of the participants experienced severe difficulty in creating a systems map. This particular participant had a background in developing Expert Systems using techniques from the field of Artificial Intelligence. The question placed in the central ellipse for the purpose of the local study was as shown in Figure 3.1 above: "What is Quality Research". This participant expressed discomfort about using such an unstructured means of articulating his ideas and at first produced a systematic description of *how* to do quality research. As this participant was willing to continue with the inquiry, AIM was repeated, but it was only on the third attempt that this person produced a diagram resembling a systems map.

West and Stansfield (1999) use the analogy of a singer, singing a song to describe the use of the ideas underpinning AIM within a situation. They suggest the song (the systems map of AIM) "is consistent with and capable of supporting interpretive inquiry, but the 'singer' (the analyst), needs to understand the essence of interpretivism and be able to put it into practice" (West and Stansfield, 1999, p. 81). West and Stansfield (1999) dismiss difficulties such as those experienced in the local study suggesting that "if the singer cannot use [his, or her] skills to overcome this resistance little can be done". Experience with any method will usually lead to an improvement in its application, though the purpose of using tools, such as AIM, is to create a shared *appreciation* of the situation, the tools act as communication devices. It seemed to rather defeat the purpose of using the AIM method to structure debate if a participant was uncomfortable using a systems map to express ideas.

As a communication device, asking questions around the CATWOE elements for each added ellipse was tiresome for both the client and the researcher. Crucially, the AIM method did not provide the researcher with an opportunity to become involved in the situation of focus as the researcher remained separate from any action. This was a major concern as it was considered to be fundamental to the framework of Action Research that the inquirer (in this case the researcher) was actively involved in the situation of focus (Argyris et al, 1985; Checkland, 1981; Reason, 1993; Rapoport, 1970). AIM was considered to be a useful means of expanding upon a problem theme, but offered limited support as a means of undertaking exploration for the purposes of the field study. Indeed, the experience of applying AIM in practice suggested that an initial exploration of the situation of focus would still be needed to formulate any questions for the central ellipse required in order to initiate an investigation. The initial study using the AIM method did provide

valuable experience, particularly in making the researcher aware how much time was needed to undertake various activities, such as organizing a meeting and discussing issues with a client. This experience also raised the researcher's awareness of the importance of the *manner* of use of any modelling method, or technique and this was to become an important theme of the research.

It was decided that the constitutive rules of SSM might provide a much more versatile guide to exploring the intended situation of focus (the Credit Card Debt Management section within Abbey National plc) of which the researcher had no previous experience. First, it was necessary to explore what principles of method SSM offered as a guide during an inquiry within a complex human situation.

3.11 Principles of Method

In the *Thirty Years Retrospective* (Checkland and Scholes, 1999) Checkland describes the four key thoughts that have shaped "SSM". First, he regards the notion of a situation as being a "human situation in which people [attempt] to take purposeful action" as being an essential principal of inquiry (Checkland and Scholes, 1999, p. A7). Second, the idea that each individual will have their own Weltanschauung and so the views emerging would be "many and various" has been crucial (Checkland and Scholes, 1999). Third, the idea that 'systems ideas' ought to be applied to the *inquiry* process itself and not be used to describe the world is a fundamental underpinning concept of SSM (Checkland and Scholes, 1999). Indeed Checkland describes SSM as "an organized *learning system*" (Checkland and Scholes, 1999, p. A8) (Checkland's italics). The fourth idea that emerged from the work on SSM was the usefulness of the ideas during a process of information systems design and development.

Holwell (1997) examines the "role of SSM in the field of Information Systems" and argues that many authors have poorly understood the ideas, although this situation has not prevented a large secondary literature on SSM developing. Holwell (1997) argues that the Constitutive Rules of SSM have perhaps not been sufficiently clear to promote more innovative Mode 2 use of SSM and she offers three such rules, which Checkland (Checkland and Scholes, 1999, p. A 35) endorses. A user of SSM must:

> 1. "...act according to the assumption that social reality is socially constructed, continuously".
>
> 2. "...use explicit intellectual devices consciously to explore; understand and act in the situation in question".
>
> 3. "...include in the intellectual devices 'holons' in the form of systems models of purposeful activity built on the basis of declared worldviews".
>
> (Holwell, 1997, p. 401).

SSM is "not a prescriptive method" (Checkland, 2000, p. 801) and different practitioners will use the ideas in different ways. In particular, as a practitioner gains experience using the ideas underpinning SSM as a guide for inquiry, the application of the ideas will become more flexible and innovative and more "Mode 2 like" (Checkland, 2000). This contrasts with a more stage by stage approach that may emerge if a practitioner uses the seven-stage Mode 1 model of SSM described in Checkland (1981).

The necessity of reflecting back upon the learning process in a continuous cycle of learning is emphasized in the work of Susman and Evered (1978) and has parallels with the hermeneutic circle (Dilthey, 1961; Gadamer, 1989). Reflecting back upon the learning gained by the author through the experience of the local study, it was also important to consider if the participants would find any intellectual devices employed during the inquiry, easily

understandable. Action Researchers have used SSM as a guide for inquiry for thirty years (Checkland and Scholes, 1999) and the devices employed within the methodology are well established as useful tools for debate.

As a guide to inquiry, SSM offers a flexible set of ideas to support an inquirer becoming involved within the situation of focus and a number of *practical* devices for exploring and making sense of the cultural and political elements of a problem situation have also become established. For example, a means of discussing and managing expressions of power within a situation is offered, by using the metaphor of "power as a commodity" (Stowell, 2000b). Rather than participate in "fruitless argument" concerning "what is power", Stowell offers the idea of the "commodity metaphor [...] to 'free' public debate about the effects of organizational power as perceived by those who participate in the debate" (1989, p. 286). The advantage of this metaphor is that it is useful for "deft, light-footed and flexible use" of SSM that Checkland argues is characteristic of SSM Mode 2 (Checkland and Scholes, 1999, p. A35). The use of the metaphor need not be limited to the initial phases of inquiry it can be used openly in debate, or in private reflection, to support *sense making* at any moment (Stowell, 2000b). This seems particularly valuable in social settings where perceptions of the problem situation will be changing all the time.

3.12 Summary

An Action Research framework for the field study was adopted as such a framework employs theoretical ideas to guide practice in an iterative cycle of learning. The researcher was to be further guided during the inquiry by using the rules constituting SSM and some practical intellectual devices for structuring the debate. The area of concern for the UMISD project was to explore means of supporting a *Client Led* approach to information systems

design. Such an approach to information system design would entail those involved in exploring the problem situation and creating ideas for purposeful action that might bring improvement to the situation. If these ideas for purposeful action are to be operationalised, it may be necessary to design a *serving* information system and so the inquiry must shift to consider this new focus. To accomplish this shift, the inquiry process must move from thinking about the *action* to thinking about the *support for action*. It is the creation of this path from ideas for purposeful action, to support for that action, that is the primary focus for the research presented in this thesis. The framework of ideas created is discussed in the next chapter.

Chapter 4

From Ideas for Purposeful Action to Ideas for Support

4.1 The Challenge

In Chapter 2, it was argued that most approaches to information system design failed to provide support for those involved in the problem situation making sense of their situation and *thinking about* and conceptualising purposeful action that may bring improvement. In recognition of this difficulty some authors have attempted to employ Soft Systems Methodology (SSM) as a guide for inquiry during the exploration of a particular problem situation in the initial stages of the information system design process. In this chapter it will be argued that despite much attention to the problem, researchers have been unable to provide coherent support for the movement from any *ideas for purposeful action* created by those involved in the situation, to thinking about *support for that action.* The lack of guidance for making this change in focus, in a logically sound and coherent manner becomes particularly problematic when the desired support includes a technology-based information system. One of the main reasons such difficulty occurs, has been argued to be the different epistemology applied during inquiry in social situations to that employed during the construction of a specification for any supporting information technology (Doyle, 1991a, b; Miles, 1988; Prior, 1990, 1991, 1992; Stowell and West, 1994). The challenge was to find some way of traversing this *gap* between, using intellectual devices suited to guiding inquiry in social settings, to using intellectual devices suited to constructing the logical specification for an information system. First, it is necessary to review the work of others who have attempted to use conceptual activity models, or holons, constructed during inquiry guided by SSM, as a starting point for information system design and in doing so have experienced difficulty.

4.2 Using Holons in Information System Design

The difficulty in moving from holons constructed during a debate guided by SSM to the sort of models employed to guide the construction of technology-based information systems has been discussed by many authors (Doyle and Wood, 1991a, b; Doyle et al, 1993; Guo et al, 2000; Gregory, 1993; Gregory and Lau, 1999; Gregory and Merali, 1993; Lai, 2000; Lewis, 1993, 1995; Liang et al, 1998; Mathiassen and Nielsen, 2000; Miles, 1988; Mingers, 1995; Prior, 1990, 1991, 1992; Savage and Mingers, 1996; Sawyer, 1991, 1992; Stowell, 1985, 1991, 1995a, 1999, 2000a; Stowell and West, 1994; Stowell et al, 1990). Miles (1988) argued that attempts at using SSM as a guide during information system design could be thought of as being attempts to "graft" a Soft Systems Methodology "front-end" onto techniques used when conducting "structured systems analysis", or as attempts to "embed" such techniques within SSM. Lewis (1993) argues that such terms are misleading, as there is "...an abrupt and distinct division" between inquiry guided by SSM and inquiry using techniques to undertake structured systems analysis. This division is seen most clearly in the fundamentally *different* way that models are used in SSM guided inquiry to the way that models are normally used by those adopting a scientific approach to inquiry, the approach that has underpinned the creation of most means of undertaking software design.

Many of the modelling techniques, used in the process of designing the technological parts of an information system, are recognised by their creators as being only intellectual devices. The models are however, *used as if they are able to represent* the real world situation (Checkland, 1995a; Graham, 1998; Lewis, 1993). Indeed, when building technology-based information systems, using a *representation* of the real world situation is often considered to be the most satisfactory means of ensuring that the software will meet requirements and also that the underpinning computer program has been built correctly (Graham, 1998; Pressman, 1997; Henderson, 2000; Sommerville and Sawyer, 1997; Zedan et al, 1999, 2000). The process of checking that the computer

program is correct and robust (verification) often employs mathematical testing techniques to *prove* that a computer program will function as expected (Pooley and Stephens, 1999).

As discussed in Chapter 2, in order to employ SSM as an initial guide to exploration and *sense making* within a particular situation various authors have attempted to use conceptual activity models, or holons, as a starting point for a logical specification for an information system (Avison and Wood-Harper, 1990; Gregory, 1993; Gregory and Lau, 1999; Guo et al, 2000; Lai, 2000; Liang et al, 1998; Mathiassen and Nielsen, 2000; Prior, 1990; Savage and Mingers, 1996; Stowell, 1991; Stowell and West, 1994; Wilson, 1984). There are some differences between these approaches, but most authors attempt different ways of "fleshing out" the conceptual activity models in order to represent the real world action under consideration (Doyle et al, 1993). The term *fleshing out* has been used to describe attempts to expand the conceptual activity models to provide a representation of any potential part of the real world situation. Doyle et al (1993) argue that such attempts are not logically sound as the conceptual models created during SSM guided inquiry are not intended to represent reality, they are simply relevant to debate.

Savage and Mingers (1996) attempt to effect a "conversion" from a conceptual activity model to an entity relationship diagram using Jackson System Development (JSD) (Jackson, 1982). Savage and Mingers (1996) report that this attempt resulted in little of the original conceptual activity model remaining, once the entity relationship diagram was complete. This work seems underpinned by an effort to *translate* a conceptual activity model into another different model that is suitable for constructing a technical specification for an information system. Savage and Mingers (1996) in reflecting upon their work, regard this effort as running "the risk of compromising" the philosophical underpinnings of SSM and offering "a solution" to the problem rather than possibilities for improvement.

Gregory (1993) regards the activities expressed in a conceptual activity model created during SSM guided inquiry as "commands" and Gregory and Lau (1999) attempt to "convert" these "commands into truth bearing propositions". Gregory and Lau (1999, p. 128) argue that for conceptual activity models to be used in the design of information systems, some representation of "causal sequences" must be derived. The authors of current approaches to designing *software* do suggest that a complete and systematic description of what the software is required to do is needed (as discussed in Chapter 2). But the attempt to move directly from some ideas for purposeful action, to a causal sequence of tasks in order to facilitate the construction of a technical specification, is not logically sound. As argued by Checkland (1981, 1983, 1995a) and Doyle et al (1993), conceptual activity models do not *represent* any real world activity and it is not possible to convert these models into causal sequences of events.

Stowell and West (1994, p. 168) in their discussion of work undertaken at Waverly Randall use a conceptual activity model to express some ideas for purposeful action to be undertaken by the Commercial Department. From this "description" of purposeful action, Stowell and West (1994) suggest moving immediately to discussing possible information system support (p. 35 and p. 168) by using Data Flow Diagrams as a communication device (p. 173-174) (and discussed in Chapter 2 of this thesis). Liang et al (1998, p. 165) in attempting to further develop the ideas of *Client Led Design* suggest that the difficult "transition" to make is from "...what is known and understood about a situation" to a "representation of this situation using an object model". The approach employed by Liang et al (1998) is to use the device of a conceptual activity model (which they refer to as simply an "activity model") in order to express the clients' requirements for the information system. They then attempt to provide a means of direct and "seamless" (Liang et al, 1998) mapping from the activity models created during inquiry guided by SSM to an object model of the activities to be

undertaken. This manoeuvre occurs via a complex series of tables, using object-oriented methods, in a manner that requires some considerable technical expertise. Overly technical approaches defeat the original purpose as a lack of technical knowledge can exclude people from participating (Savage and Mingers, 1996). This object model of the activities that are meaningful to those involved in the situation acts as the first stage in constructing the logical specification. The process of moving from the conceptual activity models to an object model though is problematic as the activity models do not provide the level of detail that is required when constructing a logical specification for a technology-based information system. It is the argument of this thesis that Liang et al (1998) move too quickly toward creating the object model. After creating some ideas for purposeful action (Winter et al, 1995), those involved in the design process first need to consider *how* the intended purposeful action *might* unfold in the situation of focus, *before* thinking about how to support that action with a *serving* information system.

In a similar fashion to Liang et al (1998), Lai (2000) moves from "meaningful conceptual activities" directly to identifying "object types across the enterprise" and also to identifying "information categories to support meaningful activities". The difference in the approach taken by Lai (2000) to that taken by Liang et al (1998), is that Lai uses the definition of an information system to be a *system to serve purposeful action* (Checkland and Scholes, 1990; Winter et al, 1995). However, Lai (2000) still moves from ideas for purposeful action expressed in a conceptual activity model, *directly* to identifying words that can represent 'objects' within the technical specification, an approach already criticised in Chapter 2.

The approach suggested in the framework of ideas within this chapter is perhaps closest to the ideas of Prior (1990, 1991, 1992) where he suggests moving from a *conceptual* activity model to a *conceptual* Data Flow Diagram. Prior is clear on the point that the DFDs created from thinking about the

information flows associated with undertaking any activity expressed in a holon are *conceptual* models. However, Prior is still attempting to effect a translation from one model to the next, though he accepts this conversion is not a mechanical activity and he suggests that there is continuing interpretation and learning occurring during this phase of inquiry (Prior, 1990, 1992).

The main difficulty with all these approaches is the repeated attempts to move *immediately* from some ideas for purposeful action expressed through conceptual activity models to some technical specification. The gap is simply too immense. Any ideas for purposeful action (*the system to be served*) need to be considered *in context*. Some authors argue that if the action is to be implemented there will be additional activities related to undertaking that action *in practice* (Mathiassen and Nielsen, 2000; Mingers, 1995; Savage and Mingers, 1996).

Mathiassen and Nielsen argue that employing the ideas underpinning SSM during information system design is problematic because the notion of human activity systems effecting a "transformation [...] corresponds to a classical flow-oriented notion of IS based on batch-processing technology and it is [in their] experience too limited" (2000, p. 244). The origin of this misconception by these authors is perhaps explained by their statement that "a transformation system [in SSM] defines a mapping between inputs and outputs with a particular focus on the overall change". The models created during SSM guided inquiry, do not describe or map, real world activity, the models are intended to convey ideas that are *relevant* to the situation, from the perspective of those involved. Mathiassen and Nielsen (2000) use an example from a case study to illustrate their argument, where "unmanaged resources" are transformed into "managed resources" via a "management system". They argue that the idea of transformation is "somewhat redundant" as:

> "a would-be problem-solver might not be able to find any tangible evidence of 'unmanaged' resources. A more likely situation would be to find managed resources –some poorly managed, some excellently managed –but nevertheless managed. This conception [transformation], as a consequence, does not contain any more information than a transformation of resources into resources".
>
> (Mathiassen and Nielsen, 2000, p. 248-9).

This extract reveals Mathiassen and Nielsen's expectation that the models created during SSM guided inquiry will contain some objective truth statements about the situation of focus rather than act as simply debating tools. If root definitions are found to be irrelevant, Mathiassen and Nielsen ought to discard them and begin again. It seems that, as is often the case in information system design, there is a rush to provide a 'solution' rather than first attempt to find out *what* the problem is and *what* purposeful action *might* bring improvement.

Mathiassen and Nielsen (2000) suggest that those involved in a situation of concern need to use other sorts of models, in addition to conceptual activity models, in the process of information system design, to help those involved identify any "extra activities" required if the action is to be implemented. They suggest using "conceptual models of interaction systems" to "explicate, not only the activities and their relations, but equally important the domain and the relations between the activities and the domain" (Mathiassen and Nielsen, 2000, p. 252). This sentence again seems underpinned by a desire to *explain* activity, rather than to explore a situation from the multiple viewpoints of those involved and to create ideas for purposeful action that might bring improvement to that situation. Crucially Mathiassen and Nielsen (2000) provide no means of moving on to producing a logical specification for a technology-based information system. The present

author would however, concur with Mathiassen and Nielsen, that the use of other devices does seem useful.

During a process of information system design, reaching some accommodation among a group of people for some ideas for purposeful action that may bring improvement, is only the first part of the journey. Thinking about ideas for purposeful action in context and considering any opportunities for technology-based support may increase the possibilities for action by those involved. Another phase of debate to reflect upon these possibilities seems essential if a *serving* information system is desired. It is argued that the above attempts at using conceptual activity models in a process of information system design move too quickly to specifying the design of the technological support, whereas what is needed is further consideration of how the potential purposeful action *might unfold in context*. This seems particularly pertinent, if situations such as occurred in the development of the asylum computer system (Morris and Travis, 2001) (Chapter 1) are to be avoided.

4.3 From Action to Support

To enable those involved in a problem situation (the clients) in creating information systems that *serve* purposeful action, it is necessary to first enable the clients to explore their situation and reach some accommodations on what action to take (Checkland and Holwell, 1998a; Stowell, 1991, 1995a, 2000a; Stowell and West, 1994). The emphasis when using SSM as a guide to inquiry is on being creative when thinking about the situation of focus and on debating fresh ways in which the situation might be improved from the perspective of those involved. During such inquiry, notional systems that *may* be relevant to the situation of focus are modelled as conceptual activity models. These systems models, or *holons,* express purposeful action from the perspective of a declared Weltanschauung, or worldview (Checkland, 1981; Checkland and Holwell, 1998a; Checkland and Scholes, 1990). Such models

are employed to support debate amongst the clients about the perceived situation, that is they are *sense making* devices and are not intended to be "...would-be descriptions of real world purposeful action" (Checkland and Scholes, 1999, p. A27). Through participating in debate supported by such models, those involved in the inquiry process learn their way to accommodations concerning what purposeful action might bring improvement to the situation (Checkland and Scholes, 1990). The operationalisation of any agreed action will often also necessitate those concerned in thinking about how some desired action might be served by an information system. If the need for some guide to inquiry to make sense of a problem situation as perceived by those involved is acknowledged then, as argued in Chapter 3, SSM constitutes a well known set of ideas to support such inquiry. Indeed *Soft Systems Methodology in Action* (Checkland and Scholes, 1999) contains a *Retrospective* on the use of the ideas underpinning SSM over the last thirty years. It is in taking the next step toward designing a technology-based information system to *serve* the desired purposeful action that the difficulty lies.

For any action to be supported by an information system, it will be necessary to undertake a consideration of how the action might unfold in the real world situation, considering if there would be any operational constraints, or any required support in the form of new resources or training. The conceptual activity models expressing ideas for purposeful action are often redrawn to express what are considered to be "feasible models" of purposeful action (Checkland, 1985b). The cycle of learning then moves on to reflect upon the new problem situation which will include "...the implementation of the changes" (Checkland, 1985b, p. 822). Checkland (1985b) argues that using the ideas underpinning SSM can also support those involved learning about this new problem situation, by undertaking a further iteration of conceptual modelling. The difficulties arise when the implementation of any action requires a technology-based information system for two reasons. First,

some authors suggest that there are extra activities *specific to implementation* that must be considered (Mathiassen and Nielsen, 2000; Mingers, 1995; Savage and Mingers, 1996). Second, the manner in which technology-based information systems are currently designed requires a systematic description of the process to be supported by the technology, to enable software design (Kristen, 1996; Pressman, 1997; Sommerville and Sawyer, 1997; Zedan et al, 1999). Conceptual activity models express human activity systems *relevant* to the situation and do not provide the contextually detailed descriptions currently required by the developers of software (Checkland, 1995a; Liang et al, 1998; Stowell and West, 1994).

When creating holons, the CATWOE mnemonic (Customer, Actors, Transformation, Weltanschauung, Owner and Environment) (Smyth and Checkland, 1976) can be used as a guide during the construction of well-formed root definitions and conceptual activity models. The elements of the mnemonic encourage an initial consideration of contextual issues of any particular human activity system under consideration, as does consideration of the efficacy, efficiency, ethicality, elegance and effectiveness of any intended purposeful action (called the "5 E's") (Checkland and Scholes, 1990, p. 288). Liang et al (1998) argue that the CATWOE mnemonic does not provide sufficient detail to construct a logical specification for an information system as although this mnemonic enables an inquirer to explore the action, designing technological support requires a focus on the *functionality* of the support system. Similarly the so-called '5 E's' facilitate debate and reflection concerning the *overall* activity system under consideration, whereas creating a *serving* information system will require knowledge concerning the intimate detail of possible purposeful action.

It seems that the changing problem situation from a concern with *sense making* within a situation and creating ideas for action, to a concern with constructing a logical specification for a supporting information system,

requires further *careful* thought and reflection. A further phase of inquiry seems necessary as the ideas that emerge from debate supported by SSM, are ideas for purposeful *action*, not support. These may be well-formed ideas, as were the information strategies created in the studies described by Checkland and Holwell (1998a), or the ideas for new action for a Commercial Department described by Stowell and West (1994). But the conceptual activity models do not describe the way these ideas for purposeful action might be undertaken in actuality (Doyle and Wood, 1991a). Crucially, if the ideas for purposeful action require a *serving* information system those involved in the inquiry must make some *shifts in thinking*, from thinking about *action* to thinking about *support* for that action. Indeed to create, or adapt, an information system the focus of inquiry will move from thinking about what action to take, to thinking about the operationalisation of that action and then on to what support might be required. These subtle, but *fundamental* changes in emphasis can be very difficult to conceptualise and manage in a logically sound and coherent manner.

If there is an intention to create an information system to support some purposeful action, it is suggested here that those concerned first, conceptualise how that action *might* be undertaken in the real world situation, that is *in context*. A *contextualised*, or detailed view, of the intended action is currently required by developers to enable them to construct any software required. It is this necessity for an absolute and unambiguous description of the process to be supported, often euphemistically referred to as the 'needs of the user' in texts on software engineering, (see Pressman, 1997 and also Sommerville and Sawyer, 1997) that creates so much difficulty in moving from some ideas for purposeful action, to a logical specification for a serving information system. The latter must be a structured, consistent and comprehensive description of required functionality so the developers can build an appropriate computer program. In other words, the knowledge about the situation must be

marshalled into a suitable format to enable the construction of the logical specification.

There seems a need for some different intellectual device(s) to provide support for a debate to consider the action *in context*. Any intellectual device(s) employed must enable all participants in the inquiry (clients *and* developers) to move from any ideas for purposeful action, to ideas for support, via some ideas on *how* the action *might* unfold in reality. Indeed if a technology-based information system is required this would seem the most crucial phase of debate. In considering how the ideas for purposeful action might unfold in a practical real world sense, it will be important to consider any technological constraints, but it is also essential to retain the sense of the information system existing to *serve* the action. Stowell (1991, 1995a, 2000a) argues that it is all too easy to permit the needs of the technology to drive the design of the action to be taken. The development of intellectual devices to guide inquiry through such a change has been suggested as being highly desirable in the quest to facilitate *Client Led* information system design, rather than limited client participation (Stowell, 1991, 2000a; UMISD, 1998). The ideas described in the next sections are directed at *navigating* the inquiry process through this difficult phase.

4.4 The Idea of a Unifying Layer

As part of the effort to think about the problem area that this research was attempting to alleviate, a model was constructed that expressed the initial ideas concerning how an inquiry process for information system design might be organized. During the work on the project, the model was continually adapted and the unfolding learning is discussed in Chapter 7. The iteration of the model provided below is the version that guided the researcher's thinking in organizing the Action Research field study.

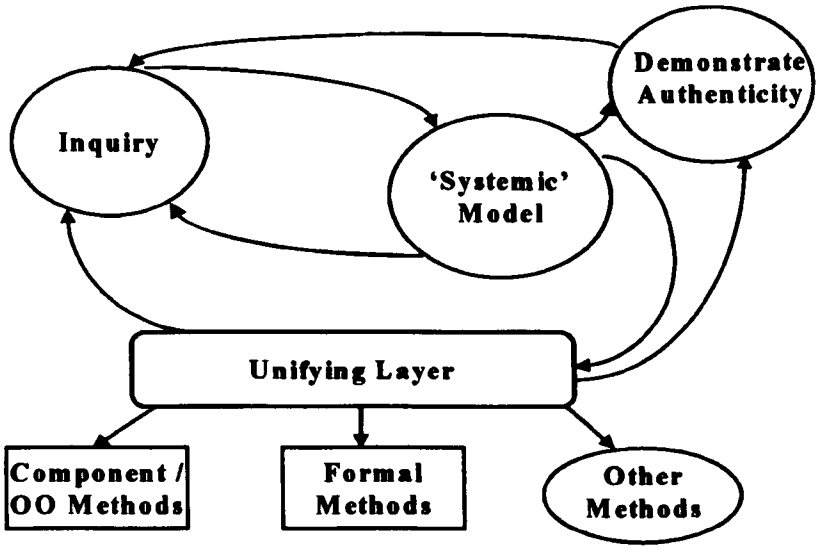


Figure 4.1: Described as "a model for interpretivist inquiry for IS design" in Champion (2000).

The model in Figure 4.1 above, was an attempt (if a somewhat clumsy one) to describe the sort of inquiry process that would need to unfold to facilitate an interpretive approach for *Client Led* information system design. An initial *sense making* phase of inquiry would need to occur in order to create some ideas for purposeful action expressed in a systemic model, or models (holons). After an exploration of the problem situation, further modelling would be needed to conceptualise how these ideas *might* unfold in the situation of focus. This phase of inquiry is described as occurring in the so-called Unifying Layer. The term: 'Unifying Layer' was chosen primarily to reflect the name of the UMISD project (Unified Mechanism for Information System Definition). This name does also emphasize the need to bring together the ideas for purposeful action that are hoped will improve the situation and ideas on how to creatively support that action with a technology-based information system, whilst also bearing in mind the principles for building well-engineered technological support. It was argued that this extra phase of inquiry could be supported by the use of some intellectual device(s) to support debate and discussion through this difficult change in focus (Champion and Stowell,

1999a, b, c). Such intellectual devices would need to be either adapted devices, or new devices, developed for the purpose of facilitating debate about the changing problem situation. Once ideas for purposeful action have been created, it is important they are considered *in context*. The problem situation will then shift again, this time to a focus on the support for that action and on the difficulties of creating a logical specification for the technology-based information system. Figure 4.1, suggests that the devices used to conceptualise the *serving* information system might be from object-oriented approaches, or more formal approaches, or other software design approaches. Figure 4.1 also attempts to express the idea that those involved in the situation of focus, must perceive the design for the information system to have been created through a genuine, or *authentic,* attempt to design an information system to *serve* the desired action. The ellipse entitled 'demonstrate authenticity' refers to this idea. The model in Figure 4.1 has several shortcomings, discussed further in Chapter 7, but this model was useful in expressing the research ideas at this stage and as such it expresses the framework of ideas used to guide the field study.

The purpose of any intellectual devices employed in the phase of inquiry referred to as the Unifying Layer is to support the participants moving from one set of ideas (ideas for purposeful action) to another (ideas for support). The next step was to consider what was required of any further devices employed to support *navigation* from ideas for purposeful action, to ideas for technological support.

4.5 A Detailed View of Ideas for Purposeful Action

To facilitate the creation of an adequate technical specification, from which to begin building the necessary software, it has been suggested above that it would be useful to create a contextualised view of *how* the intended action *might* unfold in practice. One of the central concerns when constructing the

logical specification for a technology-based information system is the necessity to check for consistency and completeness (Edwards et al, 2000; Graham, 1998; Pressman, 1997; Henderson, 2000; Sommerville and Sawyer, 1997; Zedan et al, 2000). Due to the sheer unpredictability of the future, learning about the situation will never be complete (Checkland and Scholes, 1990; Stowell and West, 1994) and so any ideas of how the potential action *might* be performed will always be associated with uncertainty and some ambiguity. In the field of Software Engineering the word *model* is often taken to mean a *representation* of some part of the real world, as it is in many scientific and technological approaches to inquiry (Checkland, 1995a; Checkland and Scholes, 1999, p. A 21). It is important then, to emphasize that any *models* created in the phase of inquiry called the Unifying Layer will only be *ideas,* or *expressions,* of how the intended action *might* be performed; these models are not *descriptions* of what *will* occur. Such models are constructed to support those involved in *navigating* from conceptualising purposeful action, to conceptualising support, through a collaborative debate.

Reflecting upon the literature and the experience of undertaking the field study in Abbey National plc (described in Chapter 5), has resulted in the term Unifying Layer being replaced with the more appropriate term: the *navigational* phase. The word *navigate* conjures up an image of inquirers 'creating a route' that seems appropriate amongst endless possibilities. This notion of *navigation* is discussed further in Chapters 7 and 8. The challenge in designing an information system perceived by those involved as *serving* the purposeful action they wish to undertake, is to move *(navigate)* from ideas for purposeful action to some ideas for support, in a coherent manner.

4.6 A Sense of Coherence

Mingers (1995) and Stowell (1995a) have criticised Multiview, for not linking the knowledge created during an inquiry guided by SSM, in any coherent

sense, to the design of a logical specification for the technology-based support. Maintaining a *sense of coherence* was a fundamental concern if *Client Led* information system design was to be achieved. The movement from thinking about ideas for purposeful action, to thinking about support for action, must be obvious as being a move to a different phase of inquiry, whilst also maintaining a sense of coherence between the action and the support for action. By using SSM as a guide, the ideas for purposeful action are expressed as conceptual activity models, or holons, and so it would seem useful for any intellectual devices employed in the next phase of inquiry to also offer an *activity-based* view, in an attempt to maintain a sense of coherence.

The intention of the UMISD project was to develop some means of supporting *Client Led* information system design, but it was considered to be unlikely that a design for a technology-based information system could be derived from the ideas for purposeful action alone, some technical 'know-how' would be required (Stowell, 1998). One of the purposes of undertaking an extra phase of modelling and debate, was to support the clients involved in the problem situation, to appreciate both the possibilities, and the limits, of what could be realistically achieved. The clients need to come to an *appreciation* of the necessity for some parts of the information system to be ordered in such a way as to provide a 'well-engineered' information system. Similarly, the developers need to come to an *appreciation* of the difficulties and issues perceived by those in the problem situation, so as to understand the intended application of any technology. Further debate will be required to reach a *shared appreciation* of meanings held by all those involved in the problem situation.

4.7 Creating a Shared Appreciation

The literature, and experiences of other researchers, described above, provide those currently grappling with these issues, some guidance on ways forward.

On critical reflection of this work, it is suggested here, that the main purpose of using any intellectual devices employed within the *navigational* phase is to support debate. These devices are intended to be *communication* devices. There seems a particular need to create a shared *appreciation* between the clients and developers, when moving on from thinking about (conceptualising) *action* to thinking about *support*. Overly technical or complex models defeat this purpose. The experience of using AIM during the local field study had provided an example of how even seemingly simple devices can cause difficulties in some situations. It was essential then for any intellectual devices suggested as being useful in supporting *navigation*, to also be tried out in a practical real world situation.

4.8 Intellectual Devices for the Unifying Layer

The holons constructed during SSM guided inquiry, are created as expressions of human activity systems from a particular viewpoint. Checkland argues that constructing a holon is informed by real world experience and knowledge "but, crucially, [such experience and knowledge] must not dominate" (Checkland and Scholes, 1999, p. A 26). Over the thirty years that the ideas underpinning SSM have been in use, a public perception of the value in using holons, or conceptual activity models, to stimulate debate and support an exploration of the problem situation, particularly during information system design, has been established (see Forbes, 1989; Holwell, 1997; Stowell, 1995b). Holons, have also become established as useful devices for supporting those involved in the problem situation in conceptualising what purposeful action might bring improvement (Checkland and Scholes, 1999). Savage and Mingers (1996, p. 126) note that if one attempts to use holons to describe information system requirements "there is a danger that having this [...] objective in mind could distort the use of [the ideas underpinning] SSM [...] by encouraging users to write very specific root definitions". Once those involved in a problem situation have conceptualised some purposeful action

that *may* bring improvement, it would seem useful to employ some *different* intellectual device(s), to facilitate the move to thinking about support, whilst also maintaining a sense of coherence.

One of the modelling techniques considered as possibly being useful as an intellectual device for the phase of inquiry termed the Unifying Layer in Figure 4.1, was "Cognitive Mapping" (Eden et al, 1983). Eden (1988) has argued that Cognitive Mapping is suited to the design of decision support systems as part of the SODA[14] approach (Eden, 1989). Heintz and Acar (1994) also suggest using a form of Cognitive Map, that they refer to as a "Causal Model", in the design of group decision support systems. Heintz and Acar (1994, p. 296) point to the difficulty in "eliciting causal maps [...] because of the large number of factors and relationships that may exist". Such Causal Models or Cognitive Maps are used to *describe* the situation of focus and do little to support those involved in that situation in creating fresh ideas for purposeful action. As a starting point for information system design, the advantage of employing Cognitive Mapping, or Causal Models, is that these devices can be used to provide a structured description of the situation from which it is possible to begin to think about the logical design for the information system (Bennett et al, 1997; Eden, 1989). The disadvantage of such devices is that the problem situation is then reduced to a description of 'when this happens, then that is the result' and there tends to be an accompanying focus on the decision-making opportunities in a situation (Bennett et al, 1997). Such a focus has been criticised for being underpinned by a rather limiting, rationalistic view of 'organization' (Checkland and Holwell, 1998a; Ciborra, 1984; Holwell, 1997; Winograd and Flores, 1987).

The idea that conversations in a social setting can be regarded as enabling co-operative action has resulted in some interest in modelling conversations in organizational settings as a precursor to information system

[14] Discussed in Chapter 2.

design (Ågerfalk et al, 1999; Dietz et al, 1998; Flores and Ludlow, 1981; van Reijswoud et al, 1999; Winograd and Flores, 1987). Conversation modelling, as a technique, has been criticised for being difficult to undertake, overly detailed and as offering a very rigid view of a situation (Graham, 1998; Hirschheim et al, 1995). For the purposes of the UMISD project, the detailed *activity-based* view provided by such models seemed useful and the possibility of using conversation models not to *map* organizational processes, but as an intellectual device to support debate was considered further.

4.9 Conversations for Action

Wittgenstein (1953, p. 146) declared that "words are also deeds" though the idea that language can be regarded as action within a particular situation is usually attributed to Austin (1962). Searle (1969, 1971, 1995) expanded upon these ideas and introduced the concept that the basic unit of language is the utterance of a "speech act". Searle argues that

> "speaking a language is performing speech acts, acts such as making statements, giving commands, asking questions, making promises, and so on; and more abstractedly acts such as referring and predicting"
>
> (1969, p. 16).

Habermas (1984) criticised Searle's ideas for not providing an explanation of how action was co-ordinated and argued that communicative action involves commitment based on some agreement between the parties involved (see also Habermas, 1990, p. 134). Flores and Ludlow (1981) were the first to suggest that the idea *communicating is taking action* was useful in thinking about business processes. This idea was expanded upon in Winograd and Flores (1987) who suggested that Conversations for Action and the concept of *commitment* developed by Habermas (1979) were central to the action undertaken in organizational settings. Winograd and Flores argued that in a

detailed analysis of the conversations that occur within organizational settings, some speech acts could be argued to constitute:

> "straightforward *conversations for action* –those in which the interplay of requests and commissives are directed towards explicit cooperative action"
>
> (1987, p. 64, authors' italics).

Winograd and Flores (1987) plotted a basic Conversation for Action in a formal manner to show possible "states" that might occur as the action is undertaken. They argue that a Conversation for Action begins with an initial request, which has some underpinning "Conditions of Satisfaction", that must be fulfilled. Winograd and Flores (1987) argue that following the request, there are five possible states for such a conversation, accept (making a commitment to fulfill the associated conditions), reject, negotiate a change by making a counter offer, also the initiator can withdraw the request, or modify the original conditions. The impetus in the work carried out by Winograd and Flores (1987) is to find Conversations for Action that recur in order to develop technology that supports group collaborative work and group decision-making. The body of work known as Computer-Supported Co-operative Work (CSCW) has evolved from these ideas.

Some researchers have developed means for mapping conversations in organizational settings (Ågerfalk et al, 1999; Auramäki et al, 1991; Goldkuhl and Röslinger, 1999; Kensing and Winograd, 1991; van Reijswoud et al, 1999; Schoop, 1998). This group of researchers are referred to as using a Language Action Perspective (LAP) (Dietz et al, 1998) and such approaches are found more often in the work of researchers in Scandinavia and Germany than in the United Kingdom. All these authors suggest very formal rule-based techniques that entail the use of a great number of tables to structure descriptions of activities via the conversations that occur. Indeed, Schoop

(1998) reported that her suggested approach was very time-consuming and difficult to undertake. The focus in these approaches is on providing accurate *descriptions* of the so-called Conversations for Action that occur within a situation, with the intention of enabling difficulties to be analysed and new processes to be designed. For example, SAMPO (Speech Act based Modelling aPprOach) (Auramäki et al, 1988, 1991) was an attempt to describe action within an organization to enable the described processes to be analysed and improved. Similarly, Business Action Theory (BAT) (Goldkuhl and Röslinger, 1999) is another approach that suggests using conversation modelling to *describe* the interactions that occur within organizational settings.

Stamper (1991, 1997) argues that Semiotics (the study of signs and symbols) is vital in the field of information systems and this work is similar to the work on conversation modelling. Stamper was responsible for the LEGOL/NORMA project (LEGOL comes from LEGal Oriented Language, and NORMA from NORMs and Affordances) (Stamper, 1985). This project was an effort to create a language to represent "social and legal norms" in a situation to enable Requirements Elicitation. To apply LEGOL/NORMA, a social situation is described as consisting of "agents and affordances"; the 'agents' in a situation undertake some action and the 'affordances' are the actions, or the results of actions. Hirschheim et al (1995) criticise this work as they argue within business, legal and social situations, agreement on norms "cannot be assumed".

Hirschheim et al (1995, p. 219) also criticise the work on LEGOL/NORMA for "its complexity and somewhat overwhelming and opaque vocabulary". Similarly, Checkland and Holwell (1998a) consider this work to be written in an "abstruse" manner. Crucially, Hirschheim et al (1995) argue that LEGOL/NORMA is unable to deal with different viewpoints and different interpretations in a problem situation. Alderson and Liu (2000) (also

associated with the SEBPC initiative) have used Stamper's work and suggest that mapping the current organizational processes with a type of semiotic representation they have devised, can be used as a precursor to information system design. The modelling approach suggested by Alderson and Liu (2000) actually resembles a complex Cognitive Map in appearance and provides a formal, rule-based description of a *process* that is read in the form of 'if this happens', 'then this occurs', 'or else that may occur'. The advantage of such a representation for the purposes of constructing logical designs is that the models constructed provide a formal systematic description of 'the process to be improved', but the maps are very complex, difficult to read and again, are only attempts at describing the current process.

Pask (1961) applied systems ideas from Cybernetics to describe the conversations that might occur between a student and a "teaching machine", by regarding a conversation as a contract between participants. Pask uses mathematical expressions as a modelling device, making this approach possibly inaccessible to some participants and also difficult to apply in practical social situations where multiple viewpoints may exist between clients (see also Pask, 1975, 1976). Hirschheim et al (1995, p. 232) consider that approaches to information system design using the ideas of Conversations for Action and Semiotics need to develop simpler "methods and principles" and also need to be applied within "field environments" so the approaches can be strengthened through practice.

A recent attempt at providing an approach to information system design using conversation modelling is DEMO (Dynamic Essential Modelling of Organizations) (Dietz, 2001; van Reijswoud et al, 1999). In DEMO, organizations are modelled as "transaction structures" with actors interacting in a co-ordinated manner to complete the desired transactions. The emphasis when using DEMO is to facilitate "business process optimisation" of the "transaction design of the organization" and to "develop a blueprint for an

information system" (van Reijswoud et al, 1999). Dietz (2001) argues that the main contribution of DEMO as a guide for specifying the requirements for information systems is the "model of the organization" that is constructed, but the effort when using DEMO is to model "an organization" by describing only the "business processes".

It has been argued in Chapter 2 that this is a fundamental weakness apparent in most information system design approaches. Following the arguments set out in Chapter 2, the DEMO approach can be criticised for four reasons. First, DEMO as a guide to information system design provides no support for an initial exploration of the problem situation beyond describing the business processes. Second, reducing an enterprise to a description of identifiable business processes is an impoverished starting position for inquiry within complex human social settings (Checkland and Holwell, 1998a; Stowell and West, 1994; Winter et al, 1995). Third, there is no effort to support those involved in the problem situation in creating new ideas for purposeful action that may bring improvement to the situation. Fourth, DEMO currently provides no links from any models of business processes, to any means of constructing the logical specifications for technology-based information systems. DEMO is at this time the most developed information system design approach to emerge from the work on conversation modelling, but as an approach, DEMO still fails to address the fundamental challenge posed when undertaking information system design. That is, to first create a shared *appreciation* of the problem situation amongst those involved and reach some accommodations on what purposeful action might bring improvement. Then it becomes *relevant* to move on to designing the support for that action (Winter et al, 1995).

It seemed that some form of conversation model might be useful, particularly as the idea that social reality is continuously constructed through social interaction (or conversation) was "clearly compatible" with the chosen

approach to the concept of 'organisation' (Checkland and Holwell, 1998a, p. 97) (see also Daft and Weick, 1984; Stamper, 1997; Winograd and Flores, 1987). In the initial stages of the UMISD research, it was argued that if some way of modelling Conversations for Action could be developed that was less obscure, such a modelling approach might be suited for use within the phase of inquiry called the Unifying Layer (Champion and Stowell, 1999a, b, c). Harris and Taylor (1998) have developed a diagrammatic approach to modelling Conversations for Action, which seemed easier to follow, though their focus again, was on only modelling *current* processes, not on encouraging debate on what action might bring improvement.

Harris and Taylor (1998) employ Vickers' (1965) concept of 'organization' to support their view that it is the commitments made between the people within a situation that enable action to be undertaken. Vickers (1983) describes human groups as being held together by "self-expectation and mutual expectation" and Harris and Taylor (1998) use these ideas to argue that models of the Conversations for Action undertaken by those involved in a situation can be used to *map* organizational processes. They argue that the Conversations for Action entered into by people within a situation "form commitments/expectations for action (or inaction) by which people coordinate as they work together" (Harris and Taylor, 1998). Harris and Taylor (1998) regard a Conversation for Action as a "dyadic interaction" occurring between a customer who makes a request and a performer, who is the person the request is directed toward and who then makes some sort of response (the performer can also be regarded as a supplier or provider). The interactants, customer and performer, can refer to *roles* and do not necessarily refer to specific people. The Conversations for Action "consist of coupled sequences of moves" that occur between a customer of the action being undertaken and the performer of that action. Examples of "moves" that might be undertaken by the customer or the performer, are a request, an offer and possibly a counter-offer, decline or accept (Harris and Taylor, 1998).

Crucially a customer will need to articulate the Conditions of Satisfaction that the performer must satisfy to be regarded as having fulfilled the request. The performer will also have some Conditions of Satisfaction that must be met to enable the performance of the action to meet the request. Harris and Taylor (1998) are somewhat vague on these Conditions of Satisfaction, but suggest they often include elements such as "requirements and deliverables". Harris and Taylor (1998) employ the convention of writing the Conditions of Satisfaction for each Conversation for Action in the centre of a loop, with each loop representing a single conversation. To enable this convention to be applied, the Conditions of Satisfaction are often drastically abbreviated.

Building on the work of others (Flores and Ludlow, 1981; Winograd and Flores, 1987), Harris and Taylor (1998) regard a Conversation for Action as being composed of four phases:

1. Preparing and making a request or an offer.
2. Negotiating and reaching agreement, or not.
3. Performing and reporting the work complete.
4. Assessing the work and declaring satisfaction, or dissatisfaction.

They depict these four phases as forming a loop:

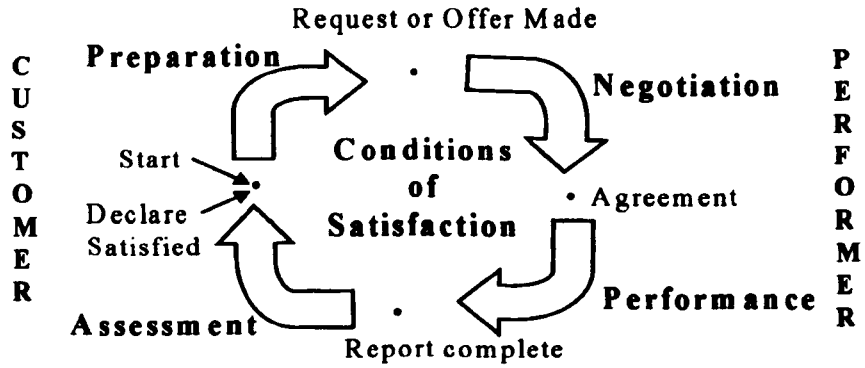


Figure 4.2: Harris and Taylor (1998) represent a Conversation for Action as having the structure depicted above.

The loop is read in a clockwise fashion with the 'start' of the loop being at the 9 o'clock position. This is also the end point as Harris and Taylor (1998) argue that each interaction must be "explicitly, or implicitly completed". These 'maps' once constructed, offer an *activity-based* view of Conversations for Action that occurred between people within the situation of focus. Harris and Taylor (1998) have constructed large maps of processes that have occurred within organizational settings by drawing out sequences of these Conversations for Action. After a discussion via e-mail with the present author, Harris (1999) created his interpretation of the Conversations for Action that *might* occur during a process of information system *development*. This map is given below in Figure 4.3. The map is provided as an example of the way that Harris and Taylor (1998) construct these diagrams. The author of this thesis would not agree with the expressed view of the development process, centred as it is on an impetus to "provide System Solution". Also the intended application for the Conversation for Action device, for the purposes of the UMISD project, was to facilitate a process of information system *design*, not to describe the development process.

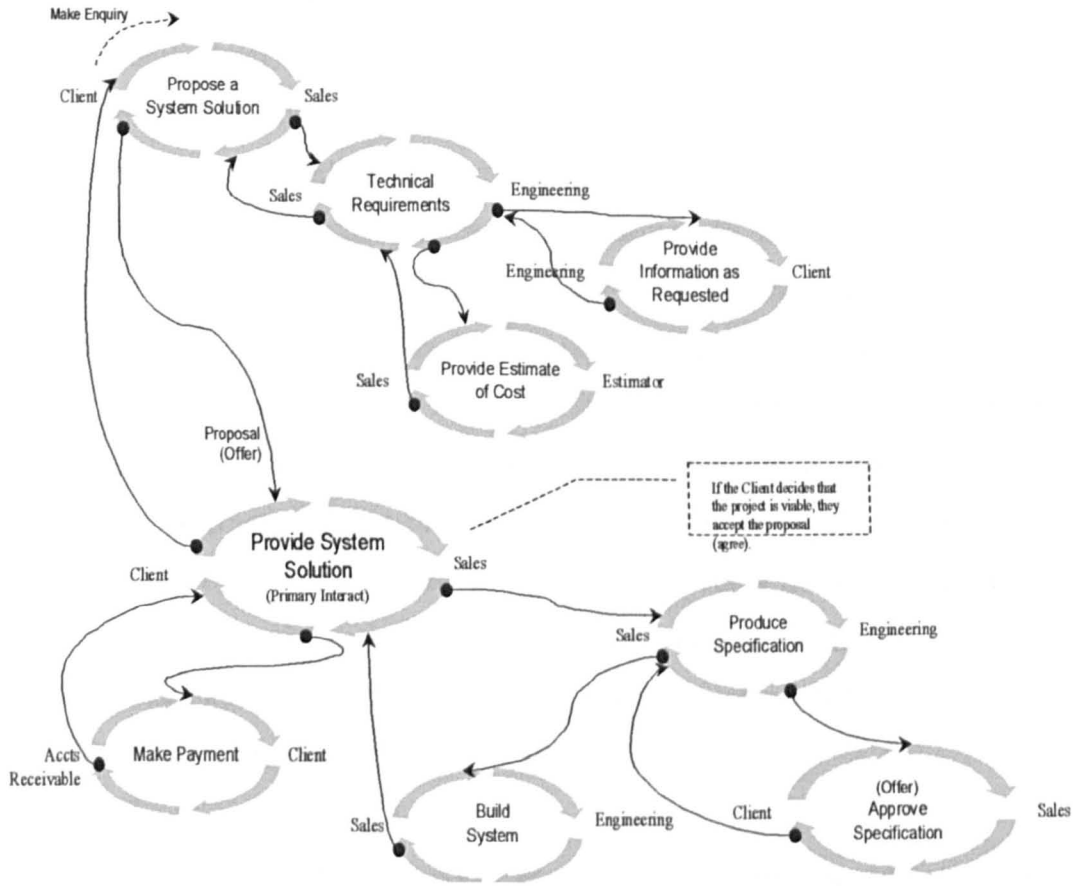


Figure 4.3: A model of the Conversations for Action that might occur during a process of IS development, constructed by Harris (1999).

Although models of Conversations for Action have been criticised for being overly detailed (Hirschheim et al, 1995), a detailed view of possible purposeful action was desirable for application within the Unifying Layer, or *navigational phase*, of inquiry. Also the models of Conversations for Action provide an *activity-based* view and it was argued prior to the field study that these devices would hopefully enable a sense of coherence to be maintained throughout the inquiry process. It was decided to apply these ideas to a case study in a simulated work environment in an attempt to evaluate the framework of ideas before undertaking a main field study.

4.10 Applying the Ideas in a Trial

The research supervisor provided a case study and set up a simulated work environment, to facilitate the researcher in trying out the framework of ideas. The purpose of the trial was to use the case study to create some conceptual activity models, or holons, of systems relevant to the problem situation presented in the study and then attempt to create some models of Conversations for Action from the holons. As there were no actual participants, an adapted Mode 1 use of SSM was followed with the researcher drawing a rich picture, identifying problem themes and some relevant systems and then constructing some root definitions and drawing conceptual activity models from these root definitions. The lack of others made it necessary to assume the conceptual activity models were relevant and potentially useful in the fictional situation of focus. The researcher then attempted to consider the implications of operationalising these ideas.

Checkland (1995b, p. 11) argues that "...for the activities in a [conceptual activity] model it is possible to ask what you would have to know in order to be able to do each activity and what you would know as a result of doing it". He suggests that by asking such questions, holons constructed during an inquiry process will support those involved in undertaking an analysis of the supporting "information/data items", making the ideas underpinning SSM relevant to the study of information systems (Checkland, 1995b). The difficulty with such an approach is the immediacy with which those involved start thinking about the information support for the action under consideration. There may be many possibilities for different ways to implement the purposeful action. It is first necessary to think about *how* the action *might* unfold in practice in some detail as there may be some additional activities needed in the real world situation, not expressed in the holons (Mathiassen and Nielsen, 2000; Mingers, 1995; Savage and Mingers, 1996).

During the trial, in order to think about how the action *might* unfold in practice, the Conditions of Satisfaction that might be relevant to the action were considered. Winograd and Flores (1987) describe the Conditions of Satisfaction as statements of the "commitment" entered into by the actors involved in undertaking the action. The Conditions of Satisfaction are not "objective realities" (Winograd and Flores, 1987) and so some accommodation concerning these potential commitments will need to be reached. The concept of *making some commitment* seemed useful when attempting to conceptualise *how* purposeful action *might* unfold in a situation. The intention for the main field study was to use the device of thinking about possible Conditions of Satisfaction with those involved. Such exploration and reflection might include thinking about required resources, constraints, training implications and necessary access to information in the real world situation. It would seem important then, to explore the Conditions of Satisfaction for each actor (or role) making explicit the *commitment* implied in any expressed ideas for purposeful action.

In the simulated work environment, constructing Conditions of Satisfaction proved very difficult as the case study did not provide sufficient detail of the situation of focus. There was no possibility of asking questions of those in the situation of focus about what would be involved in undertaking the action, as there were no participants. The conceptual activity models created during the trial had to be assumed to be relevant and the Conditions of Satisfaction were of the researcher's own creation rather than emerging through debate. Despite these obvious shortcomings in using a case study, useful lessons were gained. For example, during the work on this trial, it became apparent that the number of Conditions of Satisfaction was potentially large and that writing these in the interior space of the loop, as suggested by Harris and Taylor (1998), would probably be too restrictive. The idea of having a rectangle associated with each loop in which to write the Conditions

of Satisfaction for each actor emerged as a new convention. These boxes were drawn straight onto the conceptual activity models. See Figure 4.4 below:

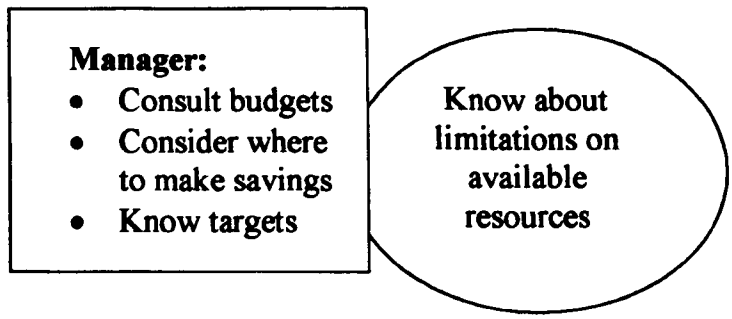


Figure 4.4: One of the sub-systems from the trial with some potential Conditions of Satisfaction for one of the actors added.

Once the Conditions of Satisfaction had been considered, it was possible to think about what Conversations for Action might occur to meet these commitments. The attempt to create models of Conversations for Action through a case study was less than satisfactory. As there were no participants the models created focused on *content*, rather than on ideas for debate and the false nature of the inquiry eventually defeated the effort to fully apply the framework of ideas. The trial was published and discussed at conference (Champion and Stowell, 1999c), but application of the ideas in a practical real world setting was needed to establish if the devices of Conditions of Satisfaction and Conversations for Action would support debate concerning how any ideas for purposeful action might unfold in the real world.

4.11 Summary of the Framework of Ideas

To facilitate *Client Led* information system design, it is essential that those involved in the problem situation first undertake an exploration of that situation to create a shared *appreciation* of the issues and perspectives of others. SSM can be used as a guide during this phase of inquiry to support *sense making* and the creation of some ideas for purposeful action that may

bring improvement. Through reading the literature and undertaking a local study, a framework of ideas was created that might offer some guidance when attempting to move on from ideas for purposeful action, to thinking about support for that action. The idea of a *navigational* phase of inquiry emerged, where participants explicitly use some other intellectual devices to *navigate* from any ideas for purposeful action, to some ideas for support. It was argued that some form of conversation model might be suitable as an intellectual device for the *navigational* phase, as these devices could provide a detailed view of potential action. A fundamental concern was to maintain a sense of coherence when moving from ideas for purposeful action, to ideas for support. This chapter has outlined the process of research, practice and argument that lead to Conversation for Action models being suggested as being useful *navigational* devices within the framework of ideas to be applied in a field study. These ideas had been applied to a case study in a preliminary trial. The trial resulted in some interesting thoughts and adaptations to how the ideas might be put into practice, but there were many questions and issues that needed to be clarified. It was decided to evaluate the framework of ideas in a real world business environment by undertaking an Action Research field study. The next chapter describes this field study.

Part 2

Ideas into Practice

Chapter 5

Experiences in Abbey National plc

5.1 Introduction

In Chapter 3, the difficulties in undertaking inquiry within social settings were discussed and the notion that a researcher can endeavour to make the inquiry process "recoverable" (Checkland and Holwell, 1998b) to other interested individuals was described. The framework of ideas, the guide for inquiry (methodology) and the problem area to be investigated had all been formally declared in advance of the field study through a series of academic papers, seminars and workshops. A trial in a simulated work environment had been attempted and reflections on this investigation published prior to the field study (Champion and Stowell, 1999c). Also, a small local study had been undertaken to gain experience in undertaking Action Research. Although the AIM method (West, 1995) used in this local study had not been considered useful for application in the situation of focus for this particular inquiry, some of the learning outcomes were valuable in planning and preparing for the main field study (as described in Chapter 3).

5.2 Planning and Preparation for the Field Study

Checkland (1981) points out that "the problem with Action Research arises from the fact that it cannot be wholly planned and directed down particular paths". Research aims might be expressed "as hopes", as indeed they were for this field study, but a researcher must "...follow wherever the situation leads [...or be prepared to] stop the research" (Checkland, 1981, p. 153). The desire for specific outcomes is necessarily relinquished. Action Research is a framework for creating knowledge about a particular situation by becoming immersed in that situation. A researcher becomes part of that situation by interacting with other people involved in undertaking purposeful action and by using explicit devices to facilitate a shared *appreciation* of issues and difficulties to emerge amongst participants. From such a shared *appreciation*, new ideas for purposeful

action can be created that may alleviate the problems experienced by those involved and hopefully bring improvement, though improvement can never be guaranteed. So the next phase of the research was to try out the framework of ideas described in Chapter 4, in a dynamic business environment.

5.3 Finding Collaborators: The Host

Abbey National plc had supported the UMISD project from the outset and the Abbey National workplace had been explicitly offered as an environment in which to try out any research ideas in the form of a field study. The Abbey National Director of Information Technology had expressed the view that any ideas that emerged from the research were potentially useful to Abbey National and that the learning from the study would be of interest even if the outcome resulted in ideas being rejected. So the collaborators in the intended field study, the personnel at Abbey National, were prepared to relinquish the desire for specific outcomes and participate in the field study simply as a learning experience. It was hoped that practical learning outcomes would emerge that would be of interest and use for all the participants.

At a meeting with the UMISD industrial collaborators, it was suggested that the Debt Management Operations Department (DMO) might provide a suitable environment for the purposes of the project. This aspect of the business was particularly complex. The work was regulated by strict legal guidelines, but also those working in this area needed to be mindful of the social, cultural and emotional issues involved, when dealing with customers who were in debt. A further meeting[15] was held with the senior staff members responsible for DMO to explain the aims of the UMISD project, the hoped for outcomes and what the field study might entail as far as Abbey National personnel were concerned. The Head of

[15] Those present at this meeting were the Director responsible for Debt Management Operations (DMO), Head of DMO, the Research Director and the researcher who was to undertake the field study.

DMO suggested that the researcher spend an initial study day in DMO. A programme of appointments with a cross-section of managers and personnel was drawn up by the Head of DMO to provide the researcher with the opportunity to gain some *appreciation* of the breadth of activities undertaken by the various sections that comprised DMO in the Milton Keynes office.

This first visit took place on the 10th March 1999 and also provided an opportunity for the Section Managers in DMO to gain some understanding of the UMISD research and to meet with the researcher concerned. The researcher was able to talk with each of the managers of the three main sections of DMO: Loans, Bank Accounts and Credit Card. There was also a specialist Mortgage section based in Peterborough, but this section operated under different legal constraints and was not included in the field study. The visit was also used to help in the planning and preparation of the main field study. Stowell et al (1997) suggest that it is useful to undertake some specific planning activities prior to undertaking an Action Research field study and offer a set of eight questions that can be used to support an Action Researcher in the planning phase. These questions are summarised in Table 5.1 below.

Table 5.1: Questions for Planning an Action Research Field Study

1. "What is an appropriate time span for the study?"
2. "How many participants should there be?"
3. "Who should be included? (and who decides upon this?)"
4. "Should interviews be undertaken with groups or individuals?"
5. "Should the views expressed in a one-to-one situation be treated in a similar fashion to the views expressed by a larger group?"
6. "How can/should the knowledge gained from one cycle of action be reinvested?"
7. "How can/should the encounters be recorded?"
8. "How can a description of the situation be 'validated'?"

From: Stowell, West and Stansfield (1997, p. 178).

For the purpose of planning the main field study for the UMISD project, the researcher considered each of these questions in turn. (The usefulness of these questions is commented on in Chapter 7).

Question 1: What is an appropriate time span for the study?

Estimating an appropriate time span was difficult to achieve with any accuracy prior to the study. The researcher required a period of time to become involved in the situation of focus and for a shared *appreciation* of the problem situation to emerge amongst the participants. The intention of the field study was to apply the framework of ideas as extensively as possible. The researcher was aware that the project manager with responsibility for the SEBPC (1996) initiative expected the UMISD project to be completed in three years. To fulfill this obligation the researcher would need to submit the final thesis by the autumn of 2001. It was decided that the researcher would monitor progress and keep the research supervisors fully informed. Any problems that might indicate that the time being spent on the field study might prevent the timely

completion of the UMISD project would need to be addressed as and when they occurred. In the event, the main field study extended over a period of five months, with follow-up visits being undertaken at regular intervals over the remaining period of the project.

Question 2: How many participants should be included?

Again this question was impossible to fully estimate prior to the field study, but the number of participants was an issue of concern. The Loans and Bank Accounts sections of DMO both comprised over 100 personnel and may have presented a single researcher working alone with an overwhelming work load in order to create a shared *appreciation* amongst those involved in these sections. The Credit Card section of Debt Management Operations (DMO) was chosen for the study as this was the smallest section within DMO having between 18 and 30 people working in the section. The main work of contacting customers who were in debt was undertaken by Collections Officers, and the exact number of people occupying such a role did vary due to seasonal changes in the amount of work to be carried out, though there was a core of around 15 stable workers. This ongoing flux of personnel was an important issue for the purposes of the field study. Ideally, the participants would remain involved in the inquiry process over a period of some months. Although it was likely that any inquiry would not be limited to personnel from only one section (and indeed this did turn out to be the case) it was decided that Credit Card did offer the opportunity for the researcher to establish a working relationship with personnel in that section. As the inquiry progressed it was possible to maintain a relationship with a cross-section of personnel from Debt Management Operations over a period of 20 months, despite a major relocation of the Credit Card business from Milton Keynes to the Sheffield office. Indeed, the learning relationship that has been established continues to provide a source of fruitful debate.

Question 3: Who should be included and who decides?

Prior to the field study it was decided to include as many people as possible from the situation of focus, in this instance the Credit Card Debt

Management section, in the inquiry process. As the inquiry progressed, the emerging experience involved people from other sections of Abbey National and the issues raised were also relevant to other areas of business. For example, Abbey National were in the process of launching a new internet bank[16] and some of the debt management issues apparent in the Credit Card section, were also directly pertinent to the running of the internet bank. (These learning outcomes are discussed further in Chapter 7). The researcher was given permission to follow the route of the inquiry, and in the event, spoke to a wide-range of personnel from different departments and offices within Abbey National.

Question 4: Should the researcher interview groups or individuals?
This question posed by Stowell et al (1997) assumes that one of the main methods of interaction with the participants would be some form of interview. Formal interviews were not considered to be a useful mechanism for the initial stages of the inquiry. The researcher had no previous knowledge of Debt Management Operations and constructing a set of useful questions to ask would have been very difficult. Devising a list of pre-determined questions may have prevented the issues that were of concern to those familiar with the area from becoming apparent. As SSM was being used as a guide for the inquiry process, the researcher employed a number of explicit devices to support debate and structure discussion. These devices included a series of rich pictures, conceptual activity models and other *navigational* devices described later in this chapter. No group interviews took place, though some group discussion did emerge, as is described below.

Question 5: Should the views expressed in a one-to-one situation be treated in a similar fashion to the views expressed by a larger group?
Due to the nature of the working environment it was not possible to arrange group meetings for a large number of staff. The Collections Officers who undertook the work of contacting customers and being

[16] The internet bank 'cahoot' is now operational.

proactive in collecting the debt were monitored for their performance on seventeen different activities, such as the number of accounts worked per hour and how quickly they answered calls. (See Appendix 1 for a list of the performance indicators used to monitor the work of the Collections Officers). It seemed unreasonable to expect these people to risk their end of year performance ratings by attending meetings. So as not to disrupt the work of the section most of the interactions were undertaken on a one-to-one basis. In particular, the discussions with Collections Officers took place as the officers worked. Some group discussions emerged during some specific activity, or on occasion informally over coffee. Every view expressed during the inquiry process, regardless of where, or the status of the person expressing the view, was taken seriously, considered fully and followed up by the researcher in the process of creating a shared *appreciation* of the situation of focus.

Question 6: How can the knowledge gained from one cycle of action be reinvested?

From an interpretive stance, any social situation will be a complex whole created amongst those involved. Attempting to reach a *shared appreciation* of such a situation may entail many cycles of learning being undertaken. Achieving the reinvestment of knowledge will be directly dependent on establishing that learning outcomes from any phase of the inquiry process are relevant and credible. The emergence of a notion of relevance and credibility will in turn depend upon the ability of those involved in the inquiry process to achieve a public perception of the validity of the knowledge created (see Question 8). The reinvestment of knowledge will also depend on being able to "recover" (Checkland and Holwell, 1998b) any past learning. This process will be supported through any records made of the inquiry as it unfolds.

Question 7: How should the encounters be recorded?

Due to the nature of social inquiry as an unrepeatable experience, some authors argue that Action Research studies ought to be recorded as fully as possible (Elliot, 1991; Somekh, 1995). For example, Eden and Huxham

(1996) suggest that a high degree of method and orderliness is required during Action Research to enable those involved to make sense of the emerging experience. Somekh (1995) argues for careful consideration of the recording techniques employed in an Action Research field study. Baskerville and Wood-Harper (1996) suggest that "rigorous Action Researchers plan methodical data collection" and reason that such data collection is critical if the credibility of the research is to be defended (p. 242). Argyris et al (1985) suggest audio-taping observations and interviews to provide a record of encounters with participants and a few authors have suggested the use of fieldwork diaries (Baskerville and Wood-Harper, 1996; Naur, 1983; Somekh, 1995). After discussions with the Credit Card Manager and Head of Debt Management Operations, the use of a tape machine was rejected. The presence of a tape machine might inhibit those working in the Credit Card section from feeling able to discuss issues openly with the researcher. Also the use of a tape recorder might emphasize the separateness of the researcher to the situation of focus, whereas the main purpose of undertaking an Action Research field study was to become involved in the problem situation and gain an *appreciation* of the situation.

Checkland and Holwell (1998b) argue that interested individuals ought to be able to follow the course of the inquiry after its completion, which suggests some record of the inquiry process is essential if the research is to be "recoverable" to other interested individuals. Attempting exhaustive data collection during a process of social inquiry might seem to be underpinned by an impetus to *prove* that the results of the inquiry are correct (Stowell et al, 1997). As Vickers (1965) explains so eloquently, no matter how detailed the documentary evidence that is complied during a process of social inquiry, such evidence can still fail to explain the outcome.

The method chosen to record the actual discussions with those who worked in the problem situation was to maintain a field notebook. The interactions with participants were recorded by creating drawings and

diagrams that attempted to capture the essence of what was discussed. This 'mini-rich picture' approach to taking notes had been developed during the experience of undertaking the local study and the preliminary trial. The approach was found to be useful when attempting to create a larger rich picture expressing the problem themes and issues of a more complex situation. (Appendix 1 contains some sample pages from the field notebook).

Checkland (1991) argues that the choice of tools employed in an Action Research inquiry ought to reflect the epistemological basis of the study as such an approach facilitates the emergent experience and learning to be reflected back to the original intellectual framework. The researcher envisaged that, in addition to the field notebook, undertaking the field study would entail the construction of rich pictures, root definitions and holons (conceptual activity models) which would be used as tools to support the debate. These devices would also act as a record of the emerging experience, reflecting the systems epistemology underpinning the framework of ideas. As the field study progressed, the researcher did collect other artefacts. For example, the researcher was provided with a copy of the performance indicators used by the Credit Card Manager to assess the performance of the Collections Officers (see Appendix 1). These additional artefacts were only collected if offered by the other participants, the researcher did not request any particular items.

The field notebook was not a private document and all the Abbey National participants showed a great deal of interest in looking at the pictures and commenting on if they considered the record of their discussions to be sufficiently detailed or accurate. The field notebook was always completed on the Abbey National site before the researcher left in the attempt to ensure nothing was forgotten. In addition to the field notebook, the researcher kept a 'reflections notebook' to record the thoughts and learning on the framework of ideas as ideas emerged. This reflections notebook was used to write about ideas that emerged from the inquiry process away from the site and was used to support the researcher

in making sense of the emerging experience and to reflect upon mistakes and successes.

Question 8: How can a description of the situation be validated?

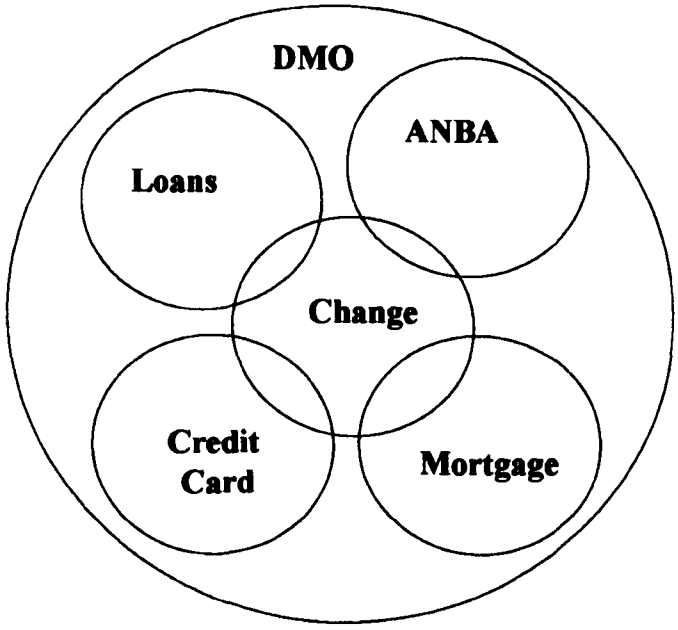
Baskerville and Wood-Harper (1996) argue that "Data-validity" is a problem in Action Research studies due to the "interpretive nature of the data". Establishing the validity of an Action Research field study became an area of great interest to the researcher as the field study progressed. The inherent difficulties of *validating* the knowledge created during social inquiry were discussed in Chapter 3 and will be revisited in Chapter 7 where the learning outcomes from the field study are evaluated. The final phase of planning and preparing for the field study was to establish how the researcher would work within Abbey National for the duration of the study.

For the purposes of undertaking the field study the researcher was provided with a temporary staff pass for Abbey National plc. This pass enabled the researcher to visit the office at different times and so talk to staff who worked outside normal working hours. A confidentiality agreement was signed by the researcher stating that no details of customer accounts, or details of processes that might be useful to people attempting to defraud the bank would be released. This agreement has not hindered the progress of the research and everyone that the researcher approached concerning the UMISD project agreed to participate in the inquiry process. Indeed, throughout the field study, people seemed interested in the ideas and tools being used, with useful debate and learning still emerging amongst those who became involved in the study.

5.4 Becoming Involved

The main field study began in October 1999. Following the ideas expressed in the framework of ideas it was necessary to first attempt to create a shared *appreciation* of the situation of focus. The Head of Debt

Management Operations (DMO) had organized DMO into five main sections, as is depicted in Figure 5.1 below:



Key: DMO Debt Management Operations
ANBA: Abbey National Bank Account

Figure 5.1: The five main sections of Debt Management Operations at Abbey National plc.

Each section had a manager who was responsible for the operation of that section. The Change Manager was responsible for innovation and improvement and his area of work crossed the other section boundaries. Credit Card section was to be the main area of focus and this section comprised three Team Managers who reported to the Credit Card Manager and between 14 and 25 Collections Officers depending on the time of year and amount of work.

Guided by Soft Systems Methodology, the first step, as decided in the planning stage, was to become involved in the situation and create a rich picture of the issues and problems and characteristics of the situation of focus from the perspective of those involved. The researcher had no

previous knowledge of Debt Management Operations and so in the first instance, time was spent gaining an *appreciation* of the work undertaken by the Collections Officers. Initially, three different Collections Officers with different periods of experience within 'Credit Card' agreed to explain their actions to the researcher, as they went about their work. Two were full-time officers and one officer was part-time.

Essentially the job of each Collections Officer was to contact customers who were behind with their Credit Card payments and persuade the customer to make a payment to the bank. This agreement was called a 'Promise'. On accepting a Credit Card from Abbey National, the customer enters into a legal agreement to pay off a certain amount of the outstanding debt each month and the customer pays interest on any amount that remains unpaid. The Collections Officers are given incentives to collect outstanding debt in an efficient manner. If an Abbey National customer keeps a Promise and pays the requisite amount, the performance figures for the Collections Officer who arranged the Promise, improve. If the agreement is not kept and so becomes a 'Broken Promise' the performance figures for that Collections Officer are adversely affected. The Collections Officers were monitored on different performance indicators, including time spent on each call and how many accounts they were able to deal with in an hour (see Appendix 1).

In the first instance, the researcher sat with each officer as they went through their work. Questions arose naturally as the researcher sat, watched and listened and made drawings in the field notebook. The researcher sat with each of the officers as long as the Collections Officer in question seemed willing, but never for less than 80 minutes at a time. The researcher was able to sit with each officer at different times and from these experiences, a rich picture was constructed. This rich picture (numbered RP 1 and included in Appendix 1) was agreed by each of the three Collections Officers as a good expression of their view of the situation that existed in the Credit Card section. RP 1 was then used as a starting point for discussion with others in the Credit Card section.

The researcher continued the discussion and debate with other Collections Officers, the Team Leaders and also with the Manager of Credit Card section. Eventually, it was possible to construct a second rich picture (RP 2, included in Appendix 1) that was agreed by all the participants to give a good account of the situation, as they perceived it. Some of the issues and problems perceived by those involved in the situation in Credit Card section involved the concept of 'Responsible Lending'.

5.5 Issues and Perceived Problems

To guide the Collections Officers in their dealings with customers who were behind with their payments a Collections Strategy was used. This strategy set out what steps could be taken to collect the outstanding debt, when to send letters and also acted as a control mechanism on the period of time that elapsed before the debt was written off. (An example of a hypothetical Collections Strategy is included in Appendix 1). The consequences of the write-off process for the customer were severe, as the customer was reported to credit agencies, ensuring that any person going through this process would find obtaining credit in the future, very difficult.

The Credit Card product was a recent venture and during the initial Sales Drive some customers who were unemployed, or living on a state pension being permitted Credit Cards, some of whom had then built up debt they were finding difficult to pay off. The Collections Officers in Credit Card DMO were encouraged to report debt that they considered could have been prevented to their Team Leaders so as to encourage better lending practice in the future. When such a case was found, the Team Leaders informed the Change Manager[17] who discussed such cases with the Underwriters and Sales Team with the aim of improving future lending

[17] The Change-Manager was responsible for making decisions to write-off large amounts of Debt from all the sections in DMO and became a participant in the inquiry process.

policies, that is encouraging Responsible Lending. The issue of finding new and creative means of helping people pay off their debt as soon as possible without resorting to the write-off process remained the core difficulty faced by those working in DMO. It was also important to keep in mind that if the bank was to make money from the Credit Card product, it was necessary to encourage people to use their Credit Cards and so some risk of losing money was always involved.

The Head of DMO became involved in the inquiry enabling the researcher to gain an *appreciation* of how those in Abbey National went about devising a product such as a Credit Card. The researcher also spent time with the personnel in Management Support to gain an awareness of how the action undertaken by the Credit Card personnel was supported by the information technology. The computer system that was used to support Credit Card activities was considered to be inflexible and awkward to work around. The supporting software package used in DMO was a limiting factor. For example, if a customer changed jobs and so their salary reached their bank account on a different day, the customer might wish to change the payment date for their Credit Card. Once the customer had signed the Credit Card agreement though, changing the payment date for that card was not possible. This customer might then appear on the computer system used in Abbey National as being frequently behind with their payments, even if that customer was making regular payment, having only changed their payment date. The software package used in DMO did then place some restrictions on any potential Collections Strategy that could be employed to support Collections Officers in collecting the debt.

The researcher constructed a third rich picture (RP 3) and continued to modify it until all the participants in the inquiry agreed that the picture was a good expression of the situation of focus. See below:

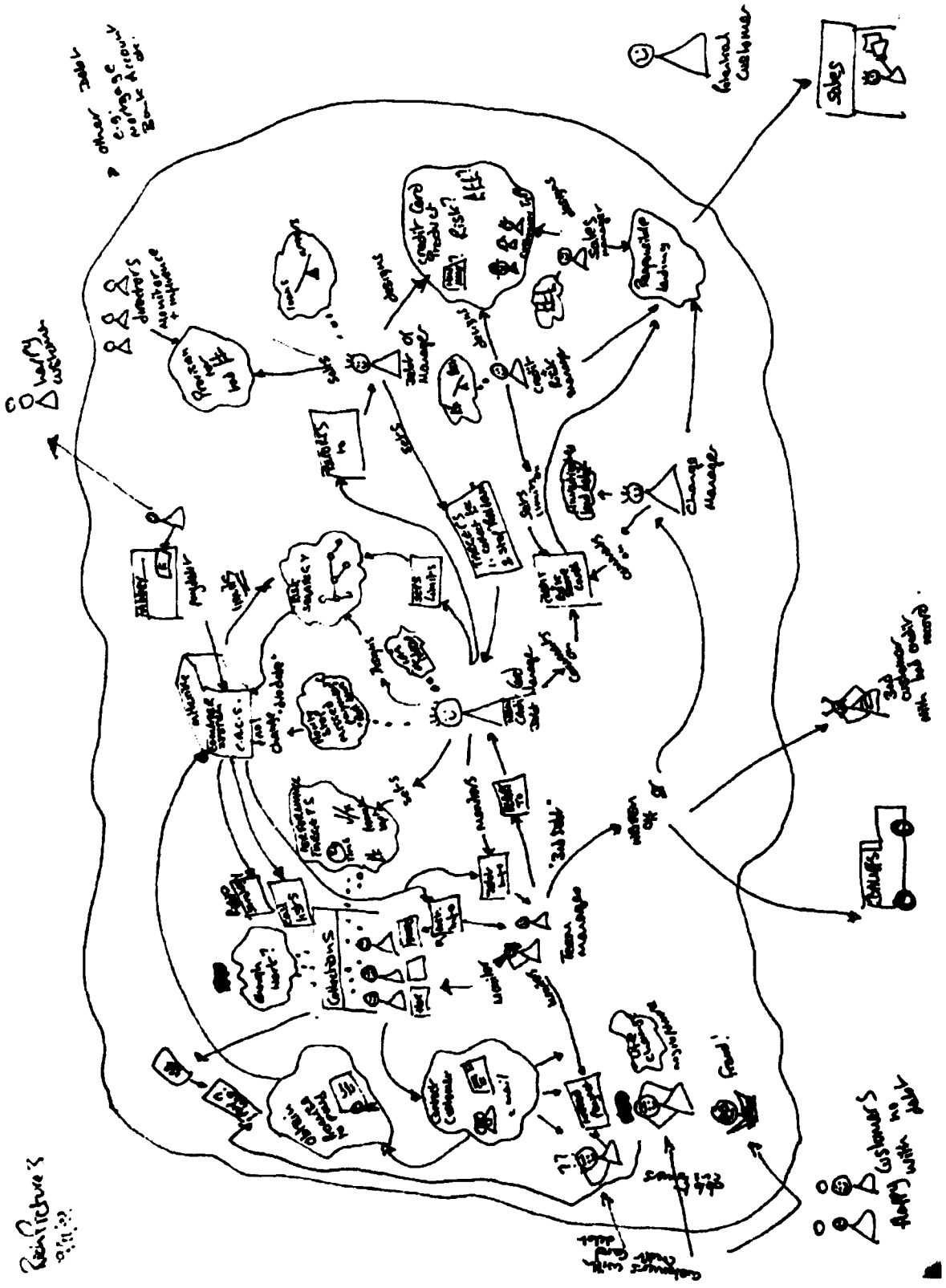


Figure 5.2: Rich Picture 3 (RP 3) describing the problem situation from the perspective of those involved in Credit Card Debt Management Operations.

The inquiry process to this point had taken a period of 6 weeks, with the researcher visiting Abbey National between 2 and 4 times a week depending upon staff availability. Having reached an agreed expression of the problem situation, the researcher began to debate with those in Credit Card, ideas for purposeful action that might bring improvement.

5.6 Ideas for Purposeful Action

To support debate concerning purposeful action that might bring improvement to the situation, following SSM as a guide, the researcher employed the devices of root definitions and holons (conceptual activity models). Several holons were discussed amongst the personnel in the Credit Card section before some ideas for purposeful action were formulated. The first root definitions and holons created by the researcher were naïve and badly constructed, but as learning about both the situation of focus and about using the ideas underpinning SSM accumulated, the ideas for purposeful action became more relevant to the problem situation. Some holons that were constructed were rejected and the progress of the inquiry was far from smooth. Eventually, an accommodation was reached on some potentially useful ideas for purposeful action. These ideas addressed an issue that was of interest and concern to those in Debt Management Operations, but that had not been pursued due to the amount of work. The conceptual activity model expressing these ideas is provided in Figure 5.3 overleaf. Following the framework of ideas described in Chapter 4, the next phase of inquiry was to *navigate* a course from these ideas for purposeful action to ideas for support, by first facilitating some debate about how these ideas might unfold in the situation of focus.

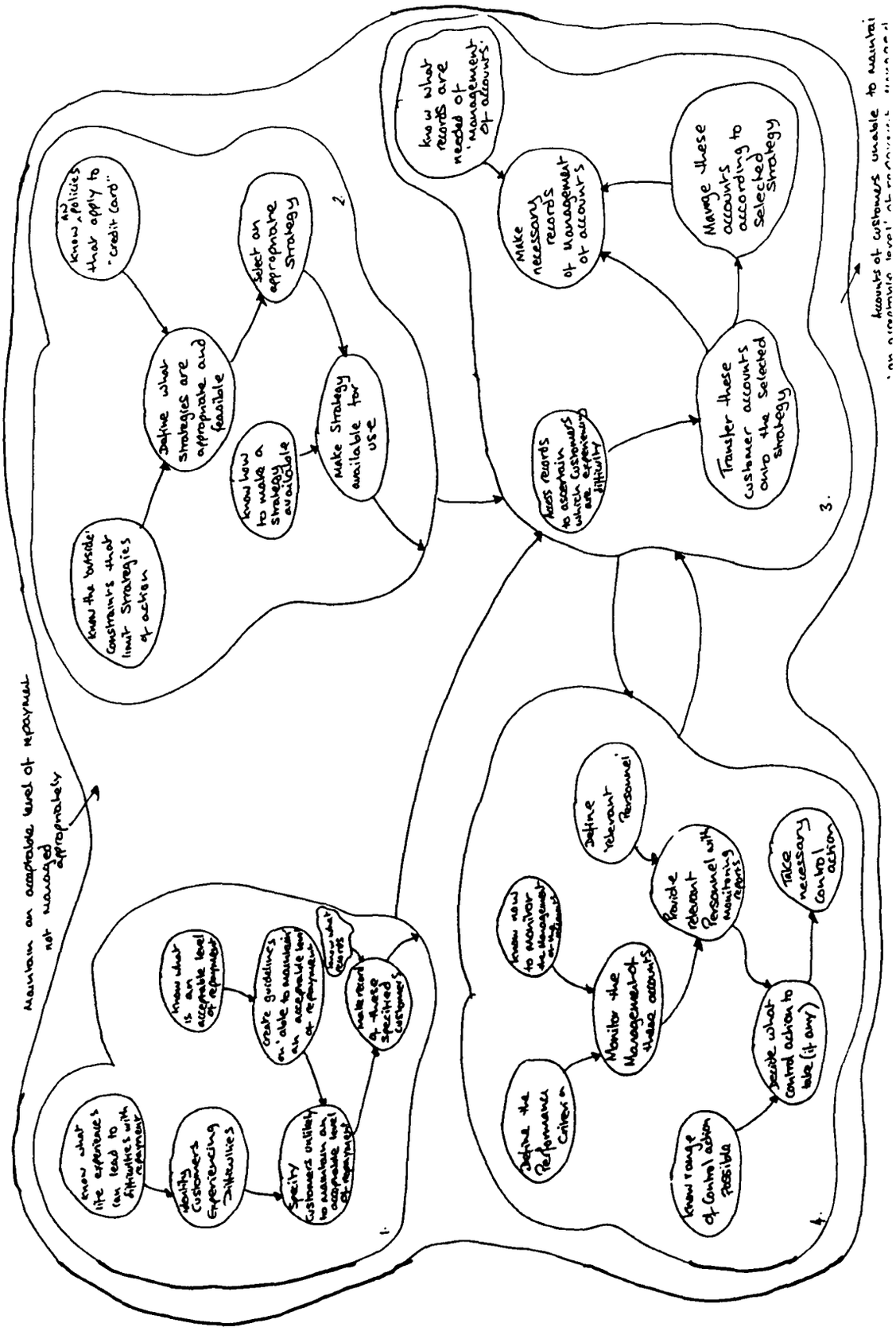


Figure 5.3: A holon expressing some ideas for purposeful action that those involved in the problem situation considered might bring improvement.

5.7 Contextualising the Ideas for Purposeful Action

To facilitate this phase of inquiry, the purposeful action expressed in Figure 5.3, was regarded as emerging from actors participating in "Conversations for Action" (Winograd and Flores, 1987). The customers of the purposeful action could be considered to have some requirements that provided the performers of any action with some knowledge of the standards to be met. Also the performers of the action might require access to certain knowledge, possibly in the form of training, information or resources in order to complete the action under consideration in a satisfactory manner. These standards and requirements are referred to as "Conditions of Satisfaction" (Harris and Taylor, 1998; Winograd and Flores, 1987). Conditions of Satisfaction emphasize what is required in order to complete any action successfully and these are different to *measures of performance*, which are indicators that the purposeful action is leading to the hoped for improvement. Any measures of performance associated with the *overall* ideas for purposeful action are made explicit when debating any conceptual activity models created during the initial phase of SSM guided inquiry. Some authors have argued that if the action is to be operationalised there is a need for additional activities specific to the process of implementation, that are not expressed in the conceptual activity models (Mathiassen and Nielsen, 2000; Mingers, 1995; Savage and Mingers, 1996). Asking participants what Conditions of Satisfaction might be associated with the purposeful action helped to structure a debate on the implementation of the intended purposeful action in the situation of focus. That is, each participant was asked to consider in what ways the proposed action *could* be undertaken and what might be required.

At times, some part of the action under consideration already seemed to occur within the real world situation and the participant would refer to current ways of 'doing things'. If such a situation arose during discussion, the participant was asked if he, or she, considered it desirable that this action continued unchanged, or if there may be other ways of operationalising the action. At other times, the action under consideration

was new and participants were asked to think of many different possibilities of how that action might unfold.

After a number of attempts to find ways of recording this phase of debate, each individual sub-system from the holon depicted in Figure 5.3 was drawn out on a new piece of paper to allow more space for detail to be added. The participants then discussed with the researcher, ways in which they perceived the action might be undertaken in reality. The researcher added boxes for each actor, or role, containing relevant Conditions of Satisfaction (according to those involved in the situation) written inside. The resulting model for sub-system 1 is shown in Figure 5.4 overleaf. The convention used in Figure 5.4 overleaf is slightly different to that used in the trial and in the initial stages of inquiry (see Champion and Stowell, 1999c, Appendix 3), but was found to be the most useful in practice.

This exercise enabled those participating in the inquiry to *appreciate* how each actor might be expected to contribute to the different aspects of the purposeful action under consideration and also participants could begin to consider where technology-based support might be appropriate. For example, in Figure 5.4 overleaf, it can be seen that in the activity: *make record of the specified customers*, the Collections Officers would carry out this particular action by using the in-house software application (called 'CACS', Computer Assisted Collection Service, by Abbey National personnel) and database and also by obtaining the relevant information from the customer. In the activity: *know what records are necessary*, some information was required for legal purposes and audit purposes. Other information was useful in facilitating the Collections Officers in their discussions with the customer. Initially, the Conditions of Satisfaction considered were at a reasonably general level, but as debate progressed some aspects of this contextualised holon were discussed in greater detail, and more Conditions of Satisfaction were added. The possibility of the activity: *identify customers experiencing difficulties* being supported with some technology was of particular interest to those involved in the situation.

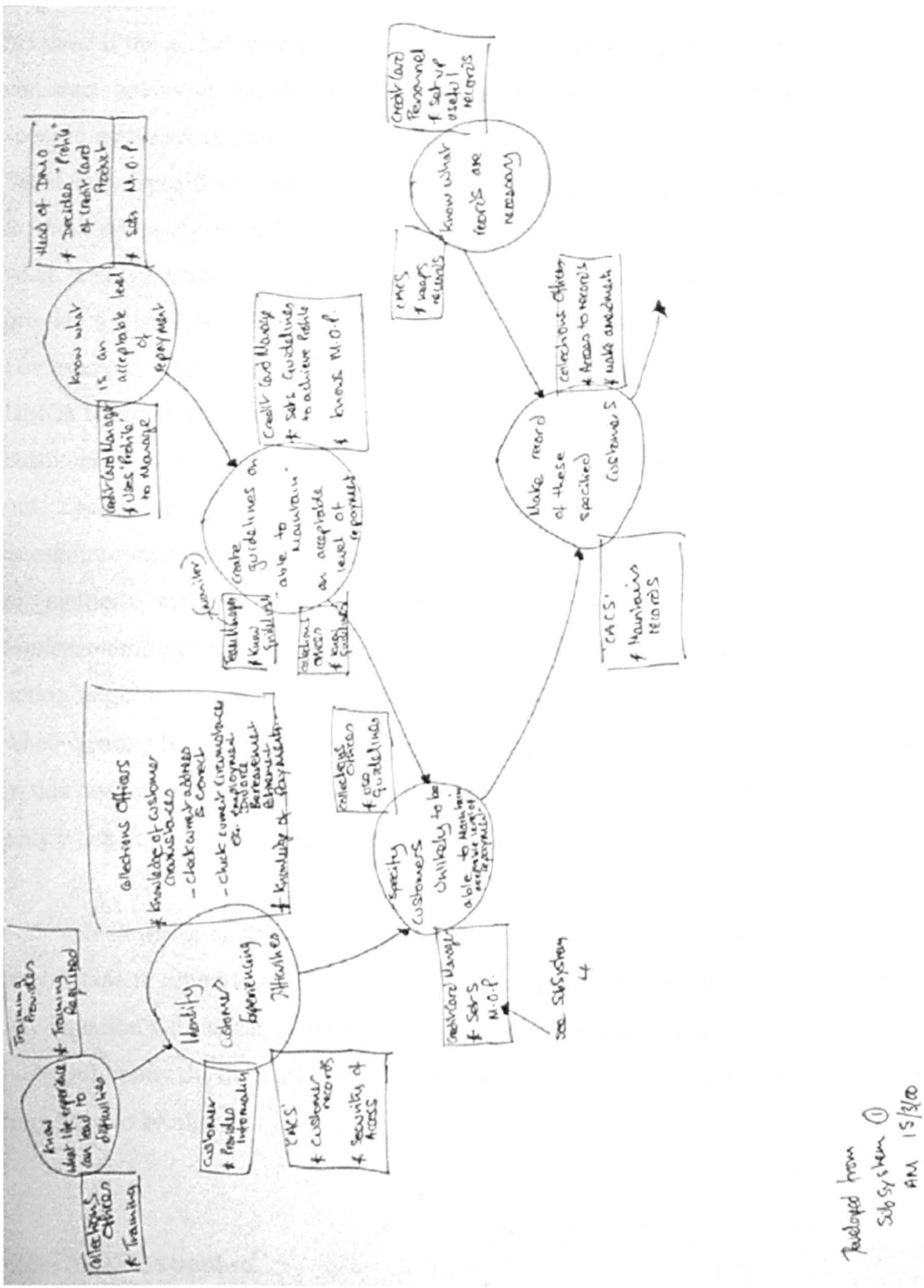


Figure 5.4: Sub-system 1 from the holon in Figure 5.3 with the Conditions of Satisfaction added.

The device of *thinking about* the Conditions of Satisfaction for each activity did seem to provide a more detailed view of *what might be involved* if the action were to be implemented. Of course, it is possible to construct holons of the activity system at a 'lower-level' by modelling specific activities in more detail. But using the device of Conditions of Satisfaction specifically encourages those involved in the inquiry process to *think about* the consequences of implementation. Also, no matter to what level of detail the holons are constructed, these devices will not provide a description of the action unfolding in the real world situation. For example, within the situation of concern (the Credit Card Section of DMO) before a Collections Officer entered into any negotiations with a customer of Abbey National, it was vital that a security check was carried out. Such checks on identity are common and usually involve asking questions concerning 'unusual information' such as a customer's shoe size, or mother's maiden name. Such activities that are specific to the *implementation* of the action are not the focus when thinking about what action might bring improvement and so are not necessarily made explicit when creating holons expressing some ideas for purposeful action. Indeed, in this instance, the participants remembered the need for a security check, only when thinking about *implementing* the action.

It is worth noting that at any point in the inquiry, those involved may decide to return to an earlier phase of investigation. Knowledge about any situation will never be exhausted and the cycle of learning is iterative and continuous. In the real world, the unforeseen often occurs and plans may have to be altered.

5.8 The Unexpected

Four months into the field study, a major and entirely unexpected event occurred; the Head of DMO announced that the Credit Card section would be relocated to the Sheffield office. Initially the only person who was to transfer to Sheffield was the Credit Card Manager. The new Credit Card

staff team in Sheffield had been involved in selling mortgages to customers and the working procedures associated with collecting Credit Card debt were significantly different. This news concentrated the mind of all those involved in the field study and work continued in *navigating* a route towards a specification for a serving information system.

5.9 Possible Implementations

Once those involved in the situation had considered, as far as possible, what might be required if the ideas for purposeful action were to be implemented, the inquiry process then shifted focus to thinking about *how that action might unfold* in the situation of concern. This phase of inquiry was needed in order to enable the developers to gain an *appreciation* of what technological support might be required. The next stage in *navigating* the gap was to construct models of the Conversations for Action that provided an expression of how the action might unfold in the real world situation. In the framework of ideas described in Chapter 4, it has been argued that the models of Conversations for Action would provide a detailed view of how the action *might* unfold in practice. During the field study these models were used to provide views on how *particular actors* might interact during the operationalisation of the purposeful action under consideration. Finding a suitable mode of construction for these models was problematic, with much learning along the way. All the models created during the field study are examples of the learning that occurred on the part of the participants about the situation of focus, the framework of ideas, and they are also examples of the learning process about the use of the *navigational* devices to support debate.

For example, an initial model of the Conversations for Action arising from the activity: *identify customers experiencing difficulties* is given below:

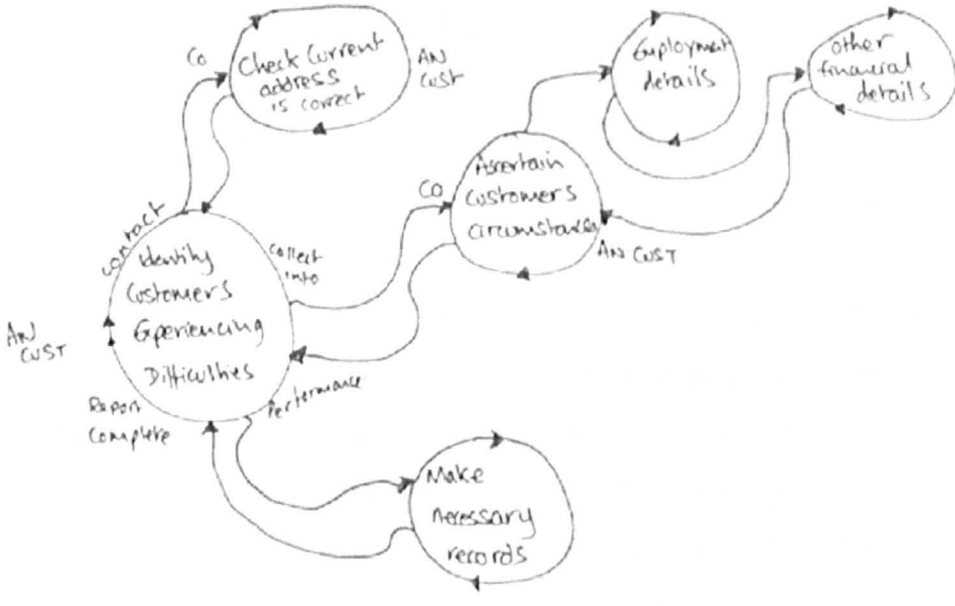


Figure 5.5: An initial model of the Conversations for Action arising from the activity: *identify customers experiencing difficulties.*

The model in Figure 5.5 expresses the likely interactions between a Collections Officer and an Abbey National customer ('AN Cust' in the diagram) during this activity. It must be emphasized that this model was constructed very quickly by the researcher on site as a practice model and is included here to illustrate the manner in which the learning unfolded in a practical sense. The model is read clockwise from the 9 o'clock position with contact being established between the Abbey National customer and the Collections Officer. (This differs slightly to the convention used by Harris and Taylor (1998) where an initial *request* is made). Following the model, the customer and Collections Officer go through the various checks on address and employment details and undertake some discussion to establish the nature of the difficulties the customer is experiencing. The Collections Officer would also need to make records of this conversation, including any new information provided by the customer and also make

records of any advice given to the customer. The model has been created from the contextualised conceptual activity model in Figure 5.4.

This first model seemed unsatisfactory. If the activities shown in Figure 5.5 above, were implemented as described by the model, the Collections Officer would have to obtain the necessary information in the same order each time. It seems most unlikely that if a customer has just been bereaved, they will be able to offer the required information in a set format. Also the Collections Officers were trained to be sympathetic to the manner in which the customer 'told their story'. Some discussion with one of the Collections Officers supported the view that these models expressed the purposeful action as being 'set' and inflexible. Second, on an examination of the other contextualised sub-systems it was apparent that whilst the Collection Officer was in discussion with a customer concerning their particular difficulties, it would be possible to link this to the Collections Officer's commitment within the activity *manage these accounts* from sub-system 3. When this particular sub-system had been considered, the Conditions of Satisfaction for the Collections Officer when managing these customer accounts had included *negotiating a promise.* The contextualised model for sub-system 3 is given below in Figure 5.6. (Note: the contextualised models for all the sub-systems from the conceptual model in Figure 5.3 are provided in Appendix 1).

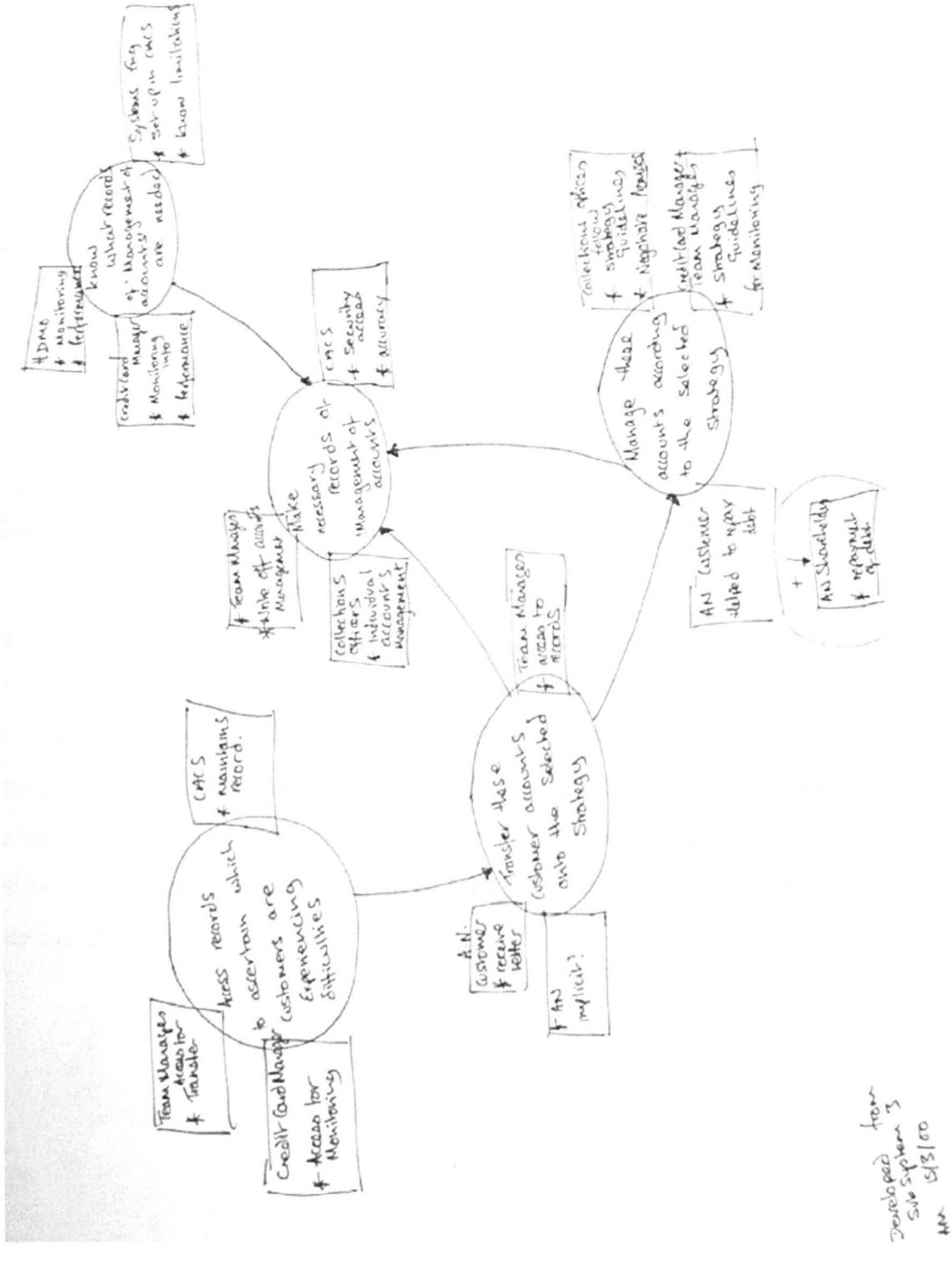


Figure 5.6: Sub-system 3 contextualised with the perceived Conditions of Satisfaction.

The Conditions of Satisfaction deemed to be associated with the activity *manage these accounts according to the selected strategy* in Figure 5.6 above, point to the Collections Officers negotiating a promise with the customer. If a Collections Officer was discussing a customer's difficulties, it would seem expedient to ask the customer to make some promise to pay, if feasible, during the same discussion. Connecting these particular actions only begins to make sense when considering the ideas for purposeful action *in context* and crucially does not contradict the logical order of action expressed within the holon. If a technology-based information system were to be constructed, the underpinning software application could be organized so that these particular actions could be undertaken together, if that was deemed appropriate.

A new model of the Conversations for Action was created that expressed the idea that the Collections Officer might participate in Conversations for Action to ascertain the customer's personal situation, employment, contact address and financial details, alongside negotiating a promise to pay. This model is depicted in Figure 5.7 below. This model also expresses the need for an initial security check to be undertaken (from sub-system 1) and is still an unsatisfactory model in some ways. This is discussed further in Chapter 7.

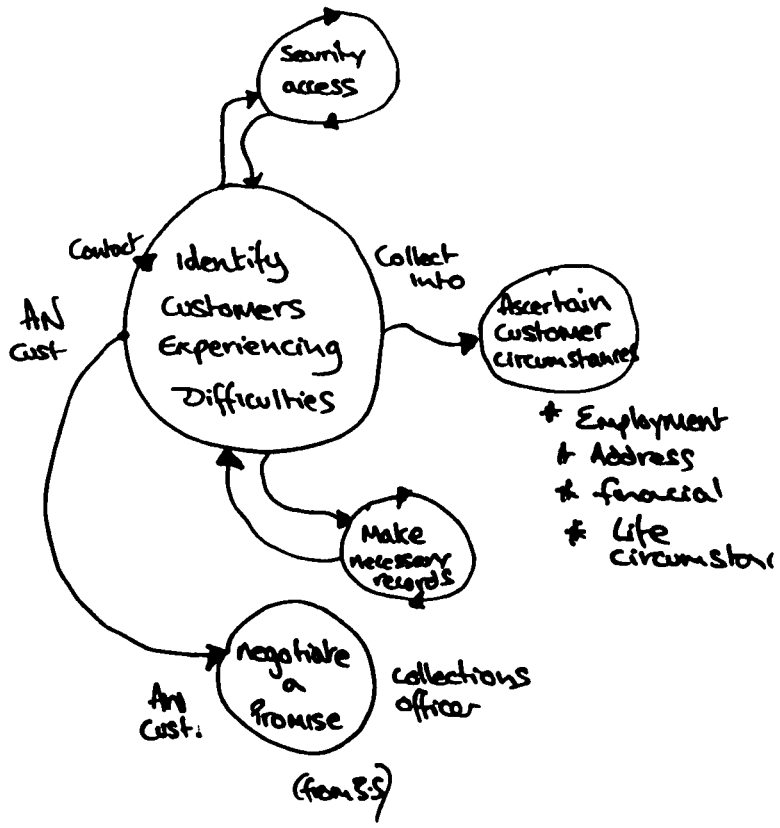


Figure 5.7: A model of the Conversations for Action that might be undertaken by a Collections Officer and an Abbey National Credit card customer when attempting to manage the Credit Card debt of that customer.

The move to the Sheffield office was now imminent and from this point in the inquiry process the researcher withdrew from the situation in order to undertake the next phase of inquiry; the creation of a technical specification for a *serving* information system.

5.10 Summary

The initial ideas for purposeful action had been created through undertaking inquiry with personnel working in Debt Management Operations and in particular the Credit Card section. The models created during the field study were also used by the Credit Card Manager to

support an explanation of some of the difficulties and issues with Credit Card debt collection to the new group in Sheffield. Some of the original personnel from the Milton Keynes office enjoyed working in Sheffield to the extent that they moved to the area permanently. This was fortuitous for the research on the UMISD project, as these personnel then remained involved throughout the duration of the inquiry. The researcher was able to make return visits at periodic intervals, to the 'new' Credit Card office in Sheffield and to the Systems Support Engineers and other DMO staff in Milton Keynes. During these visits the potential usefulness of the specifications that were created for possible serving information systems were discussed and debated. This next phase of research is discussed in Chapter 6.

Chapter 6

Serving the Action: Constructing a Specification

6.1 Introduction

As discussed in Chapter 1, Winter et al (1995) argue that in order to support those involved in the process of designing an information system to *serve* purposeful action, it is first necessary to have some conception of the system to be served. The main field study had provided the opportunity to become involved in a situation of concern, in this instance Abbey National's Credit Card Debt Management Operations, and to create some ideas for purposeful action that might bring improvement. These ideas for purposeful action had emerged through a process of inquiry guided by SSM and could be regarded as expressing *ideas* for a potential system to be served. Following the framework of ideas, other devices were then used to navigate the inquiry process through a shift in thinking from some ideas for purposeful action, to thinking about how this action *might* unfold. This shift was facilitated by first, structuring a debate around the *implications* of implementing the action, by considering the Conditions of Satisfaction for each potential actor. Conversation for Action models had then been constructed and used to structure a debate to support those involved in *thinking about*, through debate, how the action *might* unfold in the situation of concern in some detail. In Chapter 4, following Winter et al (1995), it was argued that once those involved had reached some accommodation concerning ways the action might be undertaken in the real world it then becomes relevant to move toward the construction of a specification for an information system to *serve* the action. The difficulty was the selection of an approach for creating a logical specification that would facilitate a sense of coherence being maintained through to the next phase of inquiry.

6.2 SOMA

Despite the criticisms levelled at the approach to creating logical specifications known as SOMA (Graham, 1994, 1998) in this thesis (see Chapter 2), this approach was selected as one means of undertaking the next phase of *navigation*. The advantage that the researcher considered was offered by choosing SOMA is that the Agent Object Model device provides an *activity-based* view of the ideas for a potential technology-based information system and can be used as the starting point for software design. In order to maintain a sense of coherence throughout the *navigation* process, it had been argued prior to the field study that it would be helpful to use intellectual devices that provide a similar view throughout the inquiry. By moving from the holons and models of the Conversations for Action, to an Agent Object Model, all the devices employed, offered an *activity-based* view. It was hoped that this approach would enable those involved in the inquiry process (and other interested individuals) to be able to follow the route of the inquiry more easily.

A further advantage of using SOMA conventions and modelling techniques during this phase of the inquiry is that the SOMA approach was one of the approaches that informed the Object-oriented Process Environment and Notation conventions (OPEN) (Firesmith et al, 1997). OPEN is a synthesis of several object-oriented approaches created by an international consortium of leading practitioners in order to provide a standard framework of notation and Graham (1998) argues that the SOMA approach remains compliant with the OPEN notation. From the perspective of supporting those involved in the situation of focus *navigating* from ideas for purposeful action to ideas for support, it is important to ensure the means used to construct the logical specification for the *serving* information system are not so obscure that developers in a real world situation will not use them. One important fact to note is that the models created if applying the SOMA approach are not linked to a specific programming language and any requirements specification

constructed using the *SOMATiK* case tool cannot be used directly to generate code; though Bezant Technologies[18] do offer a code generator that can perform that function in order to produce a working prototype. The models created through applying the SOMA approach are compatible with many programming languages, so using this approach to express the specification for the information system requirements offers the possibility of employing a variety of techniques for constructing any software deemed as being required.

This next phase of inquiry was crucial if *navigation* from any ideas for purposeful action, to ideas for a serving information system, was to be successfully achieved. The Agent Object Model was to act as the *first* expression of the *serving system* and it is during this phase of inquiry that those involved must make the movement from *thinking about the action* to *thinking about the support for action.* First, the nature of the models created if applying the SOMA approach must be considered in some detail.

6.3 The Theoretical Basis of the Models used in SOMA

One of the key differences between exploration-oriented approaches to information systems design, such as CLD (Stowell and West, 1994), and technique-oriented approaches, is the emphasis placed on finding out about the problem situation in the initial stages of the design process. As discussed in Chapter 2, exploration-oriented approaches provide means of supporting the creation of a shared *appreciation* amongst participants in the situation. Other approaches to information systems design tend to focus on constructing some sort of *description* of the current situation from which the requirements for the technology are 'abstracted'. This emphasis on constructing a description of the current situation is apparent in the literature on SOMA.

[18] Bezant Technologies is the company that Graham set up as a Requirements Engineering consultancy practice, now owned by Trireme International Ltd.

Indeed, the first activity is described as an effort to "...build a model of the concrete, real world business" (Graham, 1998, p. 87).

Graham (1998) regards a *business process*, as being composed of a series of conversations that occur between the actors involved in that process. He uses the ideas of Winograd and Flores (1987) to suggest that a business process is the result of a number of actors (or 'Agents' to use Graham's terminology) sending various signals to each other in order to complete some activity. Graham (1998) argues that these messages can be regarded as constituting a "semiotic act" (a signal between Agents) and as implying that the Agents involved in the sending and receiving of a message have entered into a commitment. Graham (1998) offers the Agent Object Model as a device for the purpose of creating a model of the business process, where the Agents in an activity are described as 'objects' that then pass various messages to complete the activity for which they are responsible. Graham (1998, p. 11) defines an object as "anything with a unique unchanging identity". The specified activities are described as being composed of "tasks" in the SOMA approach and each task has an associated "ruleset" that specifies the operations for that task (Graham, 1998). From this point, the models are useful to a software engineer as they facilitate the construction of an "atomic script", or single-sentence descriptions of all the tasks that the Agents undertake (Graham, 1998, p. 141). Such a script is needed if a software engineer is to be able to construct the program code.

Graham (1998, p. 23) argues that the view of the potential technology-based information system provided by object-oriented models is superior to other structured models, such as a Data Flow Diagrams. He suggests that object-oriented models with a focus on message-passing offer a more dynamic sense of the system being modelled, in this instance a potential technology-based information system. At this stage of the research, it was not certain that the use of object-oriented techniques would provide suitable devices with

which to facilitate the *navigational* phase of inquiry. Liang et al (1998) had encountered difficulties in their attempt at using holons as a starting point for an object-oriented specification for an information system.

Using the arguments of Checkland and Scholes (1990) and Winter et al (1995), it has been argued in this thesis that the fundamental shift that occurs during information system design is the movement from some ideas for purposeful action, to thinking about how to support that action. Moving from conceptualising purposeful action, to conceptualising support for action, will require those involved in the inquiry to *think clearly* and be certain which design problem they are addressing at any particular moment. SSM can be employed as a guide to support an exploration of the problem situation and to create ideas for purposeful action. This phase of the inquiry is then addressing the need to *think about* what problems are perceived by those involved and what purposeful action might bring improvement to the situation of concern. In other words, those involved are supported in *creating ideas for a system to be served.* The construction of a logical specification is addressing a different design problem, that is, the creation of a *serving system.* The intellectual devices of Conditions of Satisfaction and Conversations for Action, support those concerned in considering any issues associated with operationalising the ideas for purposeful action, so as to enable the movement from potentially relevant purposeful action to designing a serving system.

The value in *navigating* from ideas for purposeful action to ideas for support, is that the difference between the two is highlighted, and so those involved are supported in thinking clearly about, and *coming to a shared appreciation* concerning, the problem situation being considered at any point. In trying out the framework of ideas, it was important to investigate if the *navigational* devices of Conditions of Satisfaction and Conversations for Action would be sufficiently detailed expressions of the possible real world

action to *inform* the construction of a logical specification for a *serving* technology-based information system.

6.4 Using SOMA to Construct a Logical Specification

A developer using SOMA as a guide to constructing the logical specification for a technology-based information system first attempts to describe the real world business process using the device of an Agent Object Model. Graham (1998) distinguishes between "Business Objects" found in the "external context" (or business environment) and other "internal agents" who actually use the *computer* system being developed, these Agents are referred to as "Agent Objects". For example, a customer placing an order would be regarded as an external Business Object in a SOMA specification and the salesperson who takes the order and uses some technology to support this activity, would be an internal Agent Object. The emphasis when creating models using the ideas of Graham (1998) in SOMA, is to describe how the users will interact with the technology being developed. Graham argues that adopting this approach enables a *developer* to identify any *rules* associated with the activities under scrutiny. For example, when an order is placed with a salesperson as described above, Graham (1998) suggests a developer constructing a specification for a supporting information system would need to query who was responsible for setting the credit limit of the customer placing the order, the salesperson, or a more senior manager. In the approach suggested in this thesis, such issues would be addressed when those involved in the inquiry consider the Conditions of Satisfaction associated with the action they wish to undertake. Providing support for such issues to be considered would seem a more reliable guide than assuming the design team would remember, or indeed know, to ask.

Interestingly, although Graham (1998) overtly adopts the ideas of Winograd and Flores (1987) concerning Conversations for Action, the

associated Conditions of Satisfaction are not explicitly modelled in the SOMA approach. This neglect of the potential usefulness of the idea of Conditions of Satisfaction appears to be a weakness in the SOMA approach. The modelling approach that has been suggested in this thesis, actively employs the idea of Conditions of Satisfaction as an intellectual device in supporting those involved in *thinking about* (through debate) what is required (or the *commitment* involved) in order to complete the action successfully. Debating the Conditions of Satisfaction facilitates a consideration of the issues involved in the operationalisation, or *implementation,* of the ideas for purposeful action. Graham (1998) suggests using "design acumen" to cross these hurdles, but few clients in a business environment will be practitioners of some thirty years, as is Graham. The use of intellectual devices to support all the clients remaining involved in the inquiry process, regardless of their technical ability, also helps to promote the aims of *Client Led Design* as stated in the UMISD project proposal.

For the purposes of the UMISD research, the models expressing possible Conversations for Action constructed during the field study were used as an expression of *how* the intended real world action *might* unfold in practice. These Conversations for Action models were then used in the first instance, to inform the construction of a logical model of a potential serving technology-based information system using *SOMATiK*, the case tool built to support the application of the SOMA approach in a business environment.

6.5 From Conversations for Action to Agent Object Models

The Conversations for Action model depicted in Figure 5.7 (Chapter 5) is an expression of how the real world action undertaken by a Collections Officer *might* unfold when speaking with a customer who is experiencing difficulties in making payments. This model had supported those involved in the inquiry process in gaining an *appreciation* of how the action might work in practice,

by thinking about the action as a series of Conversations for Action between interactants. To construct the Agent Object Model, it was first necessary to identify the "Business Objects" (Agents who were considered to be in the external context, or the business environment) and the Agents who were considered to be in the internal context (that is, using the computer system). The *navigational* devices of Conversations for Action with any agreed underpinning Conditions of Satisfaction had been used to facilitate the participants in considering how the action *might* unfold. During this contextualisation, action that could potentially be supported by some technology had been marked on the models as 'CACS' (Computer Aided Collection Service).

In the example provided below, a customer experiencing difficulties maintaining repayment is regarded as existing in the business environment and is therefore an external Business Object and the Collections Officer who will use the computer system, is regarded as an internal Agent Object. As described earlier in this chapter, Graham (1998) regards the occurrence of Conversations for Action as being equivalent to the passing of messages between interactants. To construct an Agent Object Model using SOMA, the first task is to identify the *messages* (in Graham's terminology) that an Agent will send and receive. For the work on the UMISD project, the Conversations for Action that the Collections Officer participated in were each regarded as a message for the purpose of creating the SOMA specification, as can be seen in Figure 6.1 below. For the purposes of creating this specification the 'security check' from the Conversation for Action model has been omitted from the specification at the request of those in Abbey National, as this protocol is an overarching program already in existence.

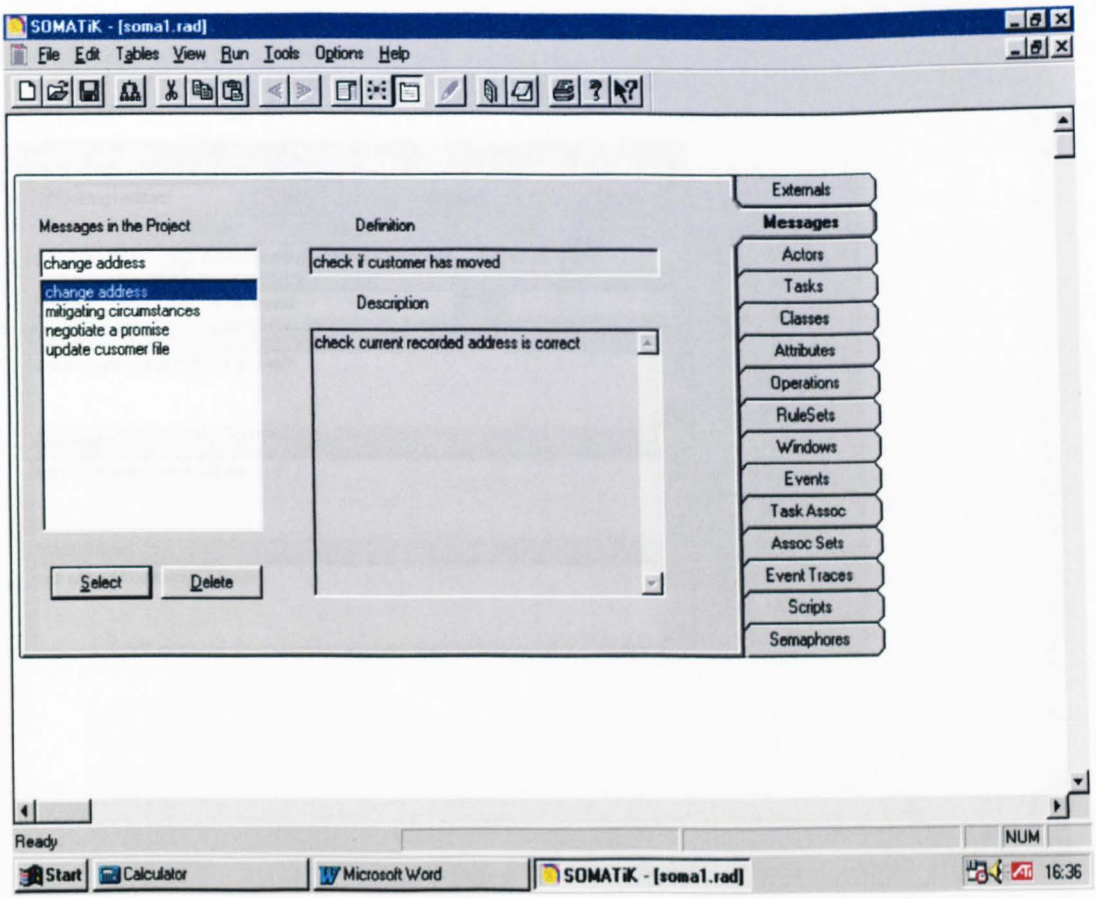


Figure 6.1: The messages identified in the initial specification using *SOMATiK*.

In the SOMA specification, some of the terminology used is different to that used in the *navigational* models. For example, one of the Conditions of Satisfaction from Figure 5.4, is 'check address is correct' and this terminology *informed* the choice of phrasing used in the specification. The phrase 'change address' is used, partly due to the need to state that there would need to be some software facilitating the Collections Officer changing the address details if necessary and partly due to the limit on space in the *SOMATiK* case tool. The definition of this message in the Message Table used the same phrasing as that in the guidelines provided for the Collections Officers in their training manual and so 'check address is correct' became 'check if the customer has moved'. This is shown in Figure 6.2 below:

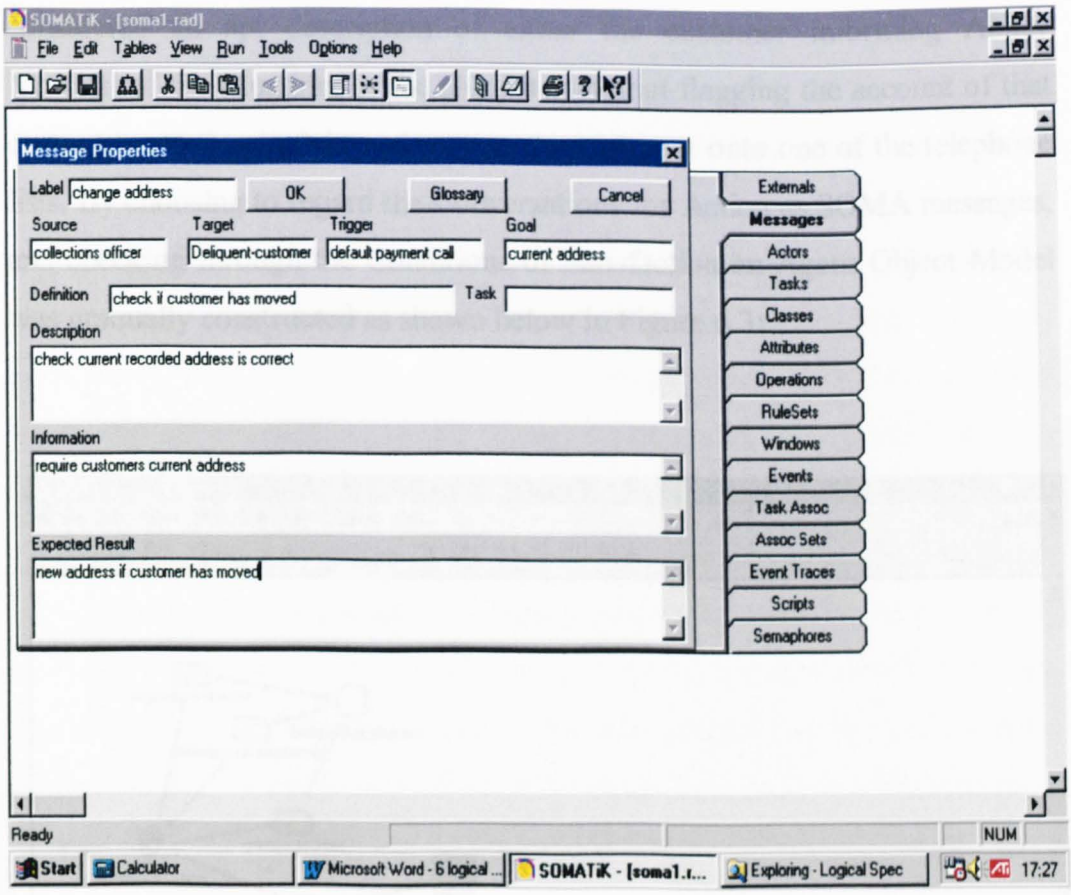


Figure 6.2: The table from *SOMATiK* describing the details of the message 'Change Address'.

Also, to create the SOMA specification a so-called "Trigger Event" was required. The accounts managed by Credit Card DMO *all* belonged to customers who were behind with repayment of Credit Card debt. It was possible that a Collections Officer might contact the customer, if that Collections Officer was working through the telephone lists. It was also possible that the customer might contact Abbey National to inform them of a change of address, or change of employment details, or even to ask advice if they were already aware that the next due payment would be missed, or would not be of the required amount. In any of these cases, as *all* the customers dealt with in this section were in debt, in essence, any of these contact situations could be regarded as notifying Abbey National of some type of default on a

required payment. For this reason, the term 'default payment call' was considered an apt description of either the customer informing Abbey National of the situation, or the computer system flagging the account of that customer as being in debt and putting the customer onto one of the telephone lists. By choosing to regard the Conversations for Action as SOMA messages, and checking through the Conditions of Satisfaction an Agent Object Model was gradually constructed as shown below in Figure 6.3:

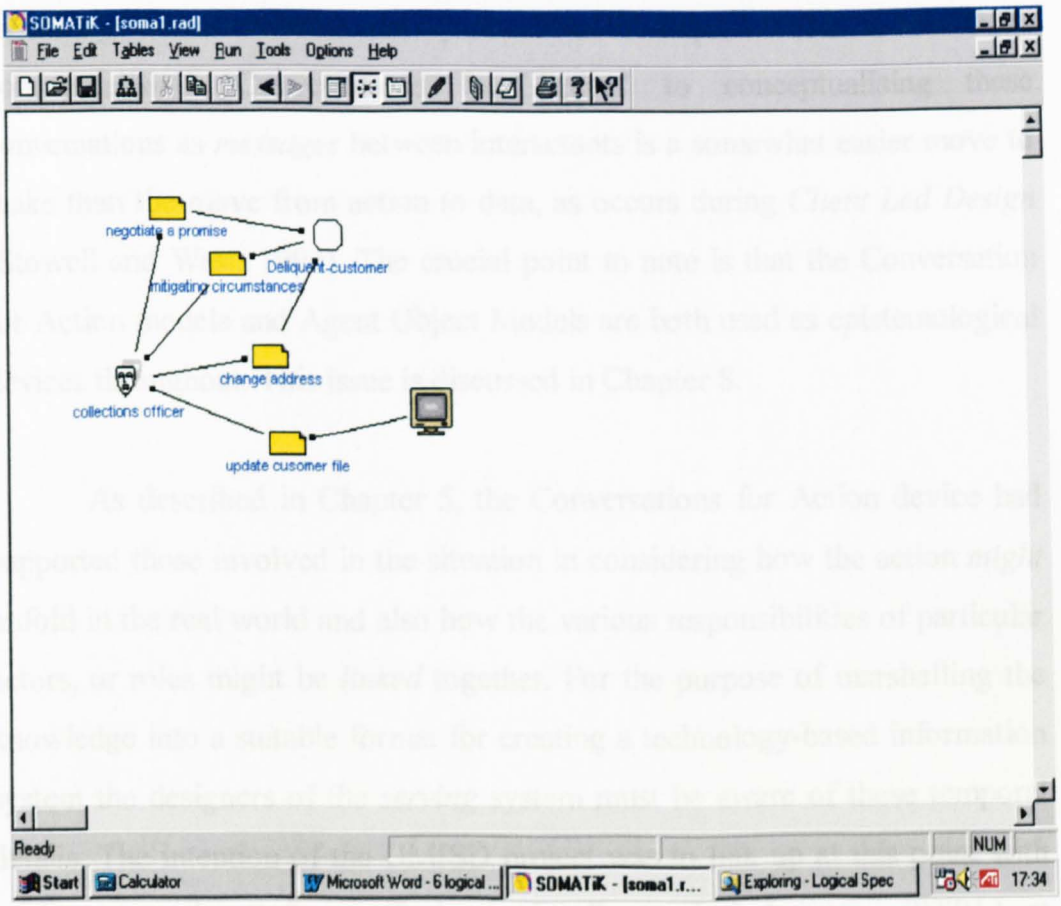


Figure 6.3: An Agent Object Model in *SOMATiK*.

Underpinning each of the messages in the Agent Object Model is a 'Message Properties Table' where each message is described in full. (Figure 6.1 is the

Message Properties table for the message 'Change Address', see also the logical specification in Appendix 1).

By constructing the above Agent Object Model the focus of the inquiry has *shifted.* The focus has moved from an emphasis on ways the action *might* unfold expressed by the Conversations for Action models to a focus on how the Collections Officer might interact with the technological support if undertaking the expressed action in the real world situation. The Agent Object Model is an expression of the basic functionality a potential *serving* technology-based information system would require. The move from conceptualising 'Conversations for Action' to conceptualising these conversations as *messages* between interactants is a somewhat easier move to make than the move from action to data, as occurs during *Client Led Design* (Stowell and West, 1994). The crucial point to note is that the Conversation for Action models and Agent Object Models are both used as epistemological devices throughout. This issue is discussed in Chapter 8.

As described in Chapter 5, the Conversations for Action device had supported those involved in the situation in considering how the action *might* unfold in the real world and also how the various responsibilities of particular actors, or roles might be *linked* together. For the purpose of marshalling the knowledge into a suitable format for creating a technology-based information system the designers of the *serving* system must be aware of these temporal details. The intention of the UMISD project was to link up at this point with engineers at the Software Technologies Research Laboratory (STRL) at DMU, Leicester. In the event, the researcher approached Alan O'Callaghan, from STRL, to further investigate the usefulness of these *navigational* devices in informing the process of software design.

6.6 Other Means of Creating a Logical Specification

Another means of creating a logical specification for a technology-based information system is to construct models that provide a view of a person interacting with the technology during specific scenarios. In creating such models, a software developer chooses certain elements of the model to act as unchanging 'objects' within the computer program (See Graham, 1998; Kristen, 1996; Sommerville and Sawyer, 1997). Essentially, these chosen 'objects' enable the developer to marshall the knowledge created about a situation into a format suited to constructing a computer program. Figure 6.4 overleaf, depicts the Class Diagram constructed by Alan O'Callaghan, using a standard notation: Unified Modelling Language, or UML, (Pooley and Stephens, 1999) and Figure 6.5 depicts the Collaboration Diagram for a scenario arising from the field study.

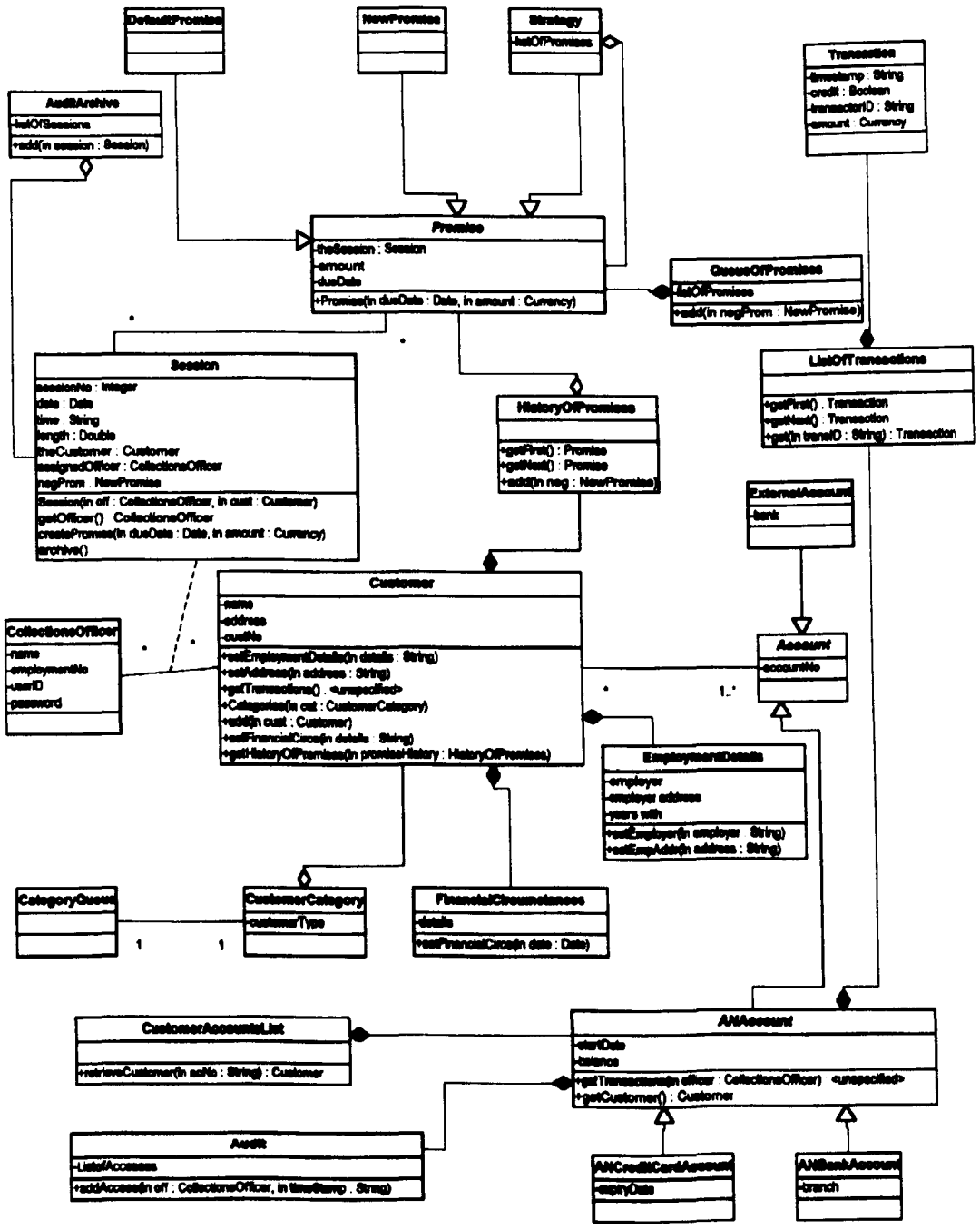


Figure 6.4: The Class Diagram constructed by Alan O'Callaghan from the models created during the field study and through discussion with the author.

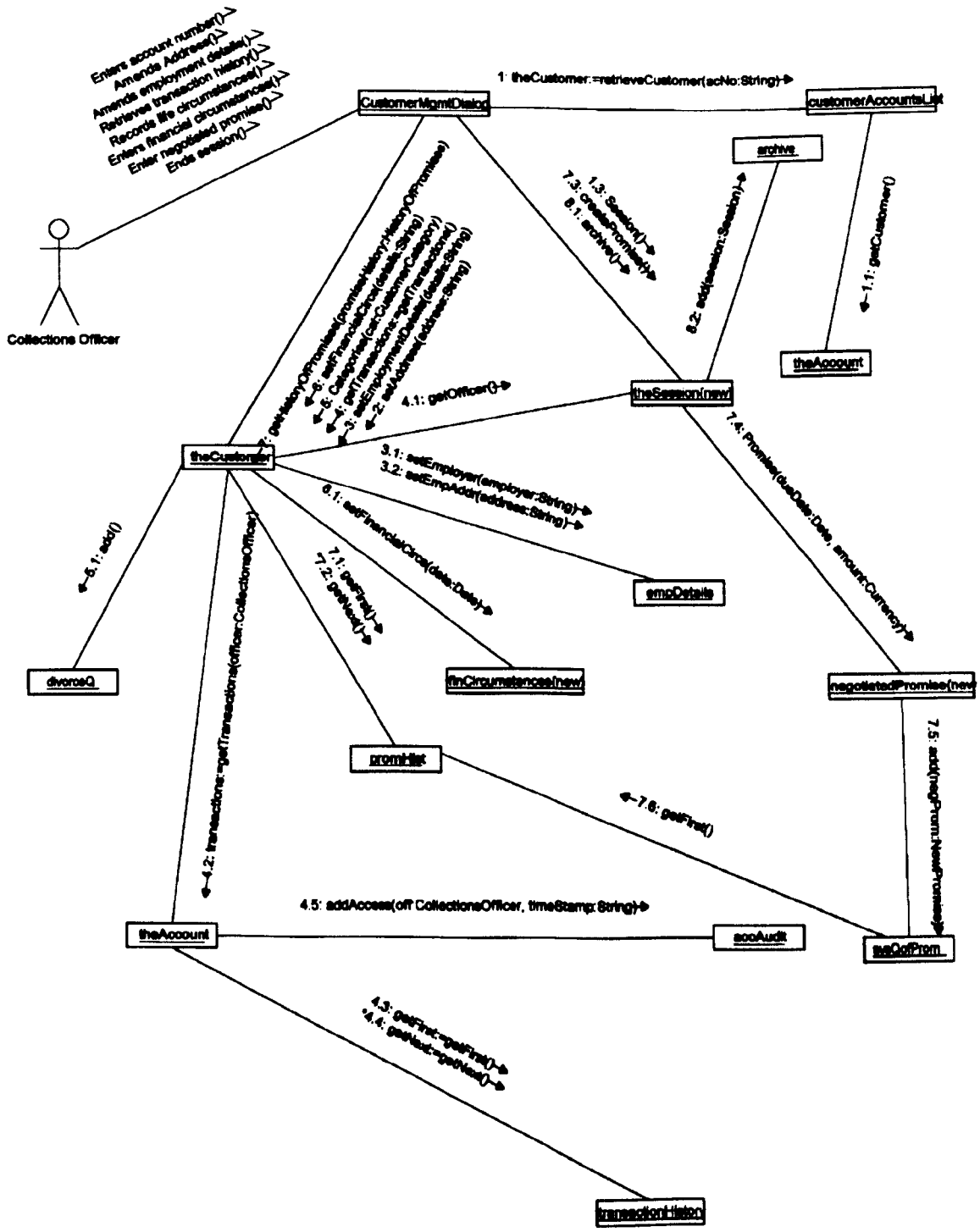


Figure 6.5: The Collaboration Diagram constructed by Alan O'Callaghan from the models created during the field study and through discussion with the author.

The Class Diagram in Figure 6.4 expresses the classes of objects that Alan O' Callaghan, as an experienced software designer, considered would be necessary if building a prototype for the Collections Officers to trial. Some of these classes of objects can immediately be recognised from the field study models. For example, *Customer* and *Promises* and *Collections Officer* can all be easily found in the models. Other classes of objects arise from the implications of creating a technology-based information system to support up to thirty Collections Officers undertaking the action simultaneously, with several hundreds of customers in debt at any point. For example, the class 'QueueOfPromises' arises from the necessity to organise some sort of check on promises that are current and awaiting to be completed or broken. Other classes of objects relate to the ongoing action over time. For example, the class 'HistoryOfPromises' acknowledges that some customers may take some time to clear their debt and make several promises over a period of time and so build up some sort of 'Promise Record'.

The Collaboration Diagram, expresses how a particular scenario (arising from the field study) might unfold, using the example of a customer negotiating a promise with a Collections Officer and also informing the officer of a change in address and employment details. This device expresses a view on what functions a computer program ought to exhibit in order to *serve* a Collections Officer in this particular scenario. The next step would be to build a prototype for testing in a real world situation. The Collaboration Diagram and the Class Diagram in Figures 6.4 and 6.5, provide a basic logical specification. These models are expressions of what is required from the technological support for a Collections Officer, if the ideas for purposeful action discussed in Chapter 5 were to be implemented.

Although a route has been *navigated* through, by using intellectual devices to support debate, the journey cannot be regarded in any manner to be *seamless*, nor can the intellectual devices used be considered to provide a

bridge. Once the devices of Class Diagrams and Collaboration Diagrams are employed, the focus of the inquiry is entirely on ordering the knowledge into a suitable format for constructing a computer program. The Collaboration Diagram does provide some sense of the activity being undertaken, but contains much notation that will act as guidance for any developer attempting to build a software application. The crucial and often unacknowledged point is that the status of these diagrams is as *sense making* devices, they *inform* the design work, they are not maps of what will be built (Graham, 1998). An interested individual will only be able to acknowledge the *relevance* of these diagrams, if he or she works through the models provided in Chapters 5 and 6. Debate with those who were actively involved in the inquiry would also be beneficial. There are some weaknesses apparent in the modelling devices used and a critical evaluation of the *navigational* devices is provided in Chapter 7. The idea of the UMISD project was for the research undertaken by the present author to inform a second phase of research undertaken by the software engineers associated with the project, to create a *definition* of the software provision to be used within the technology-based information system.

6.7 A Formal Approach to Constructing a Logical Specification

As described in Chapter 1, the work on the UMISD project was a joint venture between information systems researchers working from an interpretive stance and software engineers employing a formal, mathematical approach. The original intention was for the work of Champion and Stowell (Champion, 2000; Champion and Stowell, 1999a, b, c, 2000a, b, 2001; Stowell, 1998, 1999, 2000a; Stowell and Champion 2000, 2001) to forge a link to the work of Zedan et al (1999, 2000, 2001). One of the differences in approach between the two groups of researchers is that Zedan et al (1999) treat any models created during the initial inquiry phase as if these models provide absolute *definitions* of what would occur in the real world situation. Hence the title of the project: A Unified Mechanism for Information System Definition. To be

able to apply their preferred techniques of constructing a definition, Zedan et al (1999) *require* a precise and unambiguous specification for any intended technology-based information system as such a description facilitates the sort of mathematical analysis and application of formal verification methods with which they are familiar.

Zedan et al (2001) acknowledge that creating the ideas for an information system, in their words: undertaking "systems requirement capture", is difficult. They suggest that a person who is intimate with the business situation under scrutiny and who also possesses some technical skill could act as a "Knowledge-Mediator", or "K-Mediator" (Chen et al, 2001; Zedan et al, 2001). The K-Mediator would have the responsibility of creating new ideas by the "visualisation" and "reconfiguration" of software applications that use existing resources. Chen et al (2001) suggest that an information system could be created by a K-Mediator selecting required components from a so-called "systems service repository". They also argue that the software architecture resulting from such a selection would not only "...encapsulate business knowledge, but also reflect the hierarchical structure of the organization" (Chen et al, 2001). Zedan et al (2001) describe a scenario where the K-Mediator moves through a decision making process that involves dividing the "business goals" into "needs", with each of these so-called needs being represented as a Use Case. These Use Cases in turn act, as the first expression of the requirements for the information system. Underpinning this approach is the conception of an information system as consisting of a set of "*business-specific* components" (Zedan et al, 2001, authors' italics). Zedan et al (2001) argue that these software components must be able to be "plugged" together in a manner that enables an engineer to construct a *mathematical proof* demonstrating that the resulting software applications will work correctly.

Arguing that software components could easily be joined together, Zedan et al (1999) suggest that a problem situation might be described as a series of "states" that set the boundaries for permissible values within the system. Employing a convention from ITL (Interval Temporal Logic) (Moszkowski, 1986) Zedan et al (1999) suggest the following:

$$\vdash w \wedge As \wedge Sys \supset Co \wedge fin\ w'$$

This formula claims that if a state w is the initial state of a system *Sys* and the assumption *As* is true for the interval in which *Sys* is operating, then the commitment *Co* is achieved. The state w' is the final state of the system. Extending this argument Zedan et al (1999) reason that when two systems *Sys* and *Sys'*, are added together, if the assumptions *As* and the commitments *Co* for each of these systems are the same (or can be limited to pre-defined values) the results of combining these two states can be expressed as:

$$\vdash w \wedge As \wedge Sys \supset Co \wedge fin\ w'$$
$$\underline{\vdash w' \wedge As \wedge Sys' \supset Co \wedge fin\ w''}$$
$$\vdash w \wedge As \wedge (Sys; Sys') \supset Co \wedge fin\ w''$$

(Zedan et al, 1999, p. 32)

This particular approach has been developed to support modular design and verification techniques common in structured approaches to designing software applications. The purpose is to enable the program code to be *mathematically verified.* The limitations of such a component-based approach to information system design were discussed in Chapter 2, but a further problem is that such components are often associated with the accomplishment of simple *tasks*, rather than supporting purposeful action. Indeed Zedan et al (2001) provide an example where the K-Mediator might select functions such as "print" or "scan" or "copy file". Within a dynamic

business environment, such as Debt Management Operations at Abbey National, the accomplishment of simple functional tasks such as printing a file is not often a cause for concern. Rather the serious difficulties that are encountered surround issues such as 'what is the problem' and 'what purposeful action can be taken to possibly bring improvement'. *Purposeful action* embodies a sense of action being willed by a human being (Checkland, 1981, p. 119) and those concerned with attempting such action are better supported by a *sense making* guide to inquiry such as SSM (Checkland and Scholes, 1999). Further, the idea of a K-Mediator controlling the construction of the information system is far removed from the principles of *Client Led* information system design, where the emphasis is on facilitating the participation of all those involved in the situation of concern, whether they possess technical knowledge, or not.

In fairness to Zedan et al (1999, 2000, 2001) a formal approach to designing software is *essential* when undertaking the construction of a system in a so-called 'safety-critical' scenario. For example, when designing software that supports Air Traffic Controllers, or Railway Signals, it is vital to be certain the software will function correctly. It is important though to be absolutely clear that constructing correctly functioning software applications involves a very different design problem to that of creating a technology-based information system that *serves* purposeful action. If the latter is required, it is imperative that those involved come to an *appreciation* that software design can only be properly undertaken once they have considered what purposeful action to undertake and also *how* that action ought to be *served* (Winter et al, 1995). Software operationalises the technological components of a technology-based information system and is merely part of that system, not the whole.

6.8 Other Gaps

It has not then been possible to meet up with the ideas of Zedan et al (1999, 2000, 2001) as originally planned in the UMISD project plan. Part of the reason for this difficulty is that when considering the whole process of development of technology-based information systems, from design onwards, other gaps become evident. For example, a logical specification for an information system is simply a statement of the requirements for the technology-based information system that will need to be built. Once the logical specification is considered to be 'complete', the developers must then use this specification to guide the construction of the various aspects of the software needed to operationalise the technological aspects of the information system. This process is not a seamless progression to a computer program, it is a difficult path and each developer has his or her, own preferences in the manner in which they go about such construction (Graham, 1998; Lai, 2000).

In other words, moving from the logical specification to a *computer program* involves crossing another gap into software design. Graham (1998) describes the process of actually designing software as being two different processes. First, the engineer must define the interfaces of the objects (that is, construct the logical design) and second, a description of the architectural structure of the whole software application must be constructed (the physical design). Graham (1998) argues that the two processes are separate and that designing the software application is a disjointed progression from a logical design to the rigours imposed by the programming language adopted. The work of Zedan et al (2001) is directed at the level of ensuring the *definitions* used to construct a computer program can be proved *mathematically*, to be robust and correct. This work takes place *after* much of the design work for any software application has been completed. Creating a *seamless* route to such specifications seems scarcely possible, though *navigating* through shifts in thinking seems feasible, though there is still some distance remaining, discussed further in Chapter 8.

One of the other difficulties that emerged during the UMISD project is the different use of terminology by the information systems researchers and the software engineers. For the software engineers working on the UMISD project the phrase 'information system' was synonymous with the phrase 'group of software components'. For example, Chen et al (2001) discussing the construction of an information system describe a process of "articulating" a "business process" using only the components held in a central library, or "Systems Service Repository". Attempting to communicate the richer concept of purposeful action has been extremely difficult, as the effort in software engineering is to *document* the behaviour and properties of the computer system in an unambiguous way (Chen, 2001; Pressman, 1997; Sommerville and Sawyer, 1997; Zedan et al, 2001). The different use of language by the different groups of researchers is reflected upon in Chapter 7.

Communicating the *manner of use* of the models employed in SSM guided inquiry and during the *navigational* phase has been very difficult. There has been a tendency on the part of the engineers from STRL to reify the models constructed during the inquiry within the Abbey National situation. The holons were repeatedly referred to as 'the solution' by the engineers on the UMISD project, despite many repetitions of the fact that these models are intended to be *relevant* to the situation of concern and not absolute descriptions of that situation. Many lessons have been learned through undertaking the field study and attempting to construct a logical specification for a *serving* information system. Before these lessons are discussed, it is useful to reiterate the purpose of regarding the movement between ideas for purposeful action and support, as *navigation*, rather than crossing a bridge.

6.9 Summary

The fundamental advantage of regarding the inquiry as a process of *navigation* is to emphasize the shift in thinking that occurs when moving from *thinking about the action,* to *thinking about the support for action.* The holons support participants in the creation of ideas for purposeful action, or conceptualising some ideas for the *system to be served* (Checkland and Holwell, 1998a; Winter et al, 1995). If those involved in the situation of concern wish to design a *system to serve the action* in the form of a technology-based information system, further work must be carried out.

The suggested route of *navigation* is to construct models of *how* the action *might* unfold in the real world situation, in order to provide a detailed *view* of the intended action. Such a *view* facilitates the developers in constructing a logical specification. It is essential that those involved in the inquiry process are aware of the nature of the models of possible Conversations for Action. That is, that these models act only as a *guide* to what is considered likely to occur within the real world situation, they are not absolute descriptions of the action in that situation.

From this *appreciation* of how the purposeful action might be operationalised, the work on the logical specification can begin. In the research carried out for the UMISD project, Agent Object Models from the SOMA approach were constructed and by contacting a member of STRL, Alan O'Callaghan, a Class Diagram and Collaboration Diagram using UML, for one particular scenario, was also created. These models mark the beginning of the process of designing the software application that will be part of the *serving* system, the technology-based information system. From this point, the methods used to organize knowledge for the purposes of software engineering can *appropriately* be applied.

Chapter 7

Relating Practice to Theory

7.1 Introduction

Checkland suggests that "the process of learning by relating experience to ideas is always rich and confusing" (Checkland and Scholes, 1999, p. A7). Reflection is an ongoing activity and making sense of the experiences in Abbey National and reflecting on the framework of ideas will continue into the future. The purpose of this chapter is to presenting the learning gained thus far to interested others, in a manner that conveys the richness of the learning, the diversity of the experience and the implications for future research and practice. First, the experience of using the ideas underpinning SSM as a guide for inquiry during Action Research is reflected upon and an attempt is made at relating the experience of coming to a personal *appreciation* of the methodology through practice.

7.2 Learning about SSM as an Action Researcher

In the *Thirty Years Retrospective* (Checkland and Scholes, 1999) Checkland describes the seven-stage Mode 1 model of SSM (presented in Checkland, 1981) as being "useful for teaching purposes and occasionally in some real situations". He suggests that Mode 2 use of the ideas underpinning SSM is possible once the ideas have been "internalised" through practice. Although the difference between Mode 1 use and Mode 2 use of SSM as a guide for inquiry was acknowledged intellectually by the researcher, the process of inquiry followed a more conventional Mode 1 application at the beginning of the field study. Rich pictures were drawn, relevant systems identified, root definitions and conceptual activity models constructed. These models were then compared to action already being undertaken in the real world situation. Following a Mode 1 application of the ideas underpinning SSM closely at the start of the inquiry was not a conscious decision, but there was a personal concern on the part of the researcher to apply the ideas 'properly'. On reflection, it seems clear that the researcher needed to gain confidence and personal competence in using

the ideas described in the literature on SSM to support debate and it is not particularly surprising that the seven-stage model was used as a guide during this initial stage of the study. As the inquiry progressed constructing root definitions and creating conceptual activity models became easier, (as did using the intellectual devices in the Unifying Layer, or *navigational* phase of inquiry). The experience gained using these devices, lead to the use of the ideas underpinning SSM, becoming much more fluid and less mechanistic.

Gradually, the inquiry process became more oriented toward the problem situation and with this internalisation of the ideas the inquiry became more interactive in style. Once the ideas were being used more freely and the debate became interactive, the emerging ideas and discussion took on a much more creative tone. In a paper written to illustrate the use of SSM as a guide for inquiry by different practitioners (Checkland, 2000), Clarke comments that there is a "reduction of emotion around ideas and beliefs [allowing] measured discussion", such calm discussion, in turn facilitates some accommodations to be reached (p. 804). In the field study in Abbey National, the use of explicit intellectual devices to explore the problem situation did seem to offer a neutral area in which participants could discuss ideas and express opinions. The rich pictures, both in the field notebook and on paper, helped to create a good-humoured and supportive atmosphere from the early stages of the inquiry process, notwithstanding the dire artistic skills of the researcher.

Although different devices were employed in the *navigational* phase of the inquiry, two of the constitutive rules of SSM still guided the inquiry process, in that reality was regarded as being continuously socially constructed and intellectual devices were explicitly used to make sense of and act in the situation (Holwell, 1997). The third constitutive rule of SSM offered by Holwell (1997) is that the intellectual devices employed must include holons and these had been used in the initial stages of the inquiry to express ideas for purposeful action that might be relevant. The intellectual devices used to structure debate in the *navigational* phase

facilitated those involved considering how the ideas for purposeful action might unfold in reality and to make the *shift in thinking* required to begin creating a *serving* information system. At any stage though, participants were free to choose to explore some fresh ideas and once the Credit Card personnel had moved to Sheffield, further ideas were indeed explored. Some of the learning outcomes from the first part of the field study were applied to some of the issues surrounding debt collection in 'cahoot', the new Abbey National internet bank and these ideas are discussed later in this chapter.

Checkland describes any application of the ideas underpinning SSM as involving:

1. "...a perceived problem situation".
2. "... a process for tackling that situation in order to bring about some improvement".
3. "...a group of people involved in this process".
4. "...the combination of these three [...] as a whole".

(Checkland, 2000, p. 821)

These four elements are evident in the Action Research field study undertaken in Abbey National, but as with any inquiry within complex human situations, it is not possible to separate out four neat items describing each element. For example, the perceived problem situation for the purposes of the UMISD project can be considered to be the exploration of ways to support *Client Led* information system design. The process for tackling that situation was to follow the initial framework of ideas described in Chapter 4, guided by the principles of inquiry of SSM. The people involved in the problem situation could be considered to be participants from Abbey National, the researcher, the research supervisors and also to a lesser extent the wider research community, particularly those participating in the SEBPC research initiative. The learning outcomes can be considered to include learning about a set of ideas that may be useful

when attempting *Client Led* information system design and also academic publications and debate within the research community.

At the same time, the problem situation included the arena of Credit Card Debt Management in Abbey National. Guided by the principles of SSM and using various intellectual devices, the inquiry process was also directed at seeking ways of bringing improvement to this situation from the perspective of those involved. The participants in this problem situation were mainly those working in Abbey National, but the researcher orchestrated the inquiry, seeking advice from the research supervisors from time to time. The emergent property of this collaborative inquiry has been a lively communal debate, with those involved making a long-term commitment to the exploration of the problem situation (in all its guises). Such debate is characteristic of Action Research and an important aspect of establishing the validity of a process of social inquiry.

The eight questions offered by Stowell et al (1997, p. 178, see also Chapter 5) had been used to plan the field study in Abbey National. Attempting to answer these questions prior to undertaking the study had revealed the challenging nature of any process of social inquiry. No definite answers for any of these questions had been possible, though considering the questions had been useful. For example, Question 2 suggested the need to consider how many participants should be included. Although an absolute answer was not possible before the work started, reflecting upon this question did highlight the impracticality of a single researcher attempting a field study in the Loan section, due to the sheer number of personnel. Similarly, Question 7 suggests consideration of the recording method before commencing the field study and this was by no means a straightforward issue. As discussed in Chapter 5, a tape recorder might have provided more 'hard' evidence of the inquiry, but was considered to be inappropriate in the situation of focus, other means of recording the inquiry were found.

The highly complex nature of social inquiry does make it difficult for a researcher to learn how to approach such an endeavour. In the same way that Checkland suggests the seven-stage model of SSM, or Mode 1, is "useful for teaching purposes" (Checkland and Scholes, 1999), the questions offered by Stowell et al (1997) were useful in highlighting some of the pitfalls of working within an Action Research framework. As argued in Chapter 3, when undertaking social inquiry, learning about the framework of ideas, the methodology used and the area of concern occurs simultaneously, but *in practice* this can be hard to achieve. It took some time for the researcher to be comfortable using the devices when structuring a debate and some time elapsed before the inquiry became focused on the problem situation in Abbey National. Eventually, practical outcomes did emerge and these are discussed later in this chapter. First, the framework of ideas is reflected upon.

7.3 The Framework of Ideas: Language

The different way in which language is used by different researchers has caused difficulty at times during the UMISD research. Schön (1983) suggests that the language used by professionals to describe a real world situation can be regarded as being fairly constant and slow to change. The experience of undertaking the UMISD research would lead the present author to concur with Holwell (1997) that the language used by professionals and researchers when discussing the field of Information Systems is "either absent or confused". Similar phrases can mean similar ideas, but can also be underpinned by different assumptions and so close scrutiny of any work is always required; phrases cannot be taken at 'face-value'. For example, in a recent paper, Peppard (2001) uses the phrase "plot a route" to describe the path that various enterprises are attempting to create from "business expectations" to an "organized information system". Peppard (2001) offers a process model that describes the six elements necessary "for transforming the value-added contribution of IS", these elements are summarised in Table 7.1 below:

Table 7.1: Peppard's process model "for transforming the value added contribution of IS".

1. Get the basics right
2. Enlist key influencers
3. Build credibility
4. Seek involvement of business managers early in projects
5. Place responsibility for IS with the business
6. Cultivate and maintain partnership

Summarised from: Peppard, 2001, p. 256.

Peppard argues that those responsible for delivering information support do not know what is required and that "communication between senior IT management and IT staff was seen as central to the success of any transformation initiative" (Peppard, 2001, p. 257). Peppard also suggests that it is important to enlist influential people within the enterprise and to "build credibility", though no tools, or means of achieving credibility, or communication are offered. Peppard (2001) simply calls for a "holistic perspective [...] to illustrate how all the 'parts' fit together" (p. 268). These suggestions seem only to reiterate the main arguments of Stowell for the past sixteen years, and Peppard offers no new ways of applying these ideas and no practical suggestions on how to "plot a route" from "business expectations" to some support in the form of a technology-based information system. Stowell has long-argued that what is required is to facilitate responsibility and ownership of ideas by those involved in the problem situation (Stowell, 1985, 1991, 1995a, 1999, 2000a). Stowell (2000a) has, in addition, offered some practical guidance (Liang et al, 1998; Stowell, 1991; Stowell and West, 1994) and argued strongly for more *practice-based* research into these issues to create new tools, rather than undertake yet more studies confirming what is already known by the business and research communities. The language used by the researcher, although at first glance may seem similar to that used by Peppard (2001),

but is underpinned by different foundations (as discussed in Chapter 1). The language used has also altered somewhat over the course of the work, as an *appreciation* has been gained of the immense challenge of undertaking the UMISD research. This *appreciation* was gained through reflecting upon the literature, discussion with other researchers and practitioners, and through practical application of the ideas.

Some initial papers that were written as part of the UMISD research can perhaps be criticised for presenting the problem as a rather mechanical *transition* from action, to support. For example, in the summary of the earliest paper, it is suggested that to achieve a means of undertaking *Client Led* information system design:

> "it will be necessary to explore ways of finding a bridge between the clients' natural language descriptions of IS requirements and the formal definitions used in technical specifications"
>
> (Champion and Stowell, 1999a, p. 90).

Such writing is in danger of suggesting that it is a reasonably easy task to *find a bridge* between a *description* of requirements and the formal statements of required functionality used in logical (technical) specifications for technology-based information systems. Attempting to 'bridge the gap' between information system requirements and the logical specification is now deemed by the researcher, an oversimplification of the issues to be addressed during information system design. Indeed, the use of the word *description* in this paper is interesting to note. The researcher was aware that the models created during SSM guided inquiry were not used to *map* real world activity, but using the word *description* caused much confusion in discussions with the UMISD researchers at the Software Technologies Research Laboratory (STRL), De Montfort University (Zedan et al, 1999, 2000, 2001). Many of these researchers used the word *description* to mean an objective *representation* of actual

real world activity. It was easier to drop the use of the word *description* and replace it with the word *view*, as an alternative.

A similar problem occurred with the use of the word *validation*. In the field of Software Engineering the words *verification* and *validation* are used in the manner described by Pressman:

> *Verification:* "Are we building the product right"
> *Validation:* "Are we building the right product?"
>
> (Pressman, 1997, p. 504)

Pressman (1997, p. 522) further describes validation as being achieved "...when software functions in a manner that can be reasonably expected by the customer". He describes "reasonable expectations" as being "defined in the software requirements specification", which is a document describing "...all user-visible attributes of the software" (Pressman, 1997). From the perspective of software developers, achieving *validation* requires that they *demonstrate* that the software application meets the requirements set out in the specification document. Graham (1998, pp. 153-156) provides an excellent summary of the validation process from the point of view of a developer and acknowledges that the purpose of validation from this perspective, is to convince the client that the software will work and that the product meets the *stated* requirements.

The approaches to validation provided by Pressman (1997) and Graham (1998) however, only demonstrate that the product has been *built correctly*. Demonstrating the robustness of a software application is essential, but is actually only an extension of the *verification* process. Such a process is much more limited in scope than *validating* with the clients that a specification for a technology-based information system will *serve* purposeful action in the *manner* required. The difference between demonstrating a software product meets the specification of user requirements and validating that the specification for the information

system will *serve* the intended purposeful action was difficult to articulate to the engineers at STRL. The difficulty and confusion when using the word *validation* persisted and the idea of using a notion of *authenticity* (Champion and Stowell, 2001) emerged from the researcher's frustration. These ideas are briefly discussed later in this chapter.

Throughout the UMISD project, the research ideas have been expressed through writing academic papers, giving seminars and conference presentations and also by attempting to describe the ideas with the use of diagrams. The model given in Chapter 4 (Figure 4.1) is an expression of the researcher's understanding of how a process of inquiry that encompassed information system design might unfold within a social setting, before the field study. As discussed in Chapter 1, the researcher adopted an interpretive stance throughout this research. Reality was regarded as being continuously socially constructed and the inquiry effort was directed at creating a shared *appreciation* of the situation and placing the perspectives of those involved in that situation as being prime. As SSM was adopted as the guide for inquiry, it was envisaged that conceptual activity models, or holons, and root definitions would be created. In Figure 4.1, reproduced below from Chapter 4 for ease of reference, the use of the word *model*, rather than the plural *models*, is perhaps an indication of the inexperience of the researcher. A number of systemic models (in the form of conceptual activity models, or holons) were created throughout the field study as the inquiry progressed.

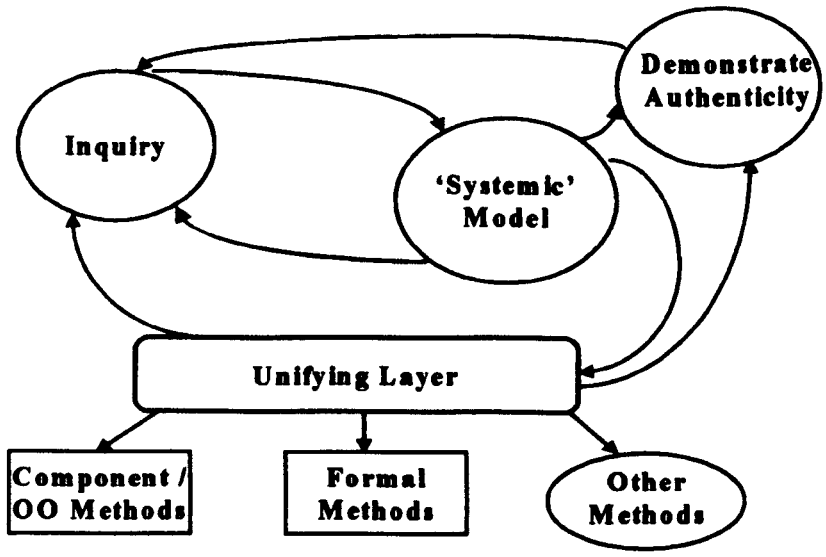


Figure 7.1: reproduced from Chapter 4, described as "a model for interpretivist inquiry for IS design" in Champion (2000).

This diagram was an attempt to express a framework of ideas, that suggested those involved in a problem situation would first undertake a phase of inquiry to create a shared *appreciation* of the situation. Using SSM as a guide, any ideas for purposeful action would be expressed as a conceptual activity model, or holon, before moving on to use the devices in the Unifying Layer. Different devices were argued as being relevant to support debate concerning how the action might unfold in the real world situation. If the action required technology-based information support, other methods for organizing any knowledge created into a format suited to constructing the logical specification for an information system would then need to be employed. Ideally, in practice the inquiry process would be an iterative cycle of learning. The model in Figure 7.1 also expresses the idea that any learning outcomes must be perceived to be an authentic and credible effort in addressing the perceived problem situation. Although this model was used to guide the unfolding action in the field study, the researcher gradually became dissatisfied with the one-dimensional view of the information system design process that this model conveys. There is no sense of the collaborative learning and *sense making* process that the researcher wanted to express to others attempting *Client Led* information system design. The model in Figure 7.1 also provides very little guidance

for others who may wish to attempt to apply the ideas expressed within this thesis (and that have also been applied in practice). Creating a model expressing a collaborative *sense making* approach to information system design is revisited in Chapter 8.

In the papers submitted before the field study commenced, the language describing the modelling phase stated as occurring in the Unifying Layer is still rather mechanistic and gives a rather step-by-step view of the gap between action and support. For example, in Champion and Stowell (1999b), it is envisaged that the conceptual activity models will be used to express the clients' requirements for the information system. This follows the suggested approach of Stowell and West (1994) and also that of Liang et al (1998). This idea was abandoned, as the immensity of the gap became apparent. In Champion and Stowell (2000a, p. 277) (accepted for publication immediately before the field study commenced), the idea is expressed that "...the role of an information system [...is] to serve and support human actors in undertaking action in the real world". By employing the definition of an information system as being a *system to serve purposeful action* (Checkland and Scholes, 1990; Winter et al, 1995) the initial phase of inquiry *must* first explore ideas for purposeful action that may bring improvement. The conceptual activity modelling is then undertaken in the first instance to "conceptualise the system served" (Winter et al, 1995, p. 132). This definition also seems useful in making the necessary *shifts in thinking* much more apparent to those involved in the design process.

In Champion and Stowell (1999b), conceptual activity models are referred to as "descriptions" which are then "systematically translated into maps of the Conversations for Action that would need to occur to complete the specified activities" (Champion and Stowell, 1999b, p. 266). The use of the word *description* has already been discussed, but writing such as this still falls into the trap of giving the impression that the inquiry process effects a 'translation' from conceptual activity models to other models. The difficulty in using the word *translation* is that it is often

taken to mean a *direct mapping* occurs when moving from one set of models to another set. This was a particular problem in discussions with the researchers in STRL, more used to employing a rigidly scientific approach to inquiry. This was not the idea that the present author wished to convey. When using the models in the Unifying Layer, or *navigational* phase, to structure debate, what is being attempted is the *creation of a route through the gap* between any ideas for purposeful action and ideas for support, and the models are employed to facilitate that process of *navigation*. The writing in the academic papers changes with the increasing *appreciation* on the part of the researcher, particularly through an increased understanding of the work of others and through practice. Gradually, phrases such as *shifts in thinking* replace words such as *transition* and *translation*, in the attempt to better communicate the framework of ideas and underpinning assumptions. This growing *appreciation* of the difficulties, on the part of the researcher, is also expressed in the changing name of this extra phase of debate from a so-called Unifying Layer, to the *navigational* phase.

7.4 The Framework of Ideas: The Navigational Phase.

In Chapter 4, it has been argued that once some ideas for purposeful action have been created that *might* bring improvement it would be necessary to move the focus of the inquiry from thinking about action, to thinking about support for that action. In business environments, support for purposeful action will often entail designing a technology-based information system. Thinking about the purposeful action to be undertaken *before* designing the information system embodies the definition of an information system as being a *system to serve purposeful action* (Checkland and Scholes, 1990; Winter et al, 1995). Using this definition, a process of information system design can also be considered as a move from using guides for inquiry suited to undertaking *social* inquiry, to using other means suited to organizing knowledge into a suitable format to enable a logical specification for a technology-based information system to be constructed. The idea of a further phase of inquiry using different intellectual devices to

facilitate the necessary shifts in thinking had been offered, with a further *navigational* phase of inquiry being suggested, (originally termed the Unifying Layer).

Some software engineers accept that an unambiguous and exact description of a process is not achievable, but most still argue for as near a complete description of the process as possible, constructed by undertaking a systematic analysis of current processes (see Kristen, 1996; Pressman, 1997; Sommerville and Sawyer, 1997). It is important to state that the models resulting from use of the *navigational* devices do not offer complete descriptions of processes such as those employed in technique-oriented approaches to information systems design (see Chapter 2). These *navigational* models, created through discussion with those involved in the situation, express the commitments made by actors and ways that the intended purposeful action *might* unfold in the real world, as perceived by those within that situation. Vickers (1981, p. 24) suggested that "systemic thinking" can provide a means of "building complementary pictures of inexhaustible reality". Holons created during inquiry guided by SSM are examples of such "complementary pictures" in that holons are constructed to express ideas that *may be relevant* to the situation of focus; these models are not descriptions of real world activity. To *navigate* the gap between ideas for purposeful action and a design for a *serving* information system in a logically sound manner, those involved in the design process must retain the idea that the models created during the *navigational* phase are also "complementary pictures" (Vickers, 1981). The value in creating such models is that they express *possibilities* that may be useful to those involved in the problem situation and the limitation in such models is the same, that they can only express possibilities, not certainties.

The idea of a Unifying Layer is then better described as a *navigational phase* of inquiry, which offers some intellectual devices to support participants through the necessary and difficult shifts in thinking. These intellectual devices offer "complementary pictures" (Vickers, 1981) to support those involved in the problem situation in thinking about

(through debate) how the action might unfold in reality. There may be many possible ways of implementing the action and so some *accommodation* must be reached amongst those involved. Once some ideas on how the action *might* work in practice have been considered, it is then possible to create a design for a supporting technology-based information system, if so desired. There are no simple 'correct answers' to be found. Those involved in the situation must learn their way, or *navigate* their way, through the space between some ideas for purposeful action and any required information support. There is likely to be much iteration, with perhaps many cycles of learning being needed before some accommodation is reached. As the potential opportunities for technological support increase, this phase of debate increases in importance, as it is essential that clients and developers work at creating a *shared appreciation* before irreversible design decisions are made.

The purpose of undertaking a *navigational* phase of inquiry is to accomplish the movement from thinking about ideas for purposeful action to thinking about support, in a logically coherent manner, with awareness, clarity of thought and in a manner that not only facilitates, but *necessitates* client involvement. The so-called 'gap' in information system design is the space between *conceptualising the system to be served* and *conceptualising the serving system* (Winter et al, 1995). The difficulties in moving from one problem situation to the other are amplified by the fundamentally different means employed to tackle these separate problems. To facilitate this *navigation* some intellectual devices were suggested as possibly being useful in structuring the necessary debate and these devices were tried out in the field study.

7.5 The Framework of Ideas: Using Navigational Devices

The intellectual devices used for this particular field study to facilitate *navigation* from ideas for purposeful action, to some support, were models of so-called Conversations for Action and the underpinning Conditions of Satisfaction, or implied *commitments* in undertaking these conversations

(Winograd and Flores, 1987). The Conditions of Satisfaction for each actor, or role, considered as being responsible for undertaking particular actions expressed in the conceptual activity models, were created through debate with participants. These Conditions of Satisfaction were written directly onto the conceptual activity models, so that the ideas for purposeful action were the focus of inquiry and debate at all times. Thinking about potential purposeful action in the form of Conversations for Action with underpinning commitments complemented the view provided in the holons and emphasized the interactions that might occur in the situation, if the ideas were implemented. The present author concurs with Mathiassen and Nielsen (2000) in their suggestion that consideration of the potential interactions is useful when designing technology-based information systems (whilst also disagreeing with their use of the ideas underpinning SSM).

In Chapter 4, the expressed purpose for the use of the *navigational* devices was to focus the attention of all participants on the possible consequences of implementing the action, by considering how the action might unfold in the real world situation, in some detail. An initial contextualisation of any ideas for purposeful action expressed in a conceptual activity model, or holon, can be facilitated in SSM guided inquiry through reflecting upon the elements of CATWOE and also the '5 E's' (efficacy, efficiency, ethicality, elegance and effectiveness) (Checkland and Scholes, 1990). These devices are applied to the ideas for purposeful action *as a whole* and although this is important, it does not provide the detail needed in order for a developer to construct a technical specification for a *serving* technology-based information system. The device of thinking about Conditions of Satisfaction for the actors who would undertake the action, was found to be useful during the field study in facilitating a consideration of the commitment implied for the particular actors, or roles, involved, in detail. Once some accommodation had been reached concerning any commitment, it was possible to begin to envisage the information support (and other resources) that would be required if the action were to be implemented.

During a process of information system design, creating a *shared appreciation* between the clients and developers (no matter how experienced) has been argued as being essential if the eventual technology-based information system is to support the clients in the manner anticipated (Stowell, 1991, 2000a). When undertaking information system design, ideas for purposeful action that might bring improvement will perhaps emerge more from the experience of the clients in the real world situation of focus. Likewise, the problem of constructing technological support will perhaps be more within the expertise of the developers. The problem is in creating a *shared appreciation* of all aspects of the whole problem situation for both groups. Using rich pictures, root definitions and holons as a guide to initial *sense making* and creating ideas for purposeful action, supports the creation of a *shared appreciation* of the purpose of undertaking that action. Using the device of Conditions of Satisfaction, can then be used to support participants in coming to a *shared appreciation* of what commitment the intended action would require from each actor, or role, and also what might be required in the form of resource and information support.

It was in creating the models of Conversations for Action that a further use for the *navigational devices* became apparent. As described in Chapter 5, by thinking about how the action might unfold within the situation, it was possible to consider how each individual actor, or role, might link together their various responsibilities when undertaking the ideas for purposeful action in the real world situation. For the purpose of organizing the action within the real world situation, it is important for the developers of the *serving* system to be aware of these links. The Conversations for Action models created during the field study were somewhat limited though, when the clients attempted to express the permissible flexibility in the way the action might be undertaken. Starting from the nine o'clock position, as suggested by Harris and Taylor (1998) and working around the model seemed limiting. The models of Conversations for Action created in the field study were intended to be

"complementary pictures" (Vickers, 1981) and were not used to describe actual real world conversations in the way that Harris and Taylor (1998) had employed these devices. Creating Conversation for Action models with arrows only being used if the time sequence of activities is important to those involved in the situation, seemed to alleviate this practical difficulty in using the models during debate (see the next section).

When moving on to constructing the logical specification for a potential technology-based information system, the developer must know of any temporal issues, if the resulting technological components are to perform in the manner desired by the clients. The necessary detailed view of the ideas for purposeful action is then provided by both the contextualised conceptual activity models and the Conversation for Action models being used together to *inform* the construction of the technical specification, through further debate.

In the work carried out for the UMISD project, creating Agent Object Models (Graham, 1994, 1998) was one means employed to create a first attempt at a view of a potential *serving* technology-based information system. Agent Object Models do provide an *activity-based* view of the Agent's interaction with the technology, as had been argued was desirable, in the effort to maintain a sense of coherence throughout the inquiry process. Work with Alan O'Callaghan had resulted in a Class Diagram and a Collaboration Diagram in UML notation (Pooley and Stephens, 1999) being constructed as an example of how other software design tools might be incorporated. The focus of the inquiry shifted from conceptualising ideas for purposeful action to conceptualising support for that action during this phase of work. During each phase of inquiry, any models created were used to *inform* and structure the debate and learning. Attempting a *translation* from the models relevant to the *system to be served* to the models relevant to the *serving system* is not logically coherent, as each set of models was relevant to a *different* system. The holons (and contextualised holons) and the Conversation for Action models were *relevant* to the *system to be served.* The Agent Object

Model(s) on the one hand, or the Collaboration Diagrams, with any associated Class Diagram, were *relevant* to the *serving system.* The underpinning coherence was supplied by continuing the inquiry process guided by the three constitutive rules of SSM supplied by Holwell (1997), though maintaining an *activity-based* view did seem helpful. This aspect of the learning is discussed in Chapter 8.

The essence of an interpretive approach to information system design is that any devices used ought to be capable of supporting an iterative and continuous cycle of learning. Those involved in the problem situation (the clients) and those undertaking the technological design activities need to be involved throughout the whole process. At different points in the inquiry process one group of people may have more experience and expertise for the tasks at hand (Stowell and West, 1994). The aim of a *Client Led* approach to information system design is to use these intellectual devices to create a *shared appreciation* amongst *all* participants, so that the learning outcomes from each phase of inquiry will be perceived to be relevant to the problem situation. The inquiry can continue in an iterative cycle until the knowledge created is considered sufficient for the purpose of undertaking the technological construction work.

The Agent Object Models, Collaboration Diagrams and Class Diagrams were validated as being relevant to the ideas for purposeful action by those in Abbey National plc from the *shared appreciation* created through the models already constructed during the field study. The models expressing the ideas for purposeful action and the process of contextualising these models and creating the Conversation for Action models, acted as a firm basis from which the suggested technological support could be judged. If a software prototype were to be built from these models, a role-play approach (as suggested by Graham, 1998) to ascertain the software would function correctly, could be used to work through as many scenarios as possible, before construction work was started. The situation in Abbey National was however, undergoing more

major change and the ideas for purposeful action were being applied in a different manner as is discussed in the next section.

7.6 Local Practical Outcomes

As discussed in Chapter 3, Susman and Evered (1978) and de Zeeuw (1995) have suggested that skills in problem solving and self-help, are some of the local practical outcomes of Action Research. The Credit Card Manager was studying for a M.B.A. with the Open University at the time of the field study and had been introduced to the literature on SSM as part of this course. The work on this course and the practical experience of the field study gave the Credit Card Manager the confidence to use the conceptual activity models created during the field study, in initiating a discussion with the new set of Team Managers and Collections Officers in Sheffield. The models supported the Credit Card Manager in his attempt to explain the problems and difficulties associated with Credit Card debt collection to the new team and also to explain the subtleties of the purposeful action taken to manage the accounts of the Credit Card customers who were in debt. These models supported the new team coming to share an *appreciation* of Credit Card debt collection with the team members who had more experience of the area (as by now, some of the Milton Keynes team members had also transferred to Sheffield on a permanent basis, by request).

As time has passed, some of the learning outcomes of applying the ideas for purposeful action have become apparent. For example, at the time of the main field study in Milton Keynes, the Head of DMO stipulated the lowest acceptable amount (expressed as a percentage of the debt owed by the customer) that a Collections Officer could agree with a customer in the form of a 'promise to pay'. Some debate had occurred around the idea of making the 'acceptable level of repayment' a much more flexible notion, by perhaps allowing the customer to make smaller repayments over a longer period of time, particularly if they had just been bereaved, or been made redundant. The new team in Sheffield duly

implemented this idea and the level of debt collected was initially, more than originally forecast. This was considered by those in 'Credit Card' to be due to more debt being collected 'in-house'. This improvement was associated, by the Credit Card Manager and Team Leaders in Sheffield, with the character of the new team, as previously this group had been selling products (mortgages) to customers and so were perhaps more customer-oriented. Also, the learning gained through the field study may have contributed to more debt being collected as perhaps awareness of customers experiencing specific difficulties had been raised and these customers were perhaps now better supported through their difficulties by being able to pay smaller amounts for a limited period. The initial outcomes from the field study then seemed favourable.

As time passed, issues from the wider environment in Abbey National plc began to influence the situation in Credit Card Debt Management. On March 19th 2001, almost exactly a year after the move of Credit Card to Sheffield, it was announced that the management of the Credit Card product was being passed to an outside agency, MBNA Europe Bank Ltd. (Financial Times, 2001). In an internal press release (see Appendix 2) the reasons given for this decision were that Abbey National were "not maximising the income" from the Credit Card product. Abbey National Directors also wanted to introduce a wider range of Credit Cards, and were buying in MBNA expertise to enable these new products to be introduced (Financial Times, 2001). As the Credit Card business was to be managed by MBNA, the Credit Card Debt Management team were being made responsible for debt management for the internet bank venture, cahoot.

One of the initiatives that those in Credit Card wanted to introduce was online debt management for cahoot customers. Building on the knowledge created during the field study, further work was undertaken to consider how to support the activity: *identify customers experiencing difficulties*, online. The activity was revisited using the *navigational* devices of Conditions of Satisfaction and also by creating a further

Conversation for Action model, and this learning was then used to *inform* the process of designing a set of web pages. By June 2001, a mock up version of a set of web pages was on trial in Sheffield (see Appendix 2). The web pages contained forms to enable customers to work out their income and to prioritise their debts. All a customer had to do was fill in the information and the arithmetic was automatically completed. There was also space for the customer to provide some information concerning the nature of the financial difficulties, that was to be linked in to a set of automatic letters related to the type of difficulty the customer was experiencing. For example, if a customer was on maternity leave, or had experienced bereavement, different and appropriate letters could be sent.

The technological support for this set of ideas for purposeful action emerged as a set of web pages. The *navigational* devices had again been used in supporting a further phase of debate to consider how the ideas *might* unfold in the real world, before the web pages had been constructed. Once again, the progression from the ideas for purposeful action to the technological support, in the form of web pages, was not *seamless*. Those involved in this inquiry, that included some familiar faces from previous encounters and some new participants, *created a way through*, learning what was acceptable and what was perceived by those concerned as potentially useful, as the inquiry progressed. As time passes other outcomes may emerge and the debate with those in DMO, Abbey National is ongoing (see Appendix 2).

7.7 A Notion of Authenticity

The participation of Abbey National personnel in the inquiry process was argued in Chapter 3 to be an essential element of Action Research, as the effort was directed at creating an *appreciation* of the situation from the perspective of those involved. Despite the best intentions however, it may simply be impossible to include everyone in an inquiry for information system design and development. Factors such as maternity leave, shift work, the general turnover of personnel, cost of time to participate and the

'unknowability' of the future, make it impossible to be certain that all stakeholders have participated. For example, in the field study undertaken in Abbey National, the inquiry began in Credit Card Debt Management, Milton Keynes, but those responsible for undertaking the implementation of the action were the team in Sheffield and this situation could not have been anticipated at the start. Issues such as who was involved and why, who was excluded and why, and any constraints that operated during the inquiry, need to be reflected upon if those eventually implicated by any purposeful action are to be able to make their own judgements concerning the validity of the learning outcomes.

In Chapter 3 it was argued that practical outcomes in the situation of concern, although important, are not sufficient to establish the validity of learning outcomes. Dash (1999) argues that this is due to the possibility that the wider effects of the action may be detrimental in the long-term. This seems a reasonable statement, but the present author would argue that this statement by Dash (1999) does not sufficiently reflect the complexity of a process of social inquiry. From the practical experience of the field study, this author would argue that due to the continuing and unpredictable flux of events, any learning outcomes will be applied in situations that have further developed, with new issues and difficulties becoming apparent all the time. This is the practical reality of conducting inquiry within a complex human social situation. The learning outcomes may simply become *irrelevant* to the new problem situation and this will contribute to any longer-term effects being considered detrimental.

By declaring the framework of ideas, F, methodology, M, and problem situation, A, in advance, an interested individual is supported in "scrutinising" the research outcomes and making a judgement concerning F and M (Checkland and Holwell, 1998b). Making a public declaration of F, M and A, in advance, also makes it possible for a researcher to argue that the learning outcomes claimed are reasonable and were relevant to the situation as it was perceived at that time. Notwithstanding such a

declaration in advance, the manner in which the inquiry was undertaken remains elusive.

Checkland (1981, 1983) argues that to make sense of complex human social situations it is useful to consider the inquiry process as being a system in itself. By employing this idea of regarding the inquiry process as a system, it may be possible to create a set of essential elements that support those concerned in developing an *appreciation* of the manner in which an inquiry is undertaken, or the character of that inquiry. In Champion and Stowell (2001), the mnemonic PEArL, (Participants, Engagement, Authority, relationships and Learning) was suggested as being potentially useful in providing guidance as to which elements are essential to consider when both planning for and reflecting upon a collaborative learning process. The purpose of the mnemonic is to support reflection and enable those concerned to plan an inquiry in such a way as to be able to demonstrate care has been taken. This set of ideas has been stated as a 'declaration in advance' in an academic paper, Champion and Stowell (2001) included in Appendix 3, and future work will be carried out on these ideas.

7.8 Summary

The many layers and interconnections that become apparent when reflecting on a social inquiry process, such as is described in this thesis, lead to further and new ideas for future practice. The unrepeatable nature of social inquiry renders it impossible for any firm 'results' to be offered to the public, in the form of: follow these guidelines and these particular outcomes are guaranteed. The nature of inquiry within an Action Research framework leads to useful lessons being offered that another person, or group of participants, may find useful if endeavouring to undertake a *Client Led* approach to information system design. The notion of *navigating* the gap between ideas for purposeful action and ideas for an information system to *serve* that action, arises if following the principles

of inquiry that underpin Soft Systems Methodology. This discussion is elaborated on in Chapter 8.

Part 3

Conclusion

Chapter 8: Navigating the Gap

8.1 Revisiting the Challenge

In the preface to *Systems Engineering for Business Process Change*, Henderson (2000), the SEBPC programme coordinator, sets out the aims of the SEBPC initiative as specifically to encourage cooperation between researchers familiar with traditional approaches to systems engineering and "business process researchers". The expressed purpose of this collaboration is to gain a better understanding of "the relationship between the business process and the system that supports it" (Henderson, 2000, p. 1). Henderson (2000) expresses the belief that such understanding will be gained through "precise formulation of business processes" and that this, in turn, will be achieved through "more scientifically sound methods". He specifically identifies the "application of [...] system engineering techniques to business process analysis" and also "the development of scientifically sound techniques for *encapsulating* legacy systems and for *mapping* business process change onto them" (Henderson, 2000, p. 1, present author's italics). In these statements, Henderson (2000) seems to assume that any models constructed during the design process are capable of being used as maps, or "as *surrogates for the real world*" (Checkland, 1995a, p. 49, Checkland's italics). Employing the work of Checkland (1983, 1985a, 1995a), using models as being representative of a real world situation has been argued as inappropriate for undertaking a process of information system design within complex human organizational settings. There is though, some common ground between the work of Henderson (2000) and the work presented in this thesis.

Henderson (2000) regards a business process as being composed of any "activities that a commercial organization performs in order to carry out its business". From this statement, it seems that what Henderson considers important is any *purposive activity* undertaken in order to *serve the purposeful action* being undertaken within any organizational setting. This is consistent

with the definition of the role of an information system being to *serve* purposeful action (Checkland and Scholes, 1990) employed for the research described in this thesis. Henderson (2000), it would seem, is focusing his attention at the level of the *system to serve*. In Chapter 2, it has been argued that one of the main difficulties with technique-oriented approaches to information system design, is that the design effort is directed at offering a technological 'solution' to any problems, rather than first, undertaking an exploration of the situation, from the perspective of those involved. In other words, these information system design approaches have (understandably, given the background of their creators) been focused at the level of designing the *system to serve*. Also as described in Chapter 2, other approaches to information system design have attempted to include some investigation into the problem domain and these approaches have been termed exploration-oriented approaches in this thesis. In Chapters 2 and 4, it was argued that the authors of these approaches to information system design, although providing support for *sense making* have also attempted to translate and match the design of the *serving system* to the design of the *served system*, but this effort is not logically coherent. The *serving* system will not necessarily have a *matching* design; the functioning of the *serving* system is entirely different to that of the *served* system. The contribution offered by the notion of *navigating* the gap is to make clear the point that those involved in undertaking a process of information system design can only use any models created to *inform* progress toward the next phase of inquiry. This point requires some further discussion.

8.2 Reviewing the Notion of Bridging the Gap

The need to move from a means of *sense making* in human social settings to constructing some software to operationalise a technology-based information system is the fundamental challenge currently facing the Information Systems community (Checkland and Holwell, 1998a). Much effort has been directed at

finding ways to cross the gap between some action desired by those involved in a situation and the logical specification for a supporting technology-based information system (discussed in Chapters 2 and 4). But, much of the previous work in this area has concentrated on devising ways to *bridge* the gap between action and the underpinning information system. The very notion of *bridging* suggests that the destination on the other side of any bridge can be known with some accuracy at the start. As Vickers points out "technology has nothing to say about *what* to want" (1983, p. 25, Vickers' italics).

In designing information systems that *serve* purposeful action, the starting point must be some expression of the *system to be served* (Winter et al, 1995). From this point, there may be many possibilities for information and communication support and it is by no means a straightforward route from conceptualising the *served system* to conceptualising and then building the *serving system* (Winter et al, 1995). Current approaches to designing technology-based information systems seem overwhelmingly constrained by the need to eventually build some software and the authors of technique-oriented approaches in particular, tend to suggest constructing, what is regarded as a definitive statement of the business process that the technology is required to support. Underpinning such approaches is the assumption that a business process is a wholly specifiable and singular course of activity and that any required changes to that process will also be wholly specifiable and singular in character. The expectation that human beings will behave in a rational manner and undertake tasks in a wholly specifiable way seems naïve, but this is the often unacknowledged assumption, that underpins methods of software design and development. Even if the developer in question does accept that any models created do not represent actual real world action, the models will usually be treated *as if they do represent* real world action (Checkland, 1995a; Checkland and Scholes, 1999) (see the work of Graham, 1998; Pressman, 1997; Sommerville and Sawyer, 1997). The need to move from methods for *sense making* in social situations to methods and techniques

for marshalling knowledge into a suitable format to enable the construction of a logical specification for a technology-based information system will continue until other ways of developing software are found.

As any purposeful action unfolds in a situation, events and ideas change and the flexibility of any technology-based support becomes a key issue. Most of the SEBPC projects have investigated ways to construct more flexible software architectures to aid the design of new software and facilitate easier ongoing maintenance. Some researchers argue that business processes and the supporting information technology need to "co-evolve" (Bustard et al, 2000; Mitleton-Kelly and Papaefthimiou, 2000). For example, Warboys et al (2000, p. 12) describe the "task of software engineering" as being "to build a machine which interacts with its application domain in the desired way". The "application domain" is taken to be "a process model, which *captures* the intersection between the business (social system), and its IT (technical system)" (Warboys et al, 2000, present author's italics). In the field of Software Engineering, this tendency to reify models is being intensified by the current interest in so-called "problem frames" (Jackson, 1995). In this approach, there is an attempt to define common problems and then provide some known solutions for these problems, called a "solution task". The common problems discussed are however, all computer programming problems, and consequently the sort of problem situations that Jackson (1995) regards as relevant, are situations that are wholly specifiable and predictable. For example, Jackson (1995) suggests some "control rules" to apply to a vending machine, or other controllable phenomenon; he also provides an example of the way objects (within a computer program) are manipulated in text editing software applications. The effort is similar to the emphasis on tasks, rather than human purposeful action, apparent in the work of Zedan et al (1999, 2001). Again the design work is directed at simplifying the problem situation and *representing* that situation as a simple process model and this

simplified model is then treated as if it is the whole, an approach argued as inadequate by Vickers 36 years ago (Vickers, 1965).

Researchers at Loughborough University have been investigating means of building software that can be easily maintained, so that when "business processes" change, the supporting software can be changed also (Edwards and Millea, 2001; Edwards et al, 2000; Millea et al, 2001). These researchers accept that most approaches to developing information systems begin by attempting to describe the current situation, or the "business domain" in their words, and that this approach is chosen only because it provides an easy starting point for software design (Edwards and Millea, 2001). They suggest that any business process is constantly changing, and so it might be advantageous to keep the "Business Models" (models regarded as representing the current situation) and the "Technology Models" (models regarded as representing the supporting software) separate. Interestingly, Edwards et al (2000) consider the software infrastructure to constitute a "Business Support System", rather than a set of components, which is consistent with the idea of the information system being a system to *serve* action (Checkland and Scholes, 1990; Winter et al 1995) employed in this thesis. Edwards et al (2000) still refer to their "Business Models" as if such models are representative of reality, but Edwards and Millea (2001) at least acknowledge the limited starting position for software development making them somewhat unusual and is perhaps also what makes this research potentially interesting.

It is the argument of this thesis that no amount of well-built software will alleviate the difficulties of those involved in that situation undertaking purposeful action, *unless* that software operationalises a technology-based information system that is *perceived to serve* the desired action. Any organizational setting is continuously created by the interactions of those involved in that setting (Boland, 1985; Checkland, 1981; Winograd and

Flores, 1987). Concepualising the purposeful action *before* designing the technology, as argued by Checkland and Scholes (1990) becomes an imperative, but still only addresses part of the journey those involved in information system design need to undertake. The challenge facing designers is that most information systems are today operationalised by software-driven technology, that must be fully specified and tested thoroughly to ensure it works correctly, and such a system is also required to *serve* purposeful action undertaken by human beings in organizational settings.

Researchers in the field of Information Systems have made attempts at addressing the difficulties of designing technology-based information systems from the perspective of those involved. As described in Chapter 2, the vast majority of exploration-oriented approaches to information system design are based on ideas from SSM. Holwell (1997) suggests that the overwhelming influence of the work on SSM has been due to the underpinning "interpretive framework". It has been argued in this thesis that any attempt at the provision of a bridge, or a *seamless* progression from action to support is somewhat over ambitious. The methods and techniques employed to conceptualise the technological aspects of information systems have been devised to support the process of designing software and so express the ideas for the technological support as a *systematic* description of the required functionality of the technology. To move from a set of conceptual ideas concerning possible purposeful action, (in this work expressed by using holons created during SSM guided inquiry), to *another set of conceptual ideas* concerning the specification of required technological functionality, requires any designers to undertake some *shifts in thinking*. The importance of the notion of *navigating* the inquiry process is that these *shifts in thinking* are shifts in the *focus* of the inquiry, *not* shifts in the underpinning philosophical assumptions, (or so-called paradigm shifts). This argument also requires some further discussion.

8.3 Paradigm Shifts or Creating Possibilities?

Sawyer (1991) has argued that moving from the models created during SSM to DFDs involves "two shifts" in thinking. He suggests the first shift in thinking is from "conceptual thinking" to "real world thinking", which he argues can be facilitated by moving from issue-based models created during SSM guided inquiry to some real world desirable models. The second shift in thinking, Sawyer argues, is from real world desirable models to "data models" (Sawyer, 1991). The shift from conceptual ideas to data models has been argued to entail the inquirer making a so-called paradigm shift, or a shift from undertaking inquiry underpinned by one philosophical perspective to undertaking inquiry underpinned by a different philosophical perspective (Doyle and Wood, 1991a, b; Sawyer, 1991). Doyle and Wood (1991a) argue that such an approach to information system design is based on the view that "by providing a series of stepping stones" it is possible to "move incrementally" from a set of models created using one particular epistemology, to a different set of models using a different epistemology. For the last ten years much of the discussion within the IS research community has centred on this issue of how to move from *models* created during inquiry guided by interpretive ideas, to *models* created when using a scientific approach to inquiry, guided by positivist principles. But such discussion is actually only a focus on the *content* of such models, or on how much of the real world situation the models can represent. Even within the work of interpretive researchers there is an underpinning concern to translate information system requirements directly from one sort of model to the next (see Guo et al, 2000; Liang et al, 1998; Mathiassen and Nielsen, 2000; Prior, 1992; Savage and Mingers, 1996; Stowell, 1998, 1999, 2000a; Stowell and West, 1994).

The argument has been made in this thesis, that one of the fundamental obstacles to moving from an approach to *sense making* within social settings, to designing software-driven, technology-based information systems, is the

manner in which different groups of people involved in the inquiry process, *use* any models created. In the technique-oriented approaches to information system design evaluated in Chapter 2 of this thesis, the common underpinning was that any models created were considered to *represent real world activity.* The danger in this approach is that using models *as if* they represent the actual problem situation leads to a perilous oversimplification and inevitably any designs created using such approaches, once implemented, fail to match the complexity of the human social situation (Vickers, 1965). But the view that data models, or object models can adequately represent the real world is by no means universal.

Lewis (1993) offers the view that "data-focused" approaches to information systems design employ data models that *are* used as "epistemological devices" that offer "...a coherent means of investigating the problem domain rather than being a description of the real world". In discussing the use of data models for the purpose of constructing technology-based information systems, Lewis argues that:

> "...however well researched and rigourous are the techniques for manipulation and refinement of the conceptual data model, they ultimately rely upon a subjective and interpretive identification of entities or objects."
>
> (Lewis, 1993, p. 180).

Lewis (1993) suggests that "data analysis" and "data modelling" can be regarded as "a process of reality creation"; this reflects the views of Boland (1985) who suggests that an interpretive approach to information system design is also a process whereby the requirements are *created* through the discussion process. Stowell and West (1994) also place emphasis on the importance of facilitating a cycle of learning and the use of intellectual devices to facilitate those involved in creating a *shared appreciation* of the situation of focus. The difficulty seems to arise from the *use* of the models as

replacements for the problem situation, which can lead to the models being given more status than is due. Indeed, Vickers (1981) refers to this tendency to place undue confidence in any models constructed as "hypnosis by models".

The actual *shifts in thinking* required by those undertaking information system design are not so-called paradigm shifts as suggested by Doyle and Wood (1991a), but what is required are shifts in the focus of the inquiry. The data models and object models created as a precursor to software construction are devices to facilitate the marshalling of knowledge into a suitable format for the task at hand, in other words these devices *are* used for the purpose of *sense making*. These intellectual devices are applied to a different phase of the design process, a phase where those involved decide what to build. These devices are also used to support a different purpose, that of facilitating the construction of correctly functioning software. What is needed is some means to facilitate these necessary shifts in focus and make them obvious, so open discussion can occur. The notion of *navigating the gap* by using various intellectual devices (referred to in this thesis as *navigational* devices) provides those undertaking information system design with a means of creating a route from any ideas for purposeful action, to the requirements for a technology-based information system to *serve* that action.

Adding to the complexity of a process of information system design is the move from some ideas for *purposeful* action (or willed action by a human being) to thinking about the *serving system* (or *purposive* action). Checkland (1981, p. 119) explains the difference between *purposeful* and *purposive* with the example of a clock: "the escapement is a *purposive* system of a clock; telling the time by reading the dial of a clock is a *purposeful* action by a human being" (Checkland's italics). Information systems are *purposive* systems serving some *purposeful* action undertaken by human beings. The technological aspects of an information system form only *part* of that

purposive system. For example, in the Credit Card section of Debt Management Operations, in Abbey National, the *purposeful* action being undertaken was the collection of debt from customers behind with their Credit Card payments. Some of the human action undertaken to accomplish the collection of debt comprised the Collections Officers contacting Abbey National customers who were behind with their Credit Card payment to discuss any difficulties. Any discussions would need to be recorded by the Collections Officers and the software-driven technology *served* this action by providing a mechanism by which the Collections Officers could record customer details, such as contact information and details of any promises to pay. The technological support then plays *a part* in the *purposive* system in the Credit Card section, but is not the whole, as the Collections Officers gather the customer's details and make judgements on what is to be recorded. *Navigating* from some ideas for purposeful action, to a technology-based information system to *serve* that action, means undertaking further debate to reach an accommodation amongst those involved on how the action *might* unfold. It is at this level of action, that thinking about requirements for technology-based information systems becomes relevant.

8.4 Navigating from Purposeful Action to Support for Action

For *Client Led* information system design to become a possibility, those involved in the situation of focus must first reach some accommodation concerning what purposeful action to take, expressed as some ideas for a *system to be served* (Checkland and Scholes, 1990; Winter et al, 1995). From these ideas for purposeful action, those involved, the *clients*, can then begin to *think about,* or conceptualise, how that action *might* unfold in the real world situation of concern. It is important to be clear that such conceptualisation will emerge from the interactions of those involved. The "ground clearing exercise" undertaken by Holwell (1997) also emphasizes the importance of those involved in information system design in undertaking this further phase

of conceptualision. The so-called *navigational* devices are intended to facilitate the necessary discussion for this phase of inquiry and learning. In addition, the intellectual devices employed within the *navigational* phase are intended to maintain the sense of coherence from the ideas for purposeful action through to the serving activities. One of the criticisms levelled at previous attempts to move from conceptual activity models to a logical design for an information system using Data Flow Diagrams, was the abrupt change from conceptualising *action* to conceptualising *data* (or *capta*, using the definitions provided by Checkland and Holwell, 1998a). It has been argued in Chapter 4 that any *navigational* devices used must provide a similar view to that created during the initial phase of inquiry, if coherence was to be maintained.

During the field study, SSM was used as a guide during the inquiry process and holons were constructed that expressed ideas for purposeful action that were then debated by those involved. To maintain a sense of coherence, the *navigational* devices employed, also expressed an *activity-based* view of how the action might unfold in the real world situation of concern. To construct each set of models, further debate and interaction was required and those involved created a way through towards a view that expressed the shared *appreciation* that emerged through the debate. The Agent Object Model created as a first expression of a potential *serving* technology-based information system also provided an activity-based view. The work with Alan O'Callaghan to create a Class Diagram and Collaboration diagram highlighted another aspect of the problem situation, in that if a technology-based information system were built, the technological aspects of the information system would also probably be designed to manage other aspects of the situation simultaneously. For example, the supporting technology would be required to manage the accounts of hundreds of Abbey National customers and the work of many Collections Officers and some of the detail in the logical specification must reflect this aspect of

operationalisation. Attempting a seamless move from ideas for purposeful action to a logical specification for such a technology-based information system would then seem at present to be unrealistic. Crucially though, an underpinning cohesion throughout the inquiry process seemed to be provided by the principles of inquiry applied; these remained the same throughout the *entire* inquiry process.

8.5 A Process of Systemic Inquiry

The models used to guide the design of technology-based information systems have been employed by many as being *representative* of the situation of focus, in an effort to simplify that situation and so render what is actually complex and unfolding human action to a set of manageable activities and tasks. One of the difficulties with designing technology-based information systems is that any software used within the technological parts of the information system remains the same, but the human situation unfolds and changes over time. Using any models constructed during information system design, as being representative of the situation, is then not only ill conceived as argued in Chapters 2-4 of this thesis, it is unnecessarily limiting. The models used throughout any process of developing software, such as object-oriented models, are actually *sense making* devices, as are rich pictures, or conceptual activity models. The much-vaunted paradigm shift occurs in the mind of the people using the models; these models can be used simply as epistemological devices as argued by Lewis (1993). What is actually required is for this situation to be openly acknowledged, so that software can be developed through a learning approach to inquiry, not through efforts to construct absolute statements of 'the process to be computerised' with an accompanying impetus toward optimisation and solution provision, that is essentially false. By acknowledging the *sense making* nature of the models constructed, the cohesion that is so necessary in a process of *Client Led* information system design can also be provided. Checkland (1983) sums up this approach to

inquiry as an approach that "*transfers systemicity from the world to the process of inquiry into the world*" (p. 672, Checkland's italics).

Rather than approach the process of information system design as a means of solving problems through the provision of technical solutions, using the idea that the inquiry can be regarded as a system, the process of IS design can become a continuation of a process of *learning* about a situation. The creation of some ideas for purposeful action that will hopefully bring improvement *may* lead to those concerned undertaking the design of a technology-based information system to *serve* that action. Such an approach will be far from easy, as discussed in Chapter 3, when undertaking inquiry within human social settings, the ideas about the framework of ideas, F, the methodology, M, and the problem area, A, all change as inquiry and learning proceeds (Checkland, 1985a). Those within the situation of focus, which will include any software developers, will need to *learn* their way toward what technological support is required and how best this may be provided in order to *serve* the action. If adopting a *learning approach* the notion of goal-seeking (achieving a limited set of objectives that disappear on realisation) as an explanation of human action in a situation, necessarily evaporates (Vickers, 1965). Human action within organizational settings is created through interactions between people and can be considered to be concerned with maintaining desired relationships and with eluding unsatisfactory ones (Vickers, 1965, 1983) rather than one-dimensional goal-seeking. Learning is a cyclic and continuous, never-ending process of creation. Previous experiences condition what is noticed in the 'here and now', or what Vickers called our "readinesses to notice particular aspects of our situation" and so a "pattern of concerns" emerges that those involved in a situation regard as relevant (Vickers, 1983). Such *appreciative systems* were described in Chapter 1 as being a founding concept for the work in this thesis. Checkland (1981, p. 263) describes *appreciative systems* as "learning systems", and both Checkland

(1981) and Vickers (1983) argue that any social process can be regarded as a *learning system.*

Client Led information system design, will necessarily be a social process entailing much discussion and debate that *hopefully* results in the creation of a shared *appreciation* of possible action and appropriate support in the form of a technology-based information system, though this cannot be guaranteed. Regarding *Client Led* information system design as a *learning* system means it is possible to express the IS design process as an *appreciative system* in Vickers' sense. Both West (1990) and Lewis (1991) have suggested applying Vickers' ideas to a process of information system design, though both authors limit their view of an information system as being concerned with the provision of data. What is being offered here is the notion of using some *navigational* devices, to facilitate the *operationalisation* of a learning system for *Client Led* information system design, where an information system is defined as a system to *serve* purposeful action (Checkland and Scholes, 1990; Winter et al, 1995).

8.6 Information System Design as an Appreciative System

In Chapter 4 (Figure 4.1, and reproduced as Figure 7.1 in Chapter 7), a model was depicted that described the researcher's view of the process of information system design before the field study was undertaken. But this is a rather pedestrian account of the richness and complexity of the whole inquiry process that entails *appreciation*, conceptualisation of ideas, and also action being taken. Regarding the process of information system design as a learning system suggests it is possible to describe information system design as a collaborative *sense making* effort. Vickers' model of an *appreciative system* expresses the way in which individuals, or groups, undertake learning, though "there will never be complete congruence between individual and (attributed) group [appreciative] settings" (Checkland and Holwell, 1998a, p. 104).

Although Vickers did not express his ideas diagrammatically, Checkland and Casar (1986) construct a useful visual model of the process of *appreciation* and the way in which *appreciation* leads to action. The models of Checkland and Casar (1986), conditioned by the experience of the field study, have provided the inspiration for the models produced below.

In Figure 8.1 below, the process of information system design is expressed as an articulation of an *appreciative system* in Vickers' sense, occurring in "a flux of interacting events and ideas" (Checkland and Casar, 1986, p. 4). The "readinesses to notice" particular aspects of the situation amongst those involved in the situation will lead to a "pattern of concerns" emerging (Vickers, 1983). Those involved in the inquiry process make so-called "reality judgements" concerning "what is the case" and in so doing select the facts they perceive to be relevant; "value judgements" concerning the significance of the perceived facts are also made (Vickers, 1983). Rather than associate this process of *appreciation* with the limited concept of goal attainment, as described in Chapter 1, Vickers (1965, 1970, 1983) insisted that a notion of "relationship-maintaining" provided a richer concept with which to make sense of human action. Using this notion, an information system can be regarded, as a system to *serve* purposeful action, with the action being undertaken to maintain desirable relationships, or elude ones considered undesirable. Any created *appreciation* is conditioned by standards that have been set through previous experiences, and these standards will in turn be modified by new experience.

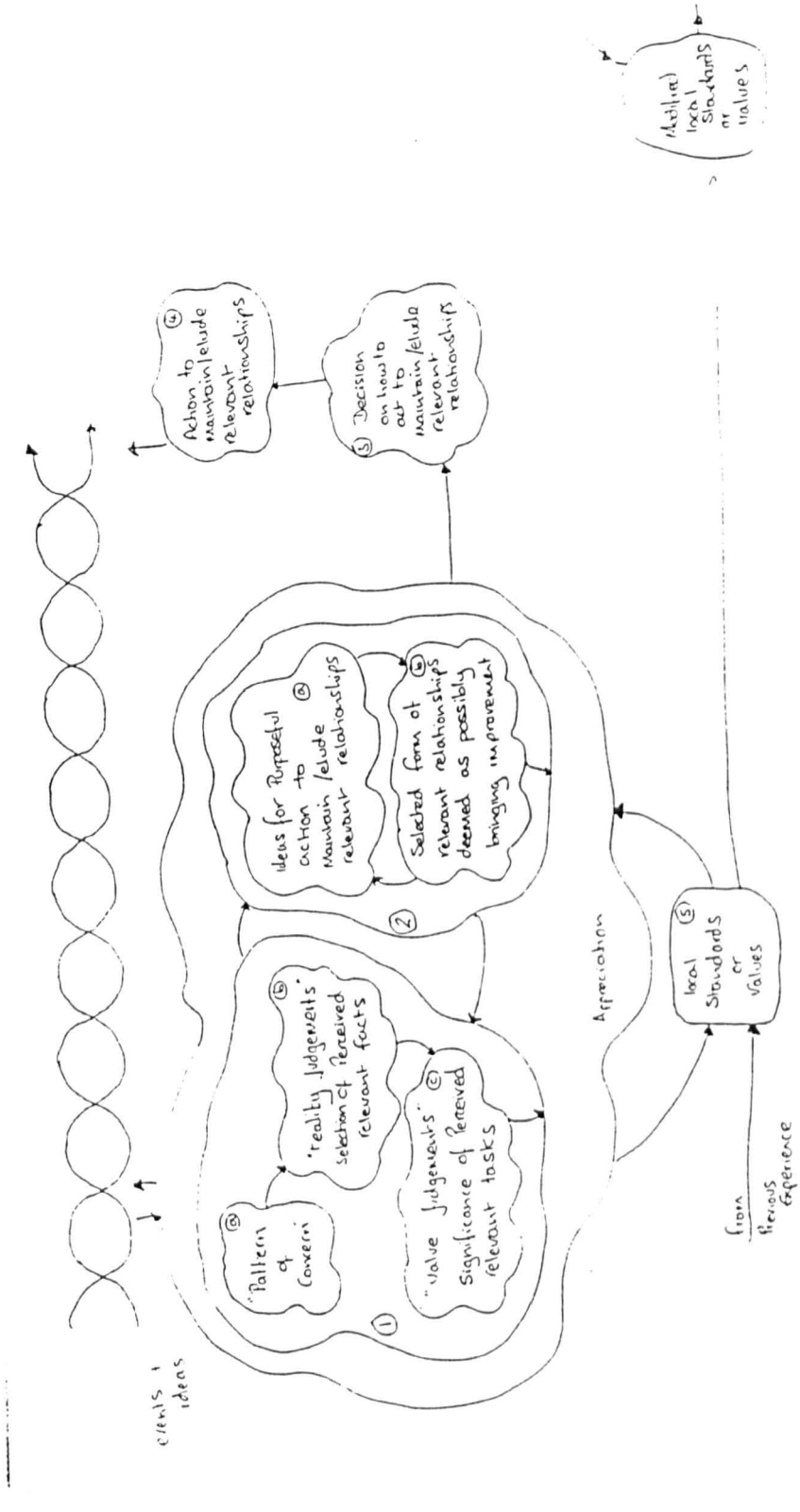


Figure 8.1: Information System Design as an Appreciative System in Vickers' sense.

Once the relevant relationships have been selected, those involved in a process of information system design will need to come to some accommodation on how to act. To support such a process of information system design, it has been suggested in this thesis that various intellectual devices can be used to facilitate discussion and debate. By reproducing the model above, and depicting the various intellectual devices occupying the place where they might be appropriately used, it is possible to begin to envisage an iterative learning approach to information system design.

The model in Figure 8.2 below is an attempt to suggest that, creating a shared *appreciation* of the initial *pattern of concern* can be supported through the construction of rich pictures, though other devices could be employed. Conceptual activity models, or holons, facilitate debate concerning relevant human activity and support those involved in the inquiry process in conceptualising what action might maintain the desired relationships within the situation of concern. During the design of technology-based information systems, it is important to consider how the action *might* unfold and some *navigational* devices were employed to structure and support the debate during this phase of inquiry. The holons and *navigational* devices offer "complementary pictures" (Vickers, 1981) expressing possibilities, rather than act as *descriptions* of the situation. That is, the holons and *navigational* devices are used as debating tools, rather than as *maps* of what *will* occur. The models expressing the logical specification for any technology-based information system also possess the status of *sense making* devices.

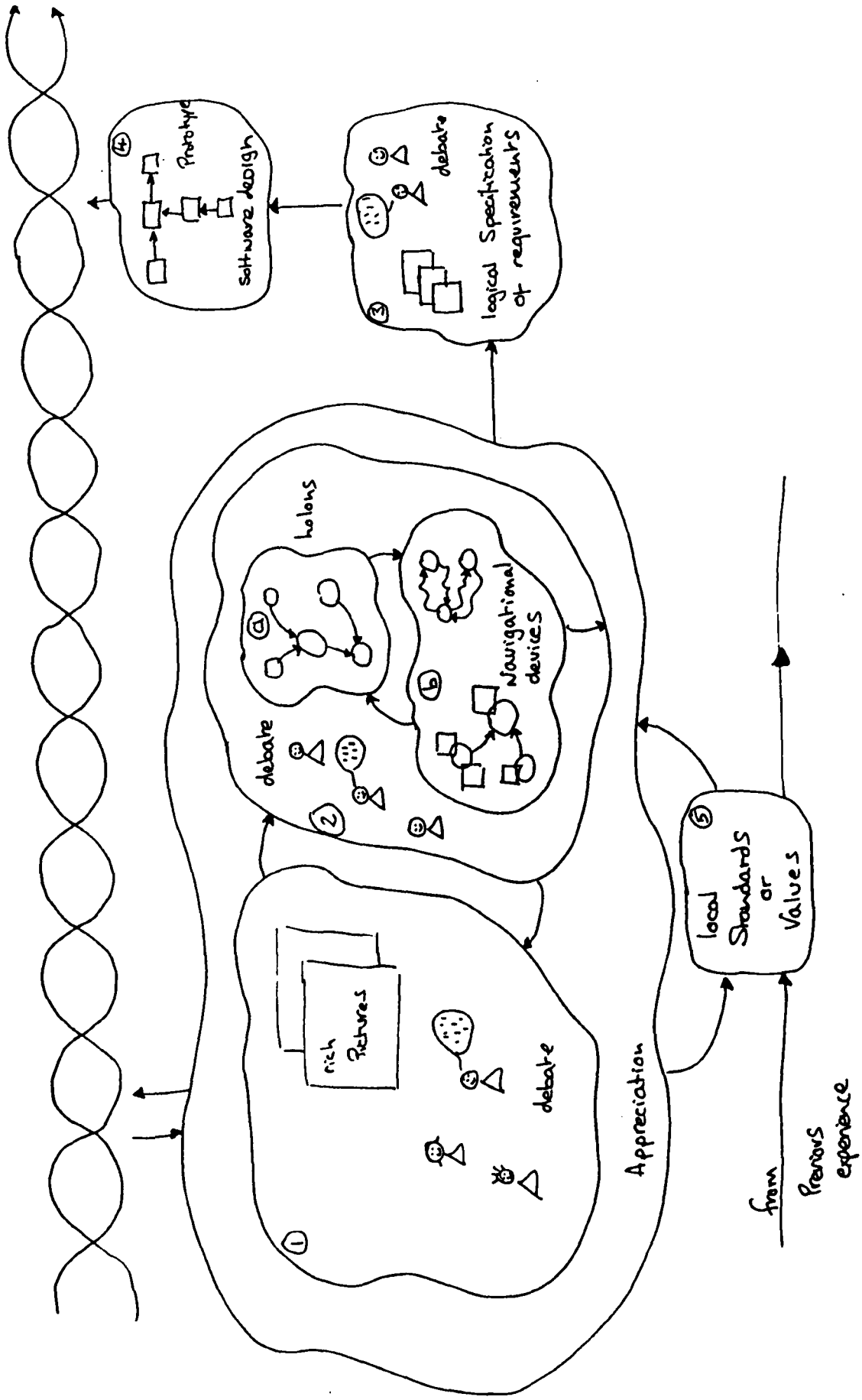


Figure 8.2: Intellectual Devices to facilitate *Client Led* IS Design.

The word *navigation* was selected in the attempt to convey a sense of *managing* the inquiry process. The design of technology-based information systems is a process of creation and is best facilitated by an agnostic (Checkland, 1981; Susman and Evered, 1978) inquiry process. When creating information systems to *serve* action in social situations, it is not possible to select between known alternatives in order to reach a predetermined objective, in the manner suggested by Churchman (1971) in his approach to learning (or *inquiring*) systems. There are endless possible variations that can emerge within human social situations. What is required is a means of *finding a way through* in a manner that is acceptable to those concerned. This learning process is not an aimless wandering, but neither can one use the cybernetics metaphor of a helmsman using a compass (Weiner, 1948). Applying this image would advocate that the design process was undertaken in the manner suggested by Zedan et al (2001), where a so-called K-mediator selects the technological components of the information system (see Chapter 6). What the models in Figures 8.1 and 8.2 attempt to convey is a collaborative *sense making* inquiry process, from which there emerges a shared *appreciation* of how purposeful action might be *served.* Once some accommodation has been reached concerning how the action might unfold, it becomes relevant to move to discussing how to *serve* that action with an appropriate technology-based information system. Once again the inquiry is regarded as a *learning* process and much discussion and debate will be necessary to reach some accommodation concerning what technological functionality might be appropriate. However, to operationalise the technological aspects of the information system, it is necessary to employ the more formal methods and techniques of software design. It is fundamentally important that those undertaking information system design recognise that even at the level of software design, where the developer is using various modelling techniques to conceptualise the final computer program that is to be written, the modelling techniques are still in essence, *sense making* devices.

It cannot be overemphasized that the design process is iterative, with the models being used to facilitate debate. The models should not be regarded as unchanging descriptions *of anything*; the models provide expressions of ideas that are *relevant* to the situation, up to and including any logical model expressing ideas for an intended software application. The computer program that is eventually written to operationalse the software design will not be an *exact map* of that design (Graham, 1998).

It seems ironic that there is this overwhelming insistence on constructing absolute descriptions that describe the functionality of the technological support, whilst at the same time, these descriptions are themselves interpreted and adapted by the developers (Lai, 2000). Perhaps this is due to a desire to be seen to be using a rigidly scientific approach. From an academic viewpoint, such work is always easier to publish (Checkland, 1983), as the *validity* of science as a method of inquiry is well established within the public domain, and so is far more attractive than applying the theory-practice cycle through an Action Research framework. As discussed in Chapter 3 and reflected upon in Chapter 7, working within an Action Research framework means accepting that learning outcomes in social situations are subjective and have no 'truth claim' as such (Checkland and Holwell, 1998b). So what has been achieved through undertaking an Action Research field study?

8.7 Establishing Public Validity

By choosing an interpretive stance, the work for the UMISD project has been underpinned by the assumption that social situations are continuously created from the interactions of those involved and as Gadamer (1989) argues, by being aware of a situation, the researcher is encompassed within. In accepting that inquiry within human situations cannot be objectively observed and commented upon though, it is important not to assume that 'anything goes'. To establish the credibility of the work undertaken for the UMISD project, the

framework of ideas, F, methodology, M, and area to be investigated, A, were all declared in advance. The researcher's *appreciation* of all three elements has changed over the course of the inquiry, through gaining experience from practice, and through reflecting upon the theoretical ideas. As the field study continued and further inquiry was undertaken, the construction of new models facilitated the ideas being refined through a cycle of learning that embodied: theory informing practice, informing theory (Checkland, 1985a). This cycle of learning will continue, no 'end point' can be offered. The set of ideas described in this thesis offer some useful lessons that have been gained through application in practice. Interested others may glean insight from this work that will hopefully support their efforts at undertaking *Client Led* information system design, though these interested others will achieve different outcomes. Others using the notion of *navigation* and applying the *navigational* devices suggested here will experience different challenges in their particular situations and improvement cannot be guaranteed; no inquirers within social situations can ever be certain of the outcome. The contribution to knowledge offered then is the notion of *navigating* from ideas for purposeful action, to a logical specification for a technology-based information system, by using some explicit intellectual devices to facilitate debate. These so-called *navigational* devices offer a means for those involved to *think about* or conceptualise how the action *might* unfold so that some ideas for a *serving* system can be considered. These devices then, act as *sense making* devices and as devices to support action being taken in the situation of concern, as is consistent with the principles of inquiry of the chosen methodology: Soft Systems Methodology.

In undertaking the UMISD research there has been considerable frustration, but also useful learning and practical achievements. There seems to be an overwhelming case for arguing that what is required is for the Information Systems and Software Engineering communities to relinquish the idea that building satisfactory technology-based information systems is best

achieved through attempts to *match*, or *map*, descriptions of the business processes to any designs for a serving technology-based information system. Compiling descriptions of the current situation in complex human social settings is a hopeless task and one which, even if it were possible, would not describe purposeful action that might be undertaken in the future, which is actually the real focus of a process of information system design. Unfortunately (or fortunately depending on your Weltanschauung), predicting the future is currently not possible. Rather than seeking wholly specified descriptions of business process (which are in any case illusory), those involved in information system design must embrace approaches that employ any models created as being epistemological devices. Such an approach opens the way for *learning a way through*. To undertake such an approach to information system design it is the inquiry process itself that must be organized (Checkland, 1985a). The three constitutive rules of SSM (Holwell, 1997) now offer the opportunity for those involved in such an undertaking to maintain a logically coherent approach to design work from problem identification onwards. It is important though to recognise that regardless of any stated philosophical underpinning of any approach, it is the *user* of any methods and tools that will determine the manner of their application (Checkland and Scholes, 1999; Lewis, 1993).

There is another advantage to approaching information system design as a *learning system*. Stowell (1991) argues that a *Client Led* approach to information system design helps foster responsibility amongst those involved. Shared *responsibility* for the *design* of an information system will help those who eventually use any technology-based information system to acknowledge the reasons for any design decisions. The purpose of a so-called *navigational* phase of inquiry is to support a coherent and collaborative learning process through which designs for a *serving* information system from the *clients'* perspective can be created.

The notion of *navigating* the gap guided by the constitutive rules of SSM Mode 2 provided by Holwell (1997) offers a way through the dilemma, though the route is far from certain. The cycle of learning about these ideas will continue through their application in new situations. It is pleasing to note that on the most recent visit to Abbey National plc, Sheffield in June 2001, (see Appendix 2) those concerned wish to remain involved in the research and apply these ideas to the current problem situation with the internet bank, cahoot.

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Appendix 1

The Abbey National Field Study

Appendix 1

The Abbey National Field Study

The following appendix contains a blank copy of the Performance Monitoring Sheet used to monitor and record the Collections Officers performance each month and also a hypothetical Collections Strategy showing the time periods that ought to elapse between actions, both referred to in Chapter 5. On pp. 237-241 there are pages from the field notebook and also the three rich pictures created during the initial exploration phase of the study. On p. 242 the holon from Figure 5.3 is reproduced with the accompanying root definition and this is followed by each of the contextualised sub-systems. On p. 247 the Conversation for Action model from Chapter 5 is reproduced as it was this model in particular, with the contextualised sub-systems, that informed the work undertaken to create the first logical specification using *SOMATiK*. The print out from this specification using *SOMATiK* is included on pp. 248-257, though the page numbers on this specification relate to the *SOMATiK* specification, not the thesis, these cannot be changed due to copyright protection.

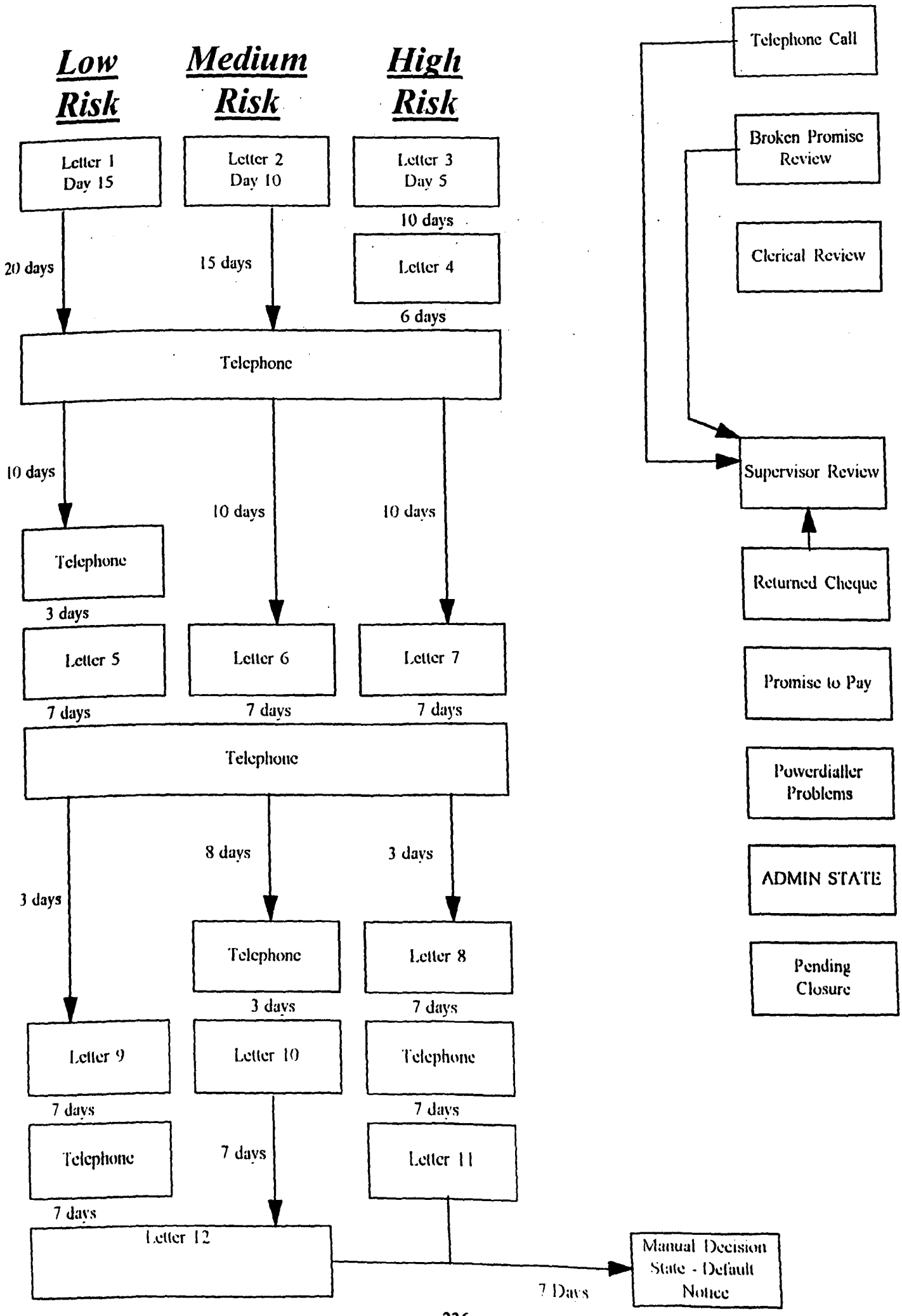
Credit Card - Officer Performance Monitoring Sheet

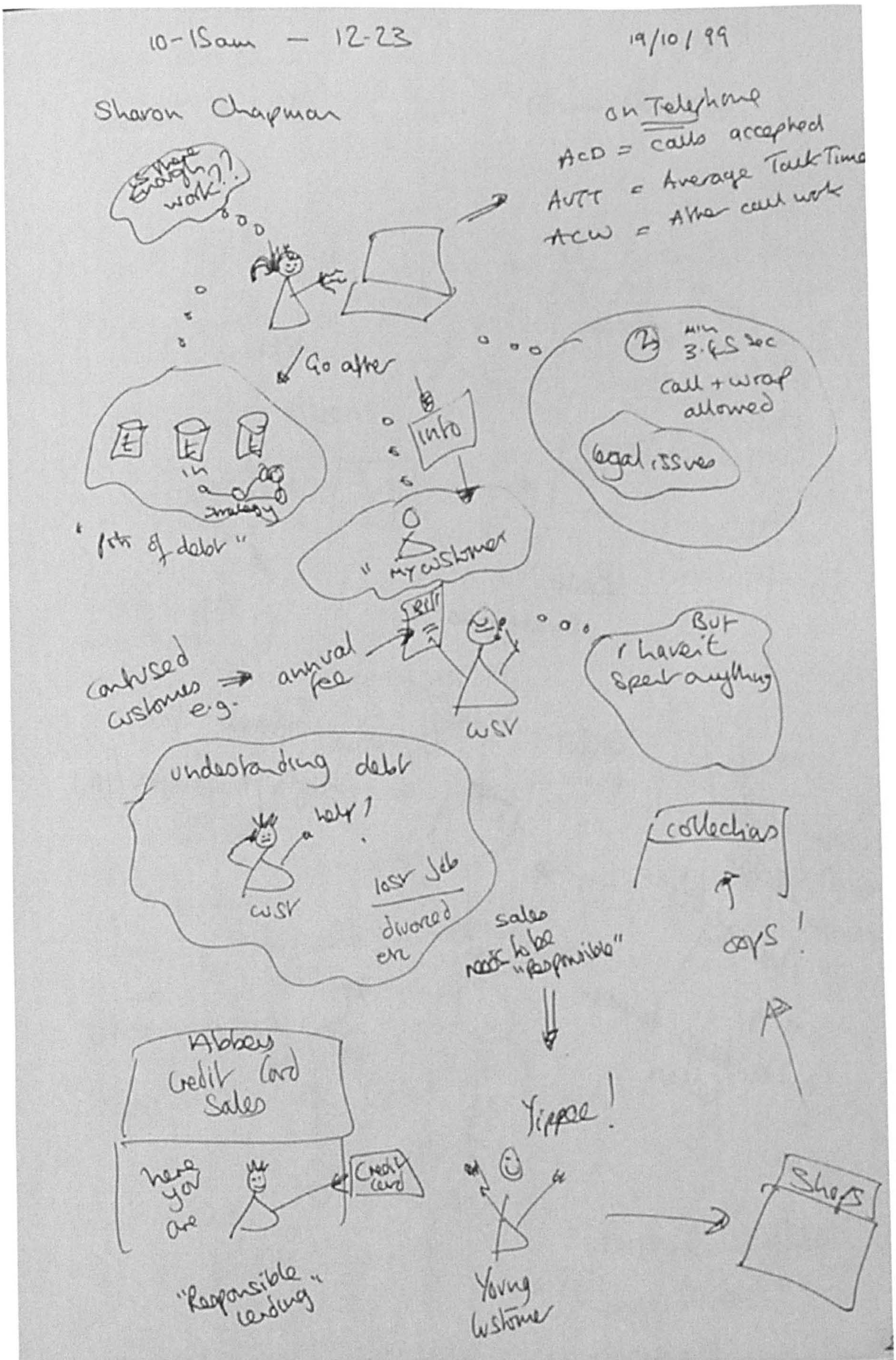
Officer: _____ *Team Manager:* _____

System Section	ACD				DIALLER			LETTERS	CACS								MONETARY	Comments / Initials
	2.1	2.2	2.1	2.1	2.6	2.6	2.6	2.3										
Description / Targets	Sign On Time	Dont Call Backs	Call & Wrap Time	Call Per Hour	Call & Wrap Time	Promises to Net Contact	Calls Per Hour	Data Accuracy	Accounts Worked Per Hour (E)	Accounts Worked Per Hour (F)	Promises Kept (E)	Promises Kept (F)	Average Promise Collected (E)	Average Promise Collected (F)	Total Promise Collected (E)	Total Promise Collected (F)	Total Money Recovery	
	100%	99%	03:45	16	03:20	85%	18	100%	17	17	80%	80%	£270	£205				
January																		
February																		
March																		
April																		
May																		
June																		
July																		
August																		
September																		
October																		
November																		
December																		
Year End Average	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	-	-	-	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Health & Safety	Banking Code	IT Policy	
Data Protection Act	Consumer Credit Act	FCA	

Hypothetical Collections Strategy

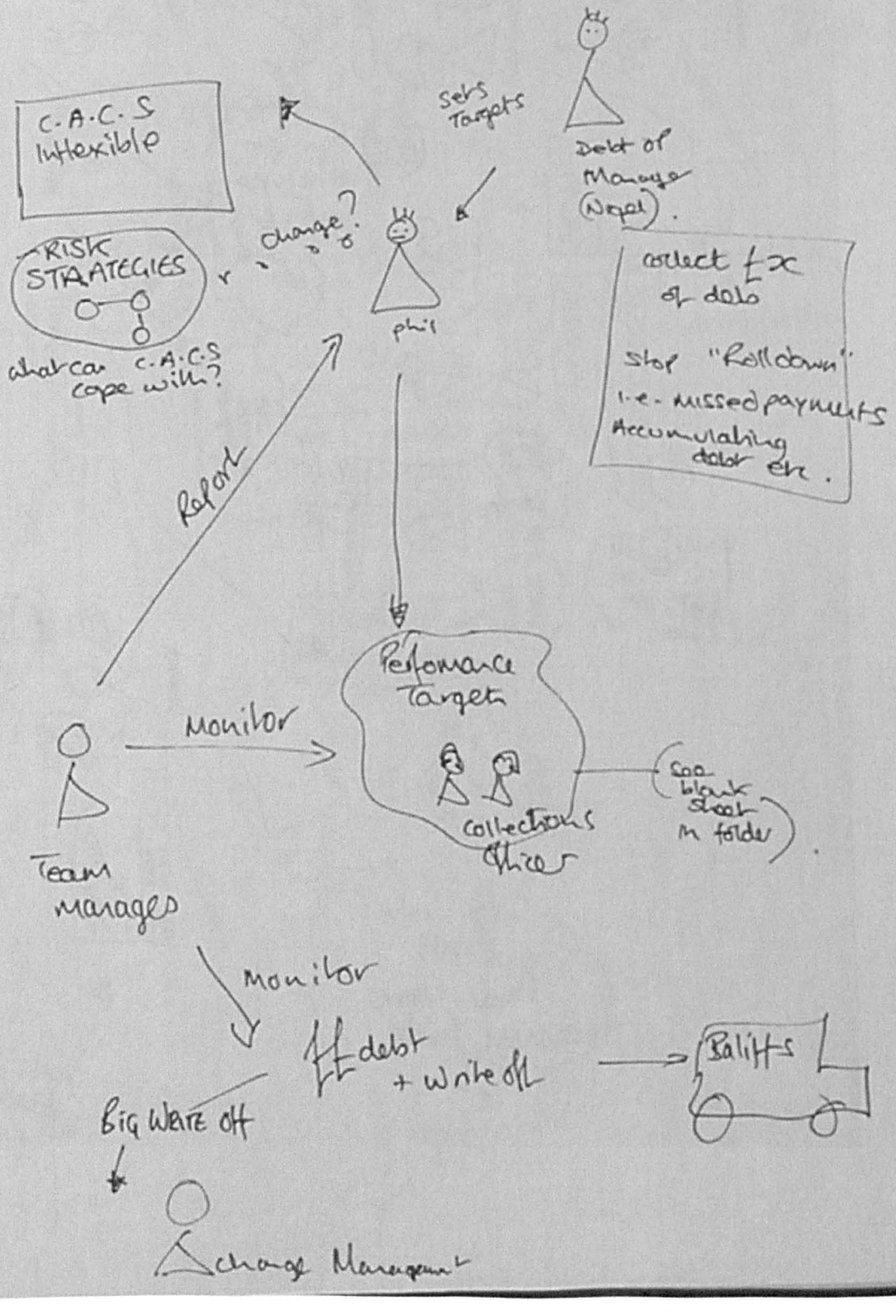


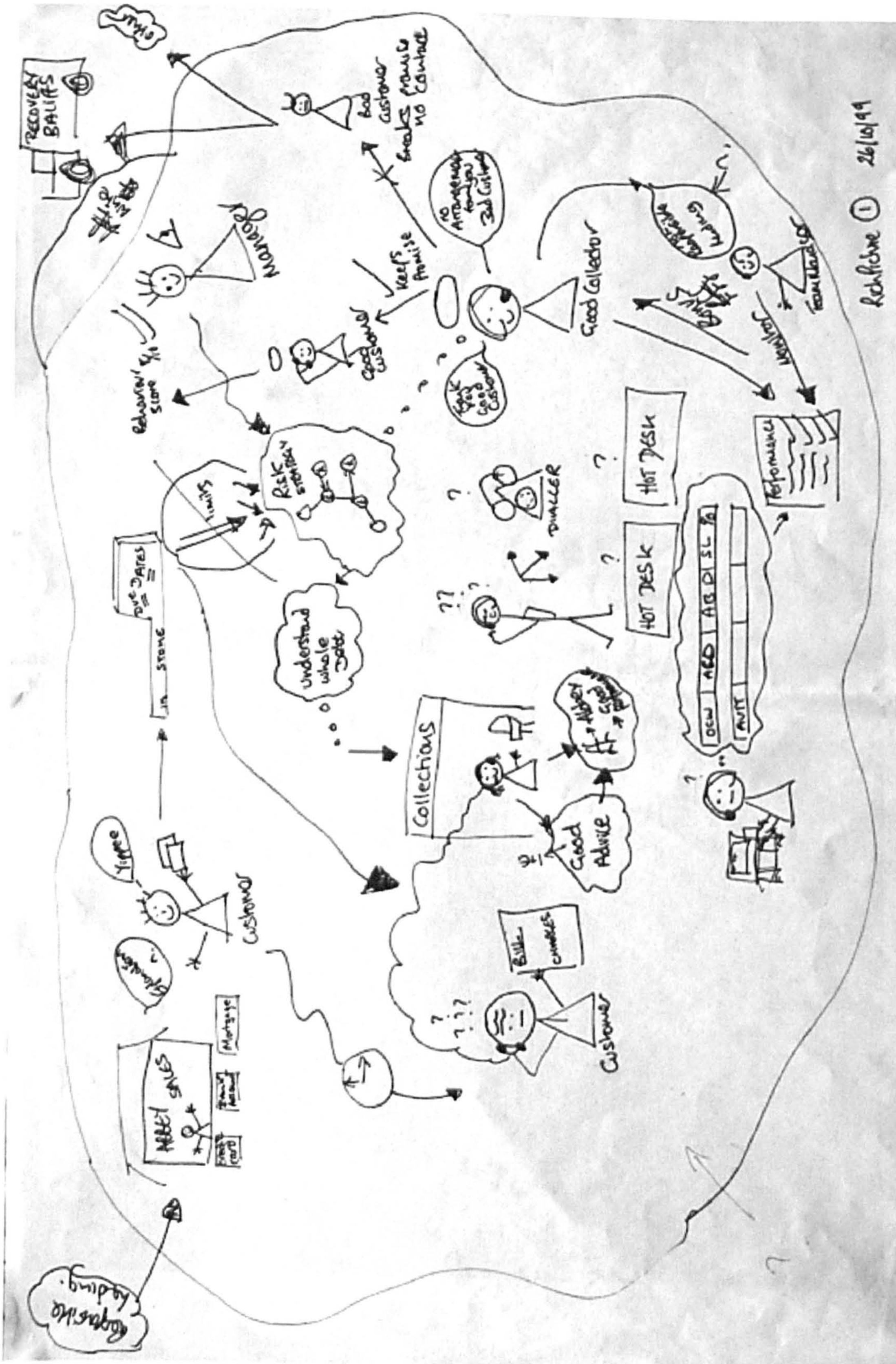

10-15am — 12-23
19/10/99
Sharon Chapman
on Telephone
ACD = calls accepted
AVTT = Average Talk Time
ACW = After call work
Is there enough work??
Go after
info
in a strategy
"my customer"
min 3.45 sec
call + wrap allowed
legal issues
confused customers e.g.
annual fee
CSR
But I haven't spent anything
understanding debt
help!
CSR
lost job
divorced etc
sales need to be "responsible"
collections
oops!
Abbey Credit Card Sales
here you are
Credit card
"Responsible lending"
Yippee!
Young customer
Shops

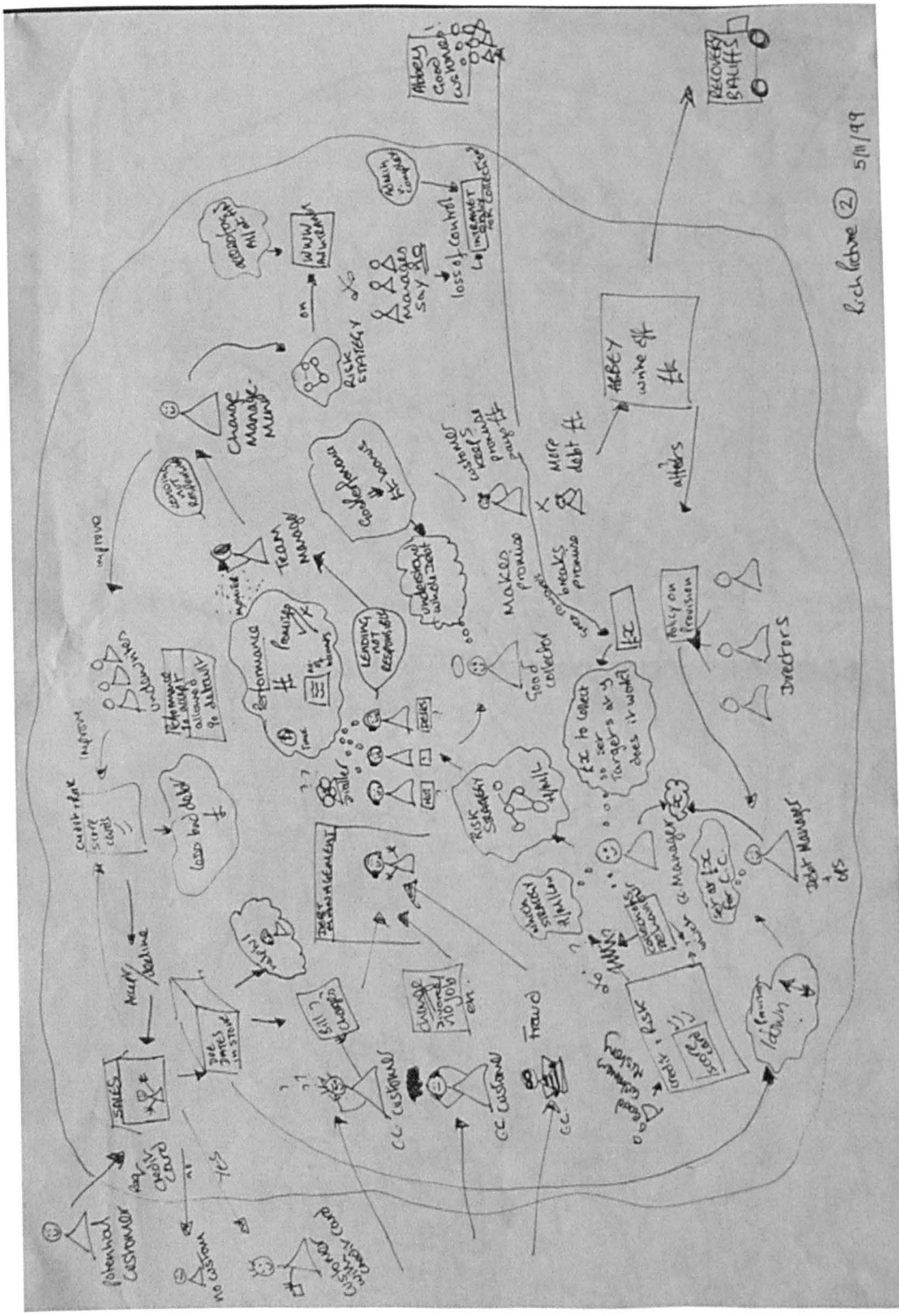
5/11/99

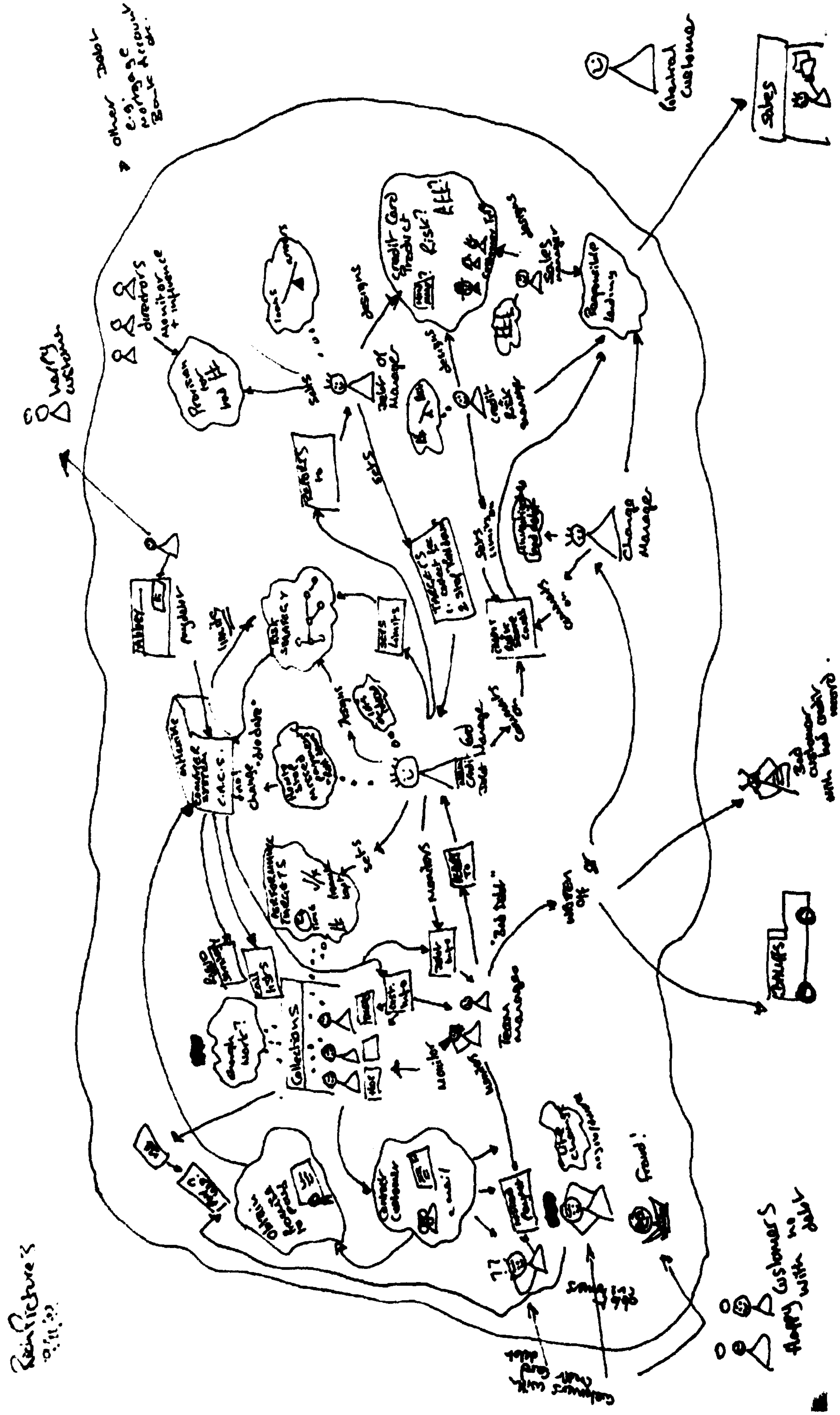
Phil Kenigan – Credit Card Manager.

11.30 – 12.35

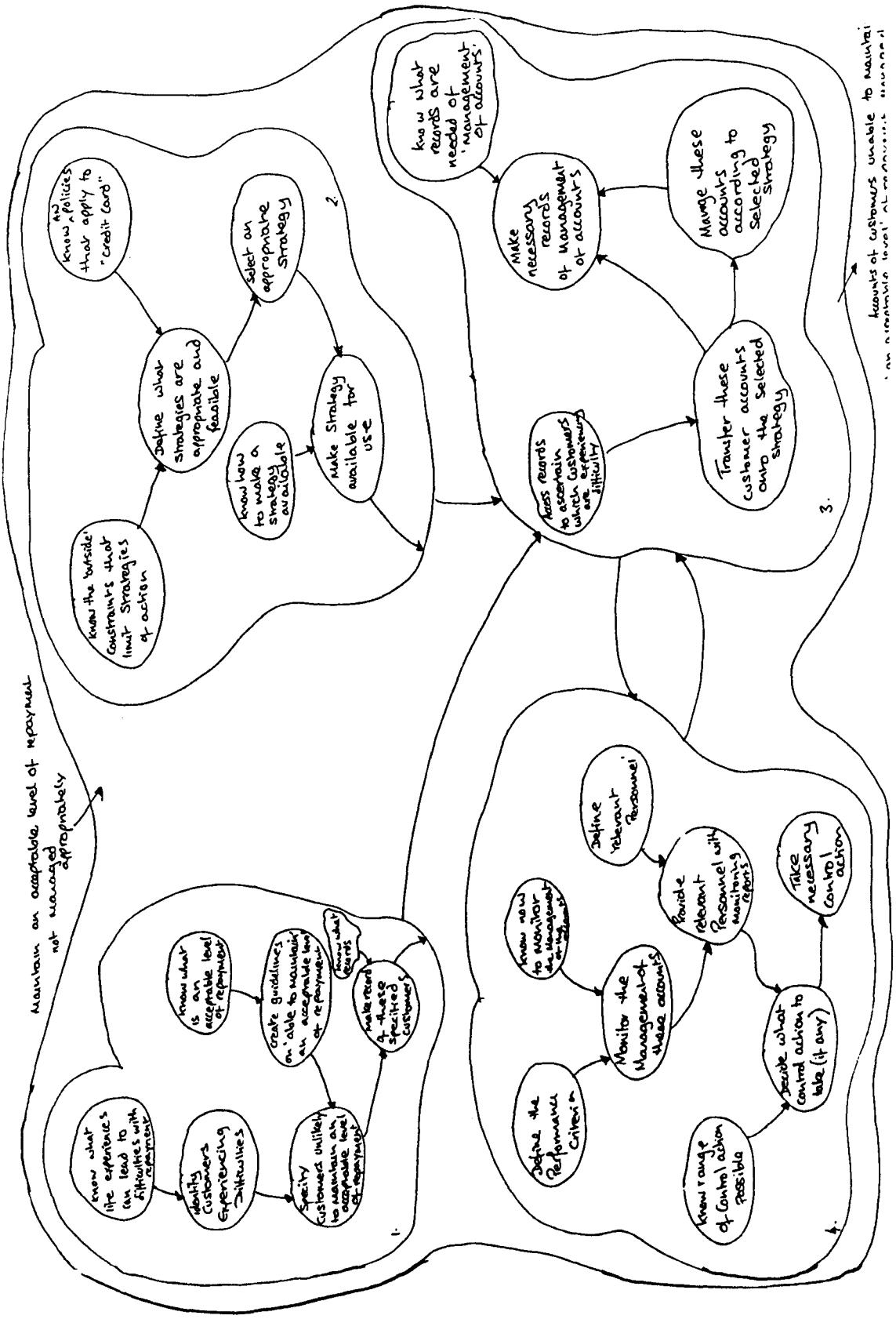



ABBEY SALES
Mortgage
Yippee
Customer
IN STONE
DUE DATES
LIMITS
RISK STRATEGY
Understand whole Debt
Collections
Good Advice
BILL
CHARGES
DIALLER
HOT DESK
HOT DESK
Performance
Good Collector
Good Customer
Keeps Promise
Bad Customer Breaks Promise No Contact
Monitor
RECOVERY BAILIFFS
Rich Picture 1 26/10/99

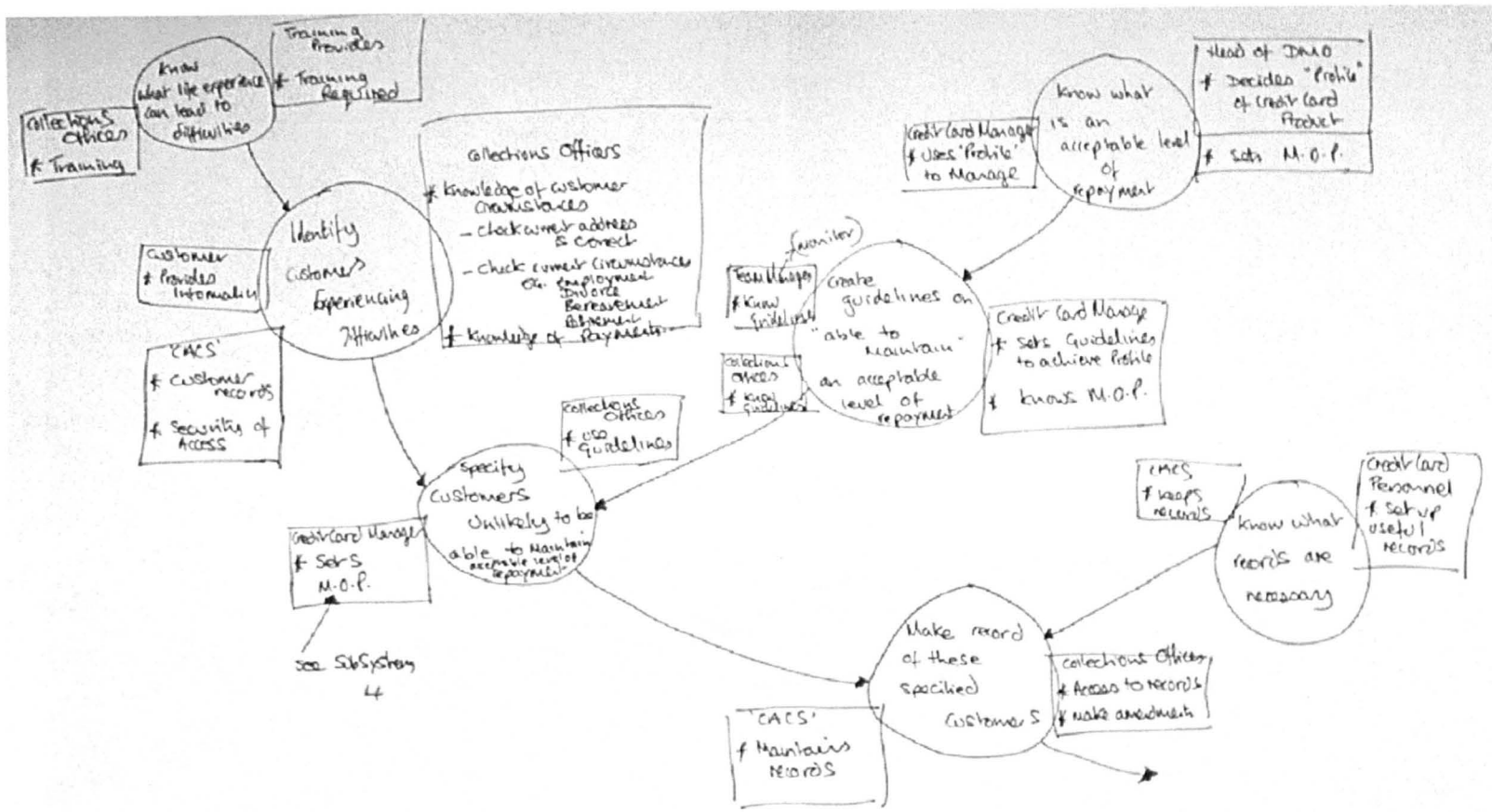

Rich Picture 2
5/11/99
Recovery Bailiffs
Abbey write off
Directors
Debt Managers
Change Management
Risk Strategy
Team Manager
Good collector
Fraud
Potential customer
Sales
CC customer



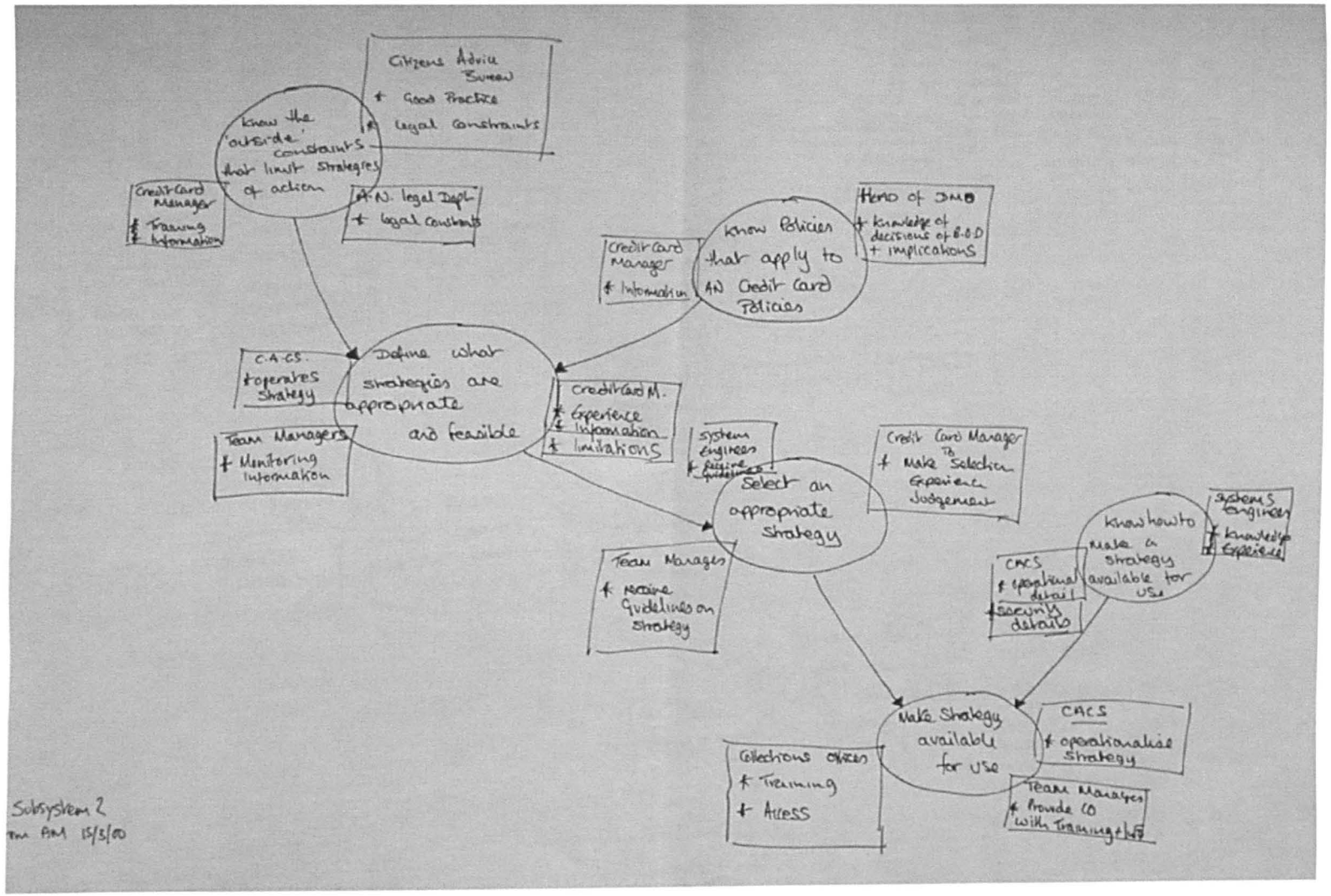
Rich Picture's
happy customer
directors
monitor + influence
Provision for bad £
other Debt e.g. mortgage Bank Account etc.
Abbey
limits
Collections
Enough work?
Call lists
PERFORMANCE TARGETS
RISK STRATEGY
Reports to
sets
designs
Credit Card Product
Risk?
sets limits
monitor
monitors
Team manager
"Bad Debt"
WRITTEN off
comments on
Change Manager
Credit Risk manager
Sales manager
Responsible lending
Obtain promise to pay
Contact Customer
e-mail
Fraud!
Potential Customer
Sales
Happy Customers with no debt
Bad customer with bad credit record

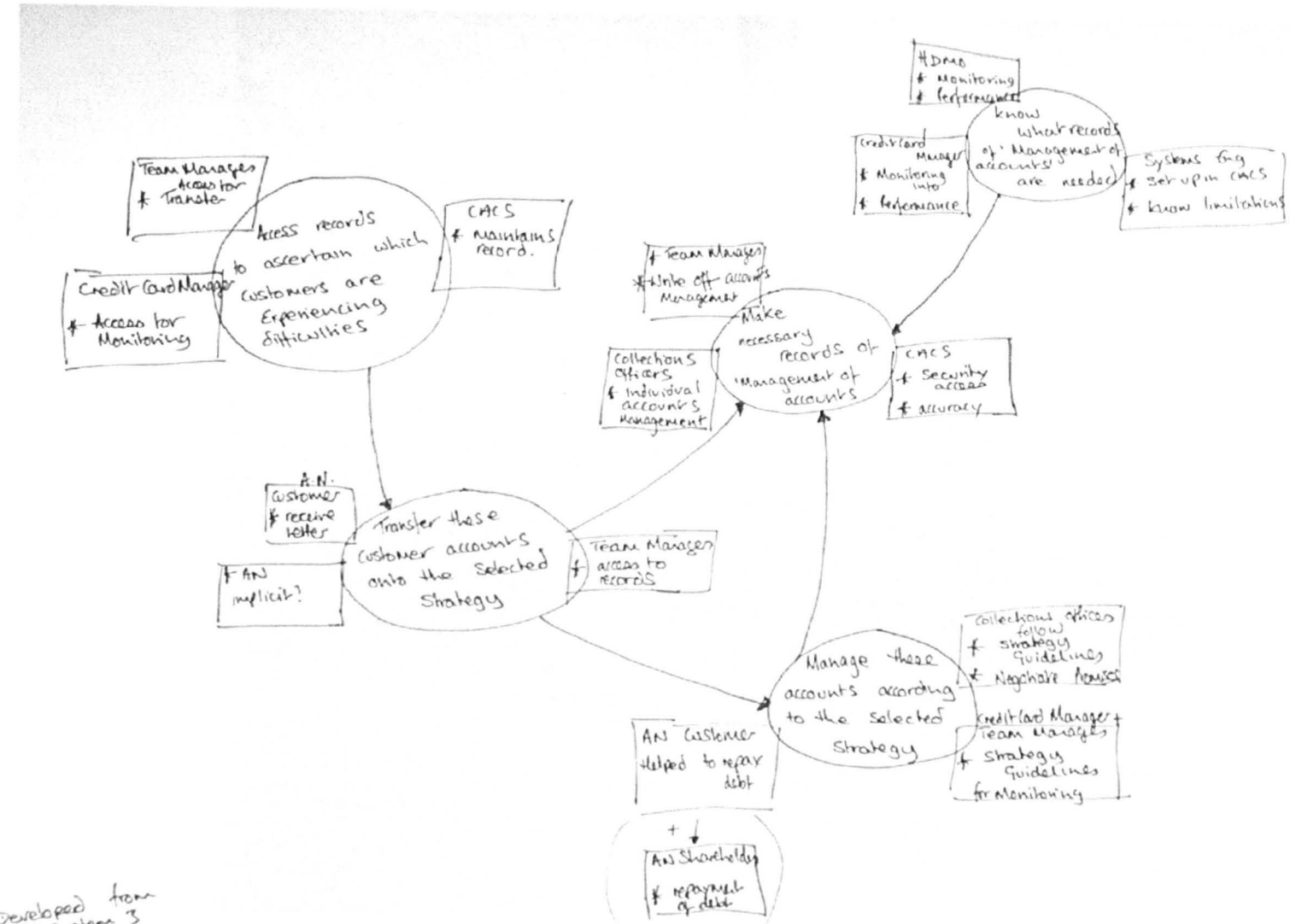


The holon from Figure 5.3, p. 128, created from the root definition: "An Abbey National Debt Management owned system to manage the accounts of Credit Card customers experiencing difficulties that mean they are unable to maintain an acceptable level of repayment".

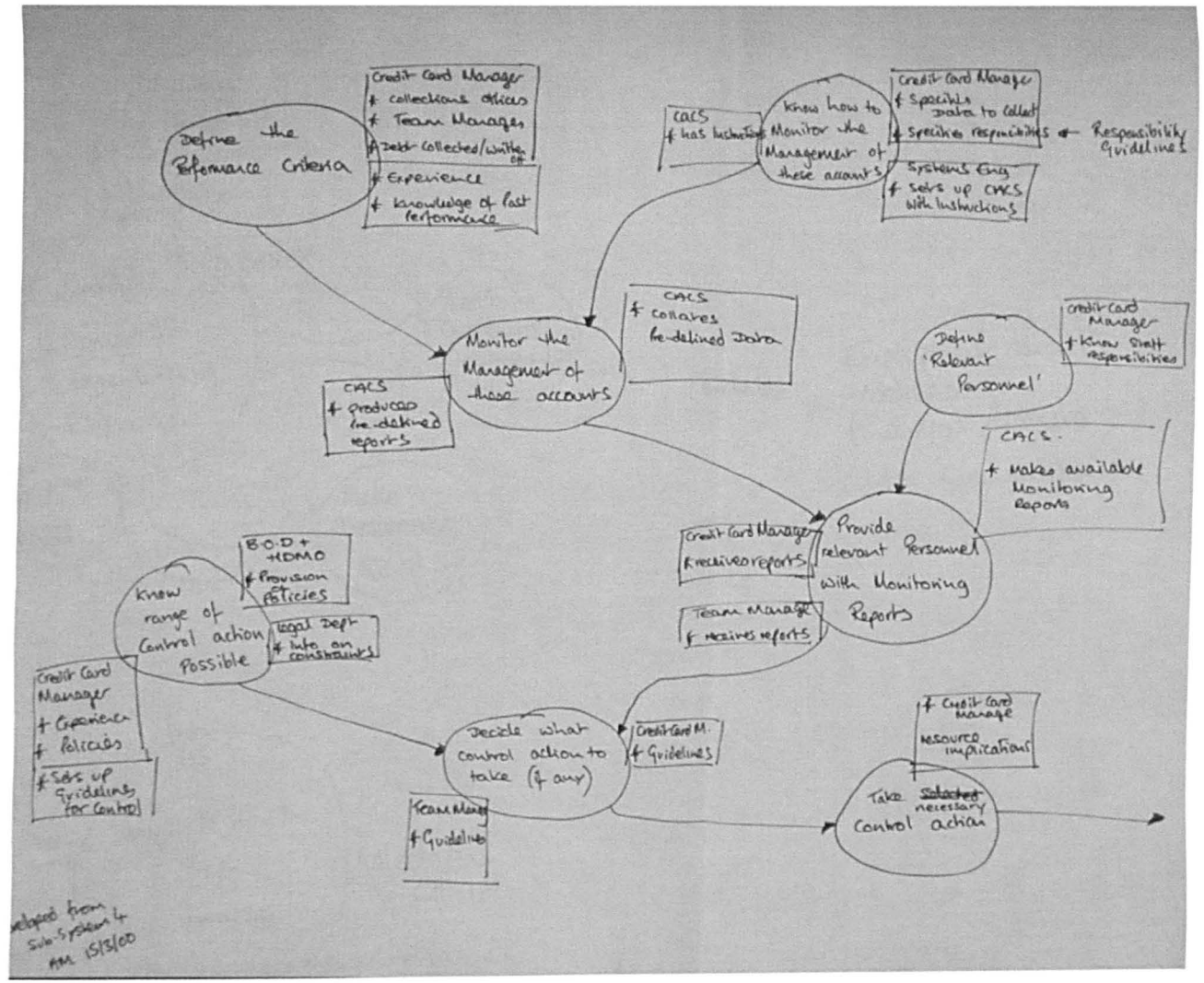


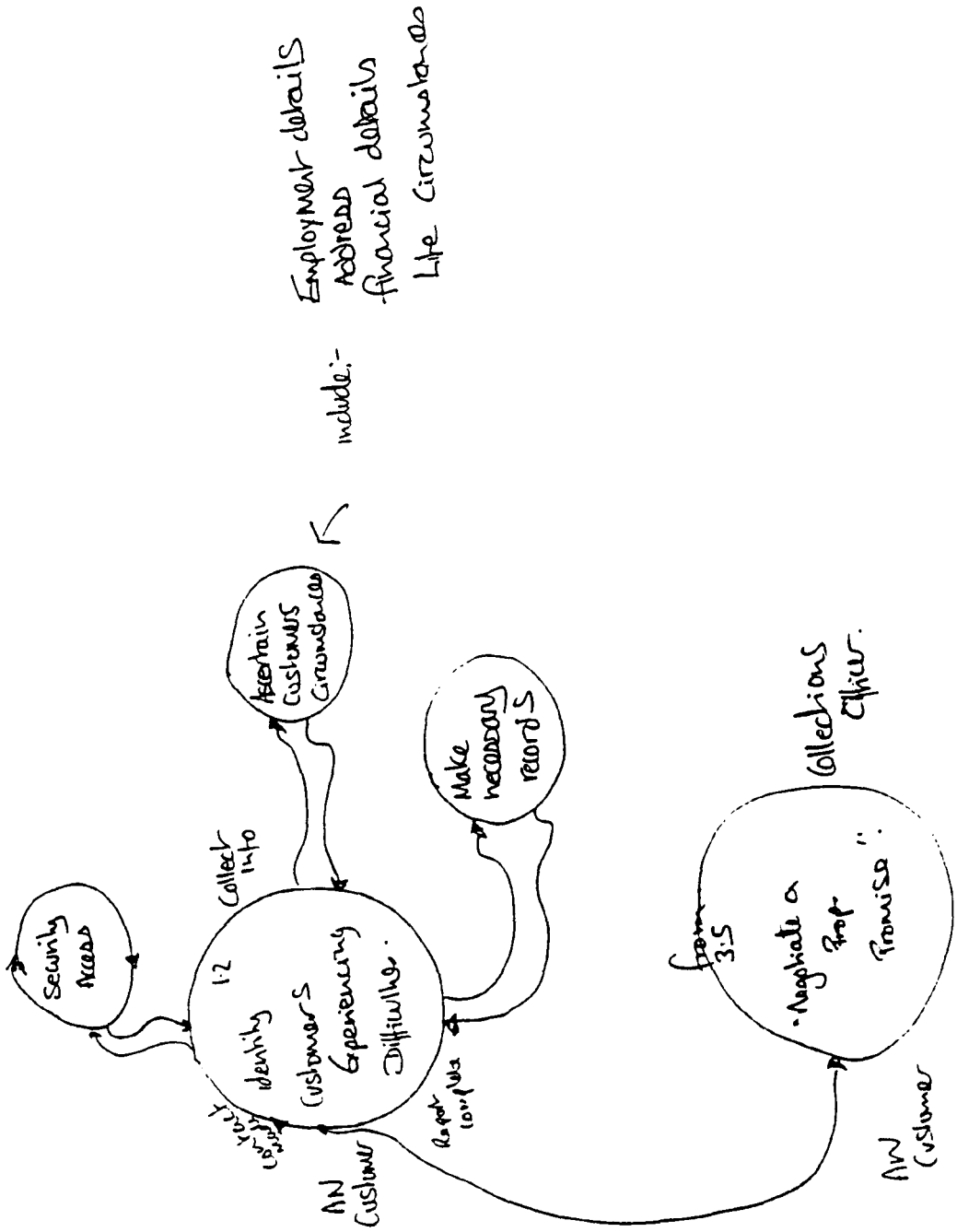
Developed from
SubSystem (1)
AM 15/3/00


Citizens Advice Bureau
+ Good Practice
+ Legal Constraints
know the 'outside' constraints that limit Strategies of action
Credit Card Manager
+ Training
+ Information
N. legal Dept
+ Legal constraints
Credit Card Manager
+ Information
know Policies that apply to AN Credit Card Policies
Head of IMD
+ knowledge of decisions of B.O.D
+ implications
C.A.C.S. operates Strategy
Define what strategies are appropriate and feasible
Team Managers
+ Monitoring Information
Credit Card M.
+ Experience
+ Information
+ limitations
System Engineer
+ Basic Guidelines
Select an appropriate Strategy
Credit Card Manager To
+ Make Selection
Experience
Judgement
Team Managers
+ Basic Guidelines on Strategy
know how to make a strategy available for use
Systems Engineer
+ knowledge
Experience
CACS
+ operational details
+ security details
Make Strategy available for use
CACS
+ operationalise Strategy
Collections officer
+ Training
+ Access
Team Managers
+ Provide CO with Training
Subsystem 2
TMA AM 15/3/00



Developed from Sub System 3
MM 15/3/00


Define the Performance Criteria
Credit Card Manager
collections officers
Team Managers
Debt collected/written off
Experience
knowledge of past performance
Know how to Monitor the Management of these accounts
CACS
has instructions
Credit Card Manager
Specifies data to collect
Specifies responsibilities
Responsibility Guidelines
Systems Eng
sets up CACS with instructions
Monitor the Management of these accounts
CACS
collates re-defined data
CACS
produced re-defined reports
Define 'Relevant Personnel'
Credit Card Manager
know staff responsibilities
CACS
makes available Monitoring Reports
Provide relevant Personnel with Monitoring Reports
Credit Card Manager
Receive reports
Team Manager
receives reports
Know range of Control action Possible
BOD + HDMO
Provision Policies
Legal Dept
info on constraints
Credit Card Manager
Experience
Policies
sets up Guidelines for Control
Decide what control action to take (if any)
Credit Card M.
Guidelines
Team Manager
Guidelines
Credit Manage
resource implications
Take Selected necessary control action
adapted from Sub-System 4
AM 15/5/00

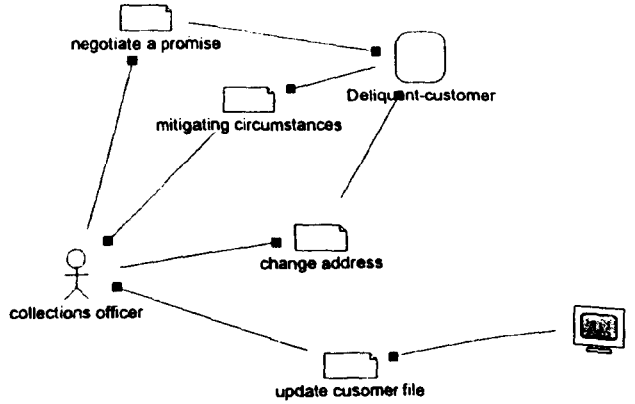


A model of the Conversations for Action that might be undertaken by a Collections Officer and an Abbey National Credit card customer when attempting to manage the Credit Card debt of that customer.

Managing Deliquent Customer Accounts

Report Version :	Ver 1
Report Date :	19th June 2000
Report Reference :	
Principal Author :	Donna Champion

Internal Context Diagram



6. Entities

(1) Label: Deliquent-customer

Definition: Deliquent-customer

Description:

Customer is a person with at least one credit card account with payment problems

7. Actors

(1) Label: collections officer

Definition: collections officer

Description:

CO liases with customer
Responsibilities: Transcribes verbal customer agreements. Record mitigating circumstances. The collections officers are informed by the Credit Card Manager, or Team Manager which clients to contact. Customer calls with a problem. Collections officer negotiates payment agreements.

User: collections officer

Role: Customer Liason, promise negotiator

8. Messages

(1) Label: change address

Definition: check if customer has moved

Description:

check current recorded address is correct

Source: collections officer

Trigger: default payment call

Target: Deliquent-customer

Goal: current address

Information Content:
require customers current address

Results:
new address if customer has moved

---

(2) Label: mitigating circumstances

Source: Deliquent-customer

Target: collections officer

---

(3) Label: negotiate a promise

Definition: negotiate a promise

Description:

co negotaites a promise from a d customer

Source: collections officer

Trigger: default payment

Target: Deliquent-customer

Goal: obtain promise

Task: negotiate promise

Information Content:
promise must be obtained unless person is dead or imprisoned

Results:
a promise is obtained and recorded

(4) Label: update cusomer file

Source: __SYSTEM

Target: collections officer

9. Events

(1) Label: default payment

Occurrence: Regular, Continuous

---

(2) Label: default payment call

Occurrence: Regular, Continuous

---

10. Task Structures

Classification Structures

Classification Hierarchy for Task : obtain deliquent customer details

obtain deliquent customer details
    negotiating promises

Classification Hierarchy for Task : Check current employment

Check current employment
    negotiating promises

Classification Hierarchy for Task : check current address

check current address
    negotiating promises

Classification Hierarchy for Task : record mitigating circumstances

record mitigating circumstances
    negotiating promises

Classification Hierarchy for Task : record agreement

record agreement
    negotiating promises

Composition Structures

...There are no Composition Structures

Association Sets

...There are no Association Sets

12. Task Details

(1) Label: Check current employment (Concrete, Manual)

---

(2) Label: check current address (Concrete, Manual)

---

(3) Label: default on payment (Concrete, Manual)

---

(4) Label: default on promise (Concrete, Manual)

---

(5) Label: negotiate promise (Concrete, Manual)

---

(6) Label: negotiating promises (Concrete, Manual)

Definition: CO negotiates promise

Description:
transcibes verbal payment agreement. Record mitigating circumstances, amount promised, time period.

Implementation: Class Collections Officer ; Operation: negotiates promise

SuperTasks

obtain deliquent customer details
Check current employment
check current address
record mitigating circumstances
record agreement

Associated Tasks
default on payment
default on promise

Exception Tasks
no agreement

Rulesets:

RuleSet: Promise agreed (Default)

Promise agreements must be obtained from all deliquent-customers

RuleSet: Check employment (Default)

Check deliquent-customer has consistent current employment. Ascertain if employment circumstances have changed.

RuleSet: Check address (Default)

ascertain if customer has changed address.

RuleSet: Assess Mitigating circumstanc (Default)

record any circumstances affecting payment

RuleSet: agreement not possible (Default)

customer unable to pay due to death or imprisonment, or fraud

---

(7) Label: negotiating strategy (Concrete, Manual)

---

(8) Label: no agreement (Concrete, Manual)

---

(9) Label: obtain deliquent customer details (Concrete, Manual)

---

(10) Label: record agreement (Concrete, Manual)

---

(11) Label: record mitigating circumstances (Concrete, Manual)

Appendix 2

Further Work

ABBEY NATIONAL

Rainbow

Click here for Retail Customer Service message

Click here for GTI message

PRESS RELEASE

CUSTOMER Q & As

COLLEAGUE Q & As

Feedback

Last Updated:
19/03/01

Author: Sue Douglas-Green

Announcement 19 March 2001 to all colleagues in Retail

This morning Abbey National made a formal announcement to the City about a new initiative.

We have been seeking a partner to work with us on the Abbey National Credit Card, who can manage the card asset and all servicing and processing associated with it. We announced today that we have signed a contract with MBNA Europe Bank Ltd., the world's largest independent credit card issuer.

All colleagues working on the credit card product – handling calls, managing customer debt and other activities – will be receiving full briefings from their managers today, however I can reassure you there are no job losses and all affected colleagues will continue to work in their same departments.

The purpose of this communication is to explain the initiative to you in more detail and explain how it may affect you, your business area, our customers and how it fits in with our Brand.

Under the proposed partnership, Abbey National will provide a strong brand, 15 million customer base and retailing skills, while MBNA will bring their systems, a full product range and expertise in delivering and managing world class credit card products. Together, we intend to increase the number of Abbey National branded credit cards in issue by 300% in the next five years.

Reason for the decision

We know we're not maximising the income from our credit card. Only about 3% of our customers have an Abbey National credit card and we have an opportunity to increase the number of cardholders substantially. However, whilst we could do this alone, our research shows that we can achieve our objectives more effectively through a partnership arrangement. We are not currently experts in enough areas in the credit card field – and major technological investment is needed to create a leading edge product.

We operate in a competitive environment, and it's essential that we provide the best possible service to our customers as efficiently as we can, so that we are meeting their needs, and at the same time maximising the return to our shareholders. In addition, maintaining our Brand means we must offer superior products and services that reflect our values of "being easy to do business with" and "being serious about customer satisfaction". We need to concentrate on the things we do best and look at other ways of sourcing activities where we believe we could do better.

This initiative is not a reflection on the performance of any of our colleagues. We recognise that all our people consistently deliver as high a quality service to our customers as possible, despite the frustrations caused by limitations in technology which can get in the way of meeting our customers' needs. In fact, one aim of this new initiative is to remove many of these frustrations.

The changes will not happen straight away, and in the short term you will still be working on credit card activities. It is very important that the current high levels of customer service are maintained.

In the future, once the new product(s) have been defined, we are anticipating that credit card sales activity within the Sales network will be much greater than it has been in recent years.

Living the Brand

One of our key challenges is the delivery of an Abbey National branded customer experience. MBNA's ability to work with us to deliver the Branded Customer Experience was a major reason for entering into discussions with them. In fact, by improving our processes, technology and proposition, this initiative is designed to enhance the customer experience and reinforces our determination to take the 'Brand on the Attack'.

Consultation

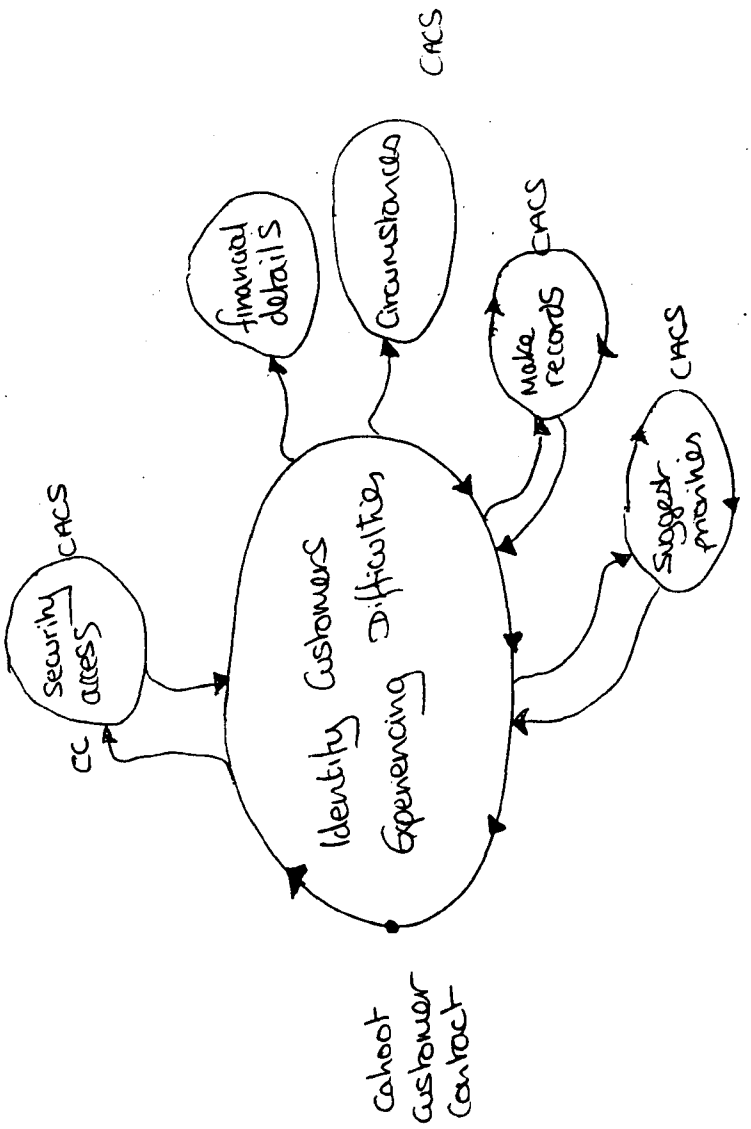
Over the past months we have been in close consultation with ANSA, and have shared with them all the information we have about this initiative; they fully support the approach taken.

Summary

The initiative we've announced today will greatly enhance our ability to compete not just in today's business environment but also in the future. The credit card market is an important growth area for us, and MBNA has a great deal of value to add in terms of credit card expertise, technology and an ability to help us improve our cost:income ratio.

Return to top of page

The above model depicts the Conditions of Satisfaction created from a further consideration of the activity: *identify customers experiencing difficulties*, this time the participants collaborated in conceptualising how the activity might unfold if customers were supported via a *serving* system that would facilitate online debt management.



The model depicted above is the Conversation for Action model created to express the ideas for how the contextualised activity from p. 261 might unfold in a real world situation. The arrows in this model were used to attempt to express the idea that the security access would occur *first*. After this check, the customer was to be able to key in details and request advice concerning which debts were priorities.

Abbey National plc
Group Debt Management Operations
Abbey House
7 Carbrook Hall Road
Sheffield
S9 2EN

Donna Champion
De Montfort University
Hammerwood Gate
Kents Hill
Milton Keynes
MK6 7HP

Telephone 0114 270 4578

4 July 2001

Dear Donna

Re: Thesis

Thank you for coming to Sheffield recently and sharing with me the chapter of your thesis relating to the GDMO fieldwork.

I can confirm that The Abbey National plc is happy for you to use our name within your thesis and is happy that the content represents a true picture of the debt management operation's task and processes involved.

I would like to thank you once more for the time and effort you have taken to explain the theory and "soft systems analysis" in general, and look forward to reading the complete thesis when available.

I am sure that as we move towards fully automated collections systems, especially within the Group's Internet Bank, cahoot, that the output of your work will be used in the development of future generations of debt collections systems and their integration to the internet, allowing customers to ultimately do our debt collections on-line.

Please keep in touch.

Yours sincerely

Phil Kerrigan MIMgt
Manager
Group Debt Management Operations

Appendix 3

Selected Papers

Glossary

Glossary

Appreciation: Vickers (1965) describes "an *appreciation*" as involving "reality judgements" concerning "matters of fact" about what is or has been in the past and "value judgements" concerning "the significance for these facts to the appreciator". Such judgements are inseparable and create our *appreciation* of what is relevant in our world. Checkland and Casar (1986) describe Vickers' idea of an *appreciative system* as an expression of human communication and action.

Business Process: This phrase is applied by the authors of technique-oriented approaches to information system design, to the "activities that a commercial organization performs in order to carry out its business" (Henderson, 2000). Graham (1998) is more specific, regarding a business process as being composed of the conversations that occur between the actors involved in that process. Essentially, in the literature from the field of Software Engineering, a business process is the process of activity that the technology-based information system is to *serve*. It is argued in this thesis that difficulties during a process of information system design arise due to the perception of a business process as a singular and specifiable course of action that can be represented in some model.

Commissives: The commitments that a person participating in a conversation (an interactant) makes to undertake some future action.

Conditions of Satisfaction: Winograd and Flores (1987) describe "Conditions of Satisfaction" as statements of the "commitment" entered into by the actors involved in undertaking the action. These commitments are not considered to exist in the real world, but are negotiated through debate.

Conversation for Action: This is a *speech act* made up of exchanges of requests and commissives directed towards undertaking cooperative action. A so-called 'Conversation for Action' begins with an initial request, which has some underpinning 'Conditions of Satisfaction' that must be fulfilled. Winograd and Flores (1987) argue that following a request the possible responses in such a conversation include: accept (making a commitment to fulfill the associated conditions), reject, negotiate a change by making a counteroffer, also the initiator can withdraw the request, or modify the original conditions.

Data: The great mass of possible facts that as human beings we might choose to select for attention. Checkland and Holwell (1998a), refer to the data we do select for attention, as *capta*.

Data Flow Diagram: A device used to model the flow of data items through an information system. Data Flow Diagrams (or DFDs) are usually employed in traditional approaches to systems analysis and design, such as the approach offered by Gane and Sarson (1979).

Entity Relationship Diagram: A device that provides a view of the so-called entity types (or in object-oriented methods, the 'objects') and the relationships between them, originally created for use in the design of relational databases (Chen, 1976). Unfortunately, the various approaches to object-oriented software design all use different terminology. Jacobsen (1992) provides a classification of various "entity types" which includes "entity objects" for storing facts (or capta), "interface objects" for communicating and "control objects" for processing.

Epistemology: The theory of knowledge. This is the study of "how we know what we do, what justifies us in believing what we do and what standards of evidence we should use" (Audi, 1998).

Information: Once a person has selected some data for attention, as human beings we each attribute meaning to that selected data according to the context. Checkland and Holwell (1998a) define information as "capta" (selected data) with attributed meaning. It is this definition that is used throughout this thesis.

Information System: A system to *serve* purposeful action (Checkland and Scholes, 1990; Winter et al, 1995). In contemporary business settings, information systems are usually technology-based, but can be operationalised without any software-driven technology.

Information System Definition: From the perspective of Zedan et al (2000) the process of *defining* an information system, is the process of constructing an absolute and unambiguous description of the functionality of the software required to operationalise the technology.

Information System Design: In this thesis, IS design is considered to be the process of *creating ideas* for a new information system, or creating ideas for adaptations to an existing one. The design process will include an initial phase of *exploration* and *sense making* in the situation of focus (Checkland and Scholes, 1990). *Client Led* information system design incorporates the idea that for an information system to be perceived as serving purposeful action, those involved in the situation, the *clients*, must be able to lead the design process.

Information System Development: This can be considered to be the *whole* process of *creating* and *implementing* an information system from exploration and sense making in the situation of focus, through to building the technological components, implementing the new, or adapted, technology-based IS and also any ongoing maintenance.

Information System Requirements: From a developer's perspective the requirements for a technology-based information system must provide a complete and consistent description of the technological system to be built. The Requirements Specification will emphasize the *functionality* of the technology and is a looser description than that provided by an information system *definition.* From an interpretive stance, the information system requirements are created through the interactions of those involved in the inquiry process, with people *learning* their way to a view of the requirements, once some accommodation has been reached concerning ideas for purposeful action.

Intellectual Device: A creation, often a drawing or visual figure though it can be textual, that is used, or adapted, for a particular purpose. The phrase 'intellectual device' has been employed as it emphasizes the conceptual nature of a device. The word 'model' unfortunately seems to have become associated with only meaning a *representation* of something (see below).

Knowledge: The Oxford English Dictionary (OED, 1998) describes knowledge as "facts, information and skills acquired by a person through experience or education". Audi (1998) suggests that knowledge is "familiarity gained by experience". Checkland and Holwell (1998a, p. 90) refer to knowledge as "larger structures of related information" which also implies a practical connection from joining meaningful facts together in a related manner. Experience seems an essential element of knowledge as it denotes a practical connection with the subject.

Legacy System: The term applied to information technology that is already installed. Such systems can comprise "computers, programs, databases and networking" (Henderson, 2000, p. 3).

Method: "A particular form of procedure for accomplishing or approaching something [...] orderliness of thought" (OED, 1998). In this thesis the word method is used to mean the particular way in which a methodology is applied, or the "specific approach adopted" (Checkland and Scholes, 1999).

Methodology: The OED (1998) defines methodology as a "system of methods used in a particular area of study or activity". Specifically in this thesis, the word methodology refers to the set of principles used to guide inquiry (Bullock et al, 1988; Checkland and Scholes, 1999).

Model: Bullock et al (1988) define a model as "a representation of something else designed for a special purpose". In the OED (1998) the definitions for 'model' also emphasize the use of the word as meaning a representation of some kind. For example, the first definition given is: "a three-dimensional representation", also a model is described as "a system or thing used as an example to follow", or "a simplified description" (OED, 1998). Certainly in software development and in technique-oriented approaches to information system design, the word 'model' has been used as if the expressed ideas *represent* some activity or some information content that exists in the real world. Building on the work of others, it is argued within the thesis that any model created during information system design is an epistemological device, or intellectual device, (Checkland, 1995a, Lewis, 1993) that can be used to *inform* learning.

Navigational Phase: A phase of inquiry where any ideas for purposeful action are considered and reflected upon, with the purpose of thinking about how these ideas *might* unfold in the situation of focus. This is particularly important when a technology-based information system is required to support the intended action. Currently, in order to develop software, the technical experts need an *appreciation* of what functionality will be expected of the

technological elements of the information system. The word *navigation* is intended to convey a sense of *finding a way through carefully*.

Navigational Devices: The intellectual devices used to facilitate debate and reflection once some accommodation has been reached regarding some ideas for purposeful action. The devices are employed in order to learn a way toward ideas for what information support *might* be appropriate in undertaking that purposeful action.

Object: An intellectual device used by software developers to *represent* things, or concepts, in the real world situation. These things or concepts are regarded as having an "unchanging identity" (Graham, 1998).

Purposeful Action: The OED (1998) defines purposeful as meaning "having or showing determination or resolve, [...] intentional". Purposeful action can be considered to be "willed" by human beings (Checkland, 1981).

Purposive Action: "Serving, or done with a purpose" (OED, 1998).

Technique: Absolute steps that describe how to do something in a way that provides almost guaranteed results.

Unifying Layer: The original name applied to what is referred to in this thesis as the *navigational* phase of debate. The name Unifying Layer was chosen to reflect the name of the UMISD (1998) project and also reflect the intention of this research to unite ideas for supporting clients in describing their desired information system with ideas for specifying the technical specification for the necessary technological provision.

Use Case: A Use-Case is a device employed by developers to 'describe' how actors in the situation of focus will interact with the *computer system* and also

to 'describe' what functions the computer system is required to perform (Jacobson et al, 1992).