Adult Learning Practises During a Time of Organisational Change: Implementing the SAP R/3 Computer System at a University

A dissertation presented in partial fulfilment of the requirements for the degree of Master of Philosophy in Adult education

by

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Abstract

The research is an attempt to understand adult learning practices in an organisation that is undergoing significant change in its financial practices. This change has brought with it a new computer system in the form of SAP R/3. A case study was used, namely the implementation of SAP R/3 at the University of Cape Town (UCT). The system was implemented by the PRISM Project, whose training team delivered most of the formal training that was required. The researcher is a member of this training team.

Four areas of research theory are used to analyse the case. A theory of organisational change is used to assess organisational learning. A model of adult learning is used to assess adult learning practices. It highlights three elements namely the learner and what they bring to the learning-teaching situation, the task and what it demands, and the means to build a bridge between the two. Theories of adult cognition are used to illuminate this model. Finally, role and discourse theory is used to understand how adults interact with others and approach the role of learner.

A qualitative research methodology was used. Thirty adults, "end users" from various levels and areas of the organisation were interviewed. I also interviewed PRISM Project Managers, trainers and representatives of central administrative departments. The data was coded and analysed, and provided a rich source of contextual data that described adult's experiences of learning to use SAP R/3 and of coping with organisational change.

The research was concerned with answering two main questions: Firstly, What organisational learning took place? Including what new organisational norms adults needed to learn about and what the organisation's theory in use of finances and SAP R/3 was. Secondly, using the adult learning model, What adult learning practices were found at UCT? I was particularly interested in the effect of role and discourse brought to learning, and in classifying different strands of the learning task and assessing which mediators of learning worked best for each. The research findings address these issues and I conclude with some implications for practice.

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Chapter One: Introduction

1.1 Introduction to the research

More than half of the adult population is engaged in working life. Working contexts take many forms but most involve some kind of structured environment geared to a particular task in society or the marketplace. Adults who carry out part of the organisation's task in exchange for earnings inhabit these rule-governed organisations. Adults work, on average, for about forty years so this activity is no minor one in their lives. Working environments frequently change and this requires adaptation by adults. In the late twentieth century, change often enters the work environment in the form of changing computer technologies. Adapting to such change requires adults and the organisation as a whole to *learn*. This learning is the focus of my research project. The aim of the research was to enter the world of work by using a case study approach and to find out what learning practices adults were engaged in as they adapted to technological change.

Two main research questions are asked. The first concentrates on the organisational context, asking *what organisational learning took place*. A theory of organisational learning, developed by Argyris and Senge, is used in the analysis. This theory highlights espoused theory (that projected by the organisation) and theory in use (that which staff actually say and do) and states that theory in use is the site of organisational learning. This learning becomes entrenched when it is written in documents of the organisation to which all staff members can refer. Sometimes organisational learning can be quite complex when norms and organisational culture are required to change as well as the procedural side of work. I was interested in finding out about new norms that adults were required to learn as well as what they actually did in the course of carrying out their work on the new computer system.

The second research question asks *what adult learning practices were found* in the organisation. This question draws on research theory that includes a model of the learning-teaching situation that emphasises three elements of learning. These are the learner, and what they bring to the learning-teaching situation, the task and what it

demands of learners, and finally the means to build a bridge between the two. Theories of adult cognition are used to illuminate and explain learning within this model. Using the adult learning model, I was interested in finding out what learning practices adults had engaged in. I looked at each of the elements of the model and identified a key issue related to each that I wanted to discuss. In relation to the learner, I was interesting in the influence of workplace roles and discourses brought to learning. In relation to the task, I was interested in identifying all strands of it and discussing the different kinds of problem solving abilities required for solving them. With the bridging process I was interested in the different agents that operate in the organisation to mediate the learning process. The research theory is presented in Chapter two, while the research questions are answered in Chapter five.

I was concerned to develop a detailed picture of adult learning in the organisation and so chose a case with which I was already familiar and in which I am personally involved. This gave me access to detailed information and allowed me to get very close the subjects. I chose a qualitative research methodology because it best suited my insider status and would allow me to build up the holistic picture I required. I interviewed adults from all sectors of the organisation, in this case university staff, about their learning to use the new computer system and about organisational change. This built up a rich set of data that I coded for the analysis. The research methodology is described in Chapter three and the data is described in Chapter four. The research concludes with implications for practice in Chapter six.

The organisation that I chose to use for the case study was the University of Cape Town.

1.2 Introduction to the case

1.2.1 The origins of the project

The research used the implementation of SAP R/3 (a main frame computer system) at the University of Cape Town as the case study. This computer system was implemented by the PRISM Project (Project to Revolutionise Information Systems and Management at UCT). The project itself had a full time staff, including project

managers and a training team (of which the researcher is a member). The project also involved staff of central administrative departments in the university and outside consultants. Ultimately it effected all staff of the university, as they were required to use the new system. The work of the project was to implement a computer system that would be able to carry into practice certain financial norms that the university was anxious to have in place.

The initial trigger that gave rise to the project was a serious error that occurred in the university's budgeting process. This highlighted the fact that "timely and accurate management information was exceedingly difficult to obtain" (PRISM Project 1995, p1). There was a proliferation of independent information processing systems across campus and these did not communicate with one another, data and work was duplicated and the systems ran on antiquated and inefficient computer platforms. In 1995, after some initial investigation, the university set up a committee to initiate the process of finding a solution to its administrative and reporting problems. This committee developed a vision for supporting the core task of the university (that of providing higher education and facilitating research) with suitable information technology (PRISM Project 1995, p2). The committee recommended a computer system that would be capable of meeting the needs of the university and fulfilling its vision. This system was SAP R/3. The committee noted that the implementation of this system, guided by the vision of the university, would require an extensive process of Business Process Re-engineering (BPR). The intention was to ensure that the university's processes and procedures would fully realise aspects of its vision and the full functionality of the new computer system (PRISM Project 1995, p2). The implementation process therefore needed to involve more than the Information Technology (IT) sector of the university. It crucially needed to involve the managers of university departments, particularly administrative ones. When these recommendations were accepted by the University Council, in August 1995, the PRISM Project was set up to carry the implementation forward (PRISM Project 1995, p2).

The goal of the PRISM Project was to close the gaps between the principles and procedures articulated in the vision document and those of the status quo by implementing SAP R/3 and improving business processes (PRISM Project 1995, p3).

The objectives of the PRISM Project are outlined on page 1 of Appendix 1. The project recognised that many of the gaps were very large and that bridging them would require significant change in the ways in which work was carried out at the university. It was also the responsibility of the project to manage the change process and so it was run by both a Project Manager and a deputy Change Manager. Change management was regarded as important because the project recognised that there needed to be "buy in" from staff at all levels and in all sectors of the university for the implementation to be successful. Positive attitudes to change would come where change was well managed and controlled and did not entail significant additions to the workloads of staff. It was recognised that positive views towards change usually only emerge after a painful transition period, and that initial resistance needed to be carefully managed. Effective and comprehensive training programs were put in place and were seen as crucial for managing the process of change. Several briefing sessions and ongoing meetings with departments were also part of the change management process.

1.2.2 The Finance phase

The implementation started in late 1995 with the Finance Phase. Implementation of each module involved a preparation phase in which the project management, training team, IT staff and administrative teams were involved. The Finance Phase began with a year of preparations towards going live between October 1996 and January 1997. Other phases that followed included the Human Resources phase and a Final phase in which various smaller modules of the system were implemented. This research focuses on the Finance implementation. At live date the system was "rolled out" to "end users" who were usually trained well in time for this. A sustain phase followed in which there was ongoing improvement and a dialogue between "end users" and the PRISM Project which led to many further improvements.

SAP R/3 is a modular, mainframe computer system. Each module is integrated with the others and the customer chooses which modules to purchase for their operation. Five modules of SAP R/3 were implemented at UCT during the Finance phase, they were Funds Management (FM), Controlling (CO), Finance (FI), Materials Management (MM) and Sales & Distribution (SD) (PRISM Project 1995, p12). These

modules provided for the university's financial requirements, which are to operate a general ledger, to control expenditure, provide commitment accounting and to record revenue. Moving to SAP R/3 required moving from an older "entities" system to SAP R/3 structures, which included a funds management system with a hierarchy of funds and funds management centres (PRISM Project 1995, p13). The system provided the functionality for purchasing and selling goods, and it was this that most "end users" encountered and used.

1.2.3 End user impact and training

The Finance phase had the greatest impact on "end users" and was rolled out a few departments at a time to manage the training and help desk workloads that were anticipated. For some staff, SAP R/3 presented not only a change from a paper based purchasing system to an on-line one, but also their first usage of the Microsoft Windows environment. Training was thus a special consideration of the Finance phase. It was estimated that about 800 "end users" required Windows training and that some 1200 required training in purchasing and reporting procedures on SAP R/3. An additional 400 to 600 users needed training in the display, reporting and planning side only. The training of the 1200 "end users" in basic SAP R/3 purchasing was done in a series of hands-on courses each lasting 4 half-days. The minimum time needed for this training program to be completed before live date was 10 weeks.

The training team consisted of a Training Manager and two Training Officers, the latter being the role played by the researcher. Together with an additional person, this team also managed a help desk for dealing with "end user" queries about SAP R/3 tasks. Training was approached by identifying different groups of "end users" and designing different courses for them. The groups that were initially identified were: "functional users" (those in central administrative departments), "departmental support end users" (secretarial staff, administrative officers and technical officers), "executive end users" (line managers, Heads of Departments and Deans) and "academic end users" (teaching academics and fund holders). It is interesting to note that the research found different groupings emerging from the data, it found that secretarial support staff and technical officers formed different groupings and that executive "end users" and academics were essentially the same. Diagram 1 tabulates

the different courses that were offered as part of the initial training drive and describes which groups of staff they were intended to service. Although it is now no longer the case, in the initial phase after implementation all staff were required to attend a training course before they could get access to the system.

Code	Course Name	Staff it was aimed at	What it covered	Duration
F0	Finance Overview Seminar	People who would not be using SAP R/3 themselves e.g. executives, Heads of Department & Deans	Concepts, processes, a demonstration of placing a purchase order & running a report	3 hour seminar
F1	Introduction to Finance	People who would need to display purchasing and financial information only e.g. fund holders and academics	Concepts and procedures, hands-on training of display functions	2 morning computer lab course (7 hours)
F2	Introduction to Finance and Purchasing	People who would need to carry out the full spectrum of purchasing tasks like placing purchase orders and goods receipts e.g. secretaries, administrative assistants, research assistants	Concepts and processes, full hands on training of purchasing functions	4 morning computer lab course (14 hours)
F3	Finance and Purchasing Refresher	as above	as above	2 morning computer lab course (7 hours)
F4	Planning and Reporting	People who needed to display purchasing and financial reports as well as carry out purchasing tasks. This course usually ran directly after the F2 course, serving the same group of staff.	Financial concepts and hands-on reporting	1 morning (3 hours)

Diagram 1: PRISM Training courses for the Finance Phase

After initial training, weekly question and answer sessions were held in a large lecture venue to deal with common problems and to demonstrate common procedures. Later updates, mainly in the reporting area, were provided in the form of lunchtime seminars. After a year of supporting the finance implementation, the training team handed over responsibility for help desk and training to the Finance Department of the

university, which has continued to run courses for new staff, or staff needing to update their skills. A weekly, hands-on funds reporting workshop was also later added to the repertoire of training facilities. The format of the main purchasing courses have also changed to accommodate a more modular format separating different kinds of functionality, reporting skills and conceptual knowledge, so that staff can choose which they need to attend. The courses are now voluntary and are more spread out over time so that staff can acquire the necessary training bit by bit while integrating it with their work.

This set of courses covers the formal training provided by the project. It by no means gives a full picture of the means that adults used to learn SAP R/3 and adapt to organisational change. Informal mediators of change are an important concern of this research and are discussed in detail in Chapters 4 and 5 where I describe and analyse the data.

1.3 Conclusion to the introduction

In this introduction I have described the aims and main concerns of the research and have outlined the research questions. I described the various areas of research theory that I use and motivated for using a qualitative research methodology. I also introduced the case, describing the origins of the PRISM project that implemented the new computer system. Finally I described the task of the training team which was to train different groups of staff (amounting to over 1200 "end users") in SAP R/3 functionality.

The dissertation continues with two chapters covering the research theory and methodology. I present my findings in a further two chapters the first of which describes the data by building up a holistic picture of adult learning practice in the organisation from the interviews, and the second which analyses the data and answers the research questions. The research is concluded with a chapter giving implications for practice.

Chapter 2: Research Theory

2.1 Introduction

The research focuses on adult learning in the workplace. In particular it examines adult learning in the face of sometimes-radical change in computer technology and organisational norms. The adaptation to new systems that is required of adults involves learning. Their learning occurs in formal situations set up by the organisation and in many kinds of informal ones that occur in their daily work.

In order to be able to understand adult learning in the organisation, the theoretical approach draws on several areas of social theory: organisational change and learning, and an adult learning model. Neo-Piagetian theories of adult cognition are used to help understand the individual in their environment. This adds a deeper dimension to the adult learning model which starts by describing the learning-teaching situation in terms of three elements: the learner, the task and the means to build a bridge between the two. An understanding of these three elements is developed using theories of adult cognition, and with reference to the organisational context in which they occur, especially with reference to workplace roles and discourse. Finally, role and discourse is discussed with reference to adults in the workplace and to the importance of objects such as computer technology in workplace discourse.

2.2 Organisational change and learning

2.2.1 Introduction

Since World War II, organisations have existed in political and technological environments that are predictably unstable (Argyris 1978, p352 & p368). This means that the requirement for organisational change and learning (in order to cope with this change) is not an occasional, sporadic phenomenon, but is continuous and endemic to society. The notions of organisational learning, and of continuing learning, have been popularised within this context.

An organisation is a collection of people that is rule governed (Argyris 1978, p356). A collection of people becomes an organisation when its members devise procedures for making decisions in the name of the collective, and delegate authority to act for the collective to its members. Boundaries are set between the organisation and the rest of its society, although these may change (Argyris 1978, p356). People act as individuals, but only in terms of the organisation's rules. As long as there is continuity in the organisation's rules, the organisation will continue to exist despite the fact that individuals come and go (Ibid.). An organisation's rules are centred around its work - the task to which it addresses itself. Seen this way, an organisation can be understood as a particular solution to a problem, or as a strategy for performing a task, one that may be performed in other ways by other organisations (Argyris 1978, p357). If the organisation is very large and the task is very complex, it can be broken down into smaller components that are delegated to individuals and departments. These departments and individuals give rise to organisational roles (Ibid.). According to Argyris, the "organisation's task system, its pattern of interconnected roles, is at once a design for work and a division of labour" (Ibid.). A university, for example, is a task system for financing and facilitating tertiary education and academic research. This massive and complex task is broken down into smaller components including administration, research and teaching. These correspond to distinct departments and roles within a university organisation.

2.2.2 Organisational theories of action

Meeting the demands of the task, around which the organisation revolves, means that it must have a "theory of action" for doing so. A theory of action is a formula for deliberate human endeavour that is geared towards achieving certain goals. A theory of action states that in a particular situation, if you want to achieve a certain goal, under certain assumptions, you need to do A, B and C. For example, a publisher is an organisation whose task it is to publish books and magazines. To achieve the goal of publishing a magazine, under the assumptions that it will be published weekly, will keep to a certain theme and will be sold to a certain target market, the organisation needs to write articles, take photographs, layout and edit the pages, and have them printed, bound and distributed. Theories of action are also theories of control that both

explain and predict human action within the organisation as it goes about achieving its goal (Argyris 1978, p354).

Two kinds of theories of action are found in all organisations. One is the *espoused* theory of action, and is that which people *say* they do, as well as the image of itself that the organisation presents to both insiders and outsiders. If a member of an organisation were asked what they would do, or how they would behave under certain circumstances, the answer they would usually give is their *espoused* theory of action for that situation. This is the theory of action to which she gives allegiance and which, upon request, she communicates to others (Argyris 1978, p354). The other theory of action is that which governs what members of the organisations *actually* do, say and believe. Argyris calls this the theory of action *in use*. Theories in use are normally tacitly expressed and inaccessible to outsiders, while espoused theories are more visible, for example through mission statements, official announcements and publications. The theory of action which is *in use* and the *espoused* theory of the organisation are normally different, sometimes to the point of incompatibility (Argyris 1978, p358). Members of the organisation may or may not be aware of the incompatibility, and some argue that the difference does not indicate that the organisation is "unwell". On the contrary, it is argued that the gap between the two theories of action can provide an impetus for growth and creativity (Senge 1990, p7). Finally, while *espoused* theories of action are used to communicate an identity for the organisation to both insiders and outsiders, it is through socialisation into the theory of action *in use* that members come to join the organisation.

Underpinning the theories of action of the organisation are norms for performance and strategies for achieving and maintaining those norms. For example a norm on a computer implementation project may be to always meet deadlines, no matter what. Norms in turn are grounded by the underlying assumptions, or philosophies, which bind them together. The norm of meeting deadlines on an implementation project may be underpinned by a philosophy of professionalism, which manifests in a culture of dedication in the organisation. Norms for performance include patterns of communication and control, ways of allocating resources, provisions for self-maintenance, systems of reward and punishment, approaches to recruitment and instruction and ways of building careers (Argyris 1978, p358). In the above example,

this might mean allocating resources to areas of work that have imminent deadlines, rewarding workers who put in over time with either praise or additional remuneration, indeed favouring professionals who work this way. Such professionals would be able to build their careers in the organisation by demonstrating the willingness to work according to the norms of the organisation.

I have mentioned that espoused theories are communicated to members of the organisation and to outsiders. In large organisations, such as a university, it is also important that theories of action *in use* are outwardly re-presented in some way so that, as individuals come and go, this record of the organisation's theory of action in use is not lost. If written down it can be referred to and used to guide the behaviour of newcomers. This helps theories of action to remain stable. Outwardly presenting theories of action in a way that all members of the organisation can refer to them is essential for continuity and contact between physically separate individuals, and groups of individuals. Argyris introduces the notion of organisational "maps" to describe how theories of action are re-presented outwardly in some concrete form and internalised by individuals so that their actions will be guided in line with the organisation's norms for achieving its goals. Maps, he explains, are both public representations and private images held by individuals (Argyris 1978, p360). Each member of the organisation constructs their own picture of the whole and, as change occurs, they "strive continuously to complete the picture and to understand themselves in the context of the organisation" by testing and modifying their mental "map" of the organisation (Argyris 1978, p359). It is this "continual, concerted meshing of individual images of self and others, of one's own activity in the context of the collective interaction [and the purpose of the organisation], that constitutes an organisation's knowledge of its theory in use" (Ibid.). This ongoing, active, cognitive process is one of individuals coming to know themselves in terms of the organisation and of the organisation defining itself and the task its sets about fulfilling. In this sense, the organisation is an artefact of individual ways of representing it. Through this process actual patterns of activity come to be described, and are physically encoded in external maps to guide future action. Some examples of external maps for theories in use include statements of procedure, process flows, on-line help systems, organograms, compensation charts, telephone directories organised by department, staff manuals, even the organisation of office space is a external expression of theory

in use. Continually reconstructed, these public maps of theory in use, are the media of organisational learning.

2.2.3 Organisational learning

Organisation learning is the testing and restructuring of theories of action (usually the theories in use). Organisations experience two types of learning. *Adaptive learning*, by far the more common, is about learning in response to an external stimulus. This could come from an independent change in some aspect of the task the organisation performs, or it could come from external changes in the socio-political or economic climate in which the organisation operates. Internal factors may also act as an impetus for learning and change, for example a new and charismatic leader, or a new computer system may be able to bring about change in theory in use. *Generative learning* occurs far less often, and is not in response to any external stimulus. This latter kind of learning is about creativity, innovation and development. It is an ideal that is much written about, and this philosophy of creativity is often represented in the espoused theory of action of an organisation. In practice, theories of action in use, which constitute the real practice of an organisation, are reactive rather than generative and therefore change only due to external impetus.

But organisations do not literally think or learn, these are metaphors. According to Argyris, "there is no organisational learning without individual learning [yet] individual learning is a necessary but insufficient condition for organisational learning" (Argyris 1978, p362). This seeming paradox is explained as follows: organisations can only learn through the experience and actions of individuals but that learning becomes collective and is encoded in organisational maps at which point it becomes "organisational learning". For organisational learning to be said to have occurred there must be communication and/or collaboration among individuals and the result of learning must be encoded in organisational maps. Individuals learn within the context of the norms of the organisation and the roles they occupy relative to its task or purpose. These roles and histories mediate the learning process in that they carry the culture of the organisation, a culture that may either favour or inhibit learning. These roles are sometimes also required to change as part of the learning process.

This research was concerned with "deep" organisational learning (or "*Double-loop learning*" according to Argyris) in which not only the theory in use needed to change, but the underlying norms and assumptions as well. This kind of situation requires the organisation to venture into unfamiliar territory where the requirements of growth and change come into conflict with the normal organisational requirements of predictability and stability (Argyris 1978, p364). This often occurs when the acquisition of new technology does not fit the organisation's familiar pattern of operation. The result is the restructuring of organisational norms, strategies and assumptions *as well as* espoused theories *and* theories in use. Normally the inquiry into organisational norms occurs at management level (Argyris 1978, p365). Later other sections of the organisation struggle to bring their norms in line with that of management, and to revise theory in use. Groupings of people may express the great stress that this produces as inter-group and inter-personal conflict (Argyris 1978, p365). For learning to occur, the conflict must be resolved through independent inquiry by individuals and sub-groupings in the organisation that result in restructuring norms and re-presenting theory in use. Circumvention of incompatible requirements and coercion through the use of power in a top-down fashion do not constitute learning. As new priorities are set in all areas of the organisation, new emphases on the task and restructuring of norms and roles takes place. When learning occurs all members of the organisation end up with a new understanding of their requirements, and the requirements of other groupings. Resources, conditions and consequences of action are understood in new ways and these become encoded in maps of the organisation indicating that organisational rather than individual learning has taken place. In this way learning occurs and new requirements become realised in the organisation (Argyris 1978, p367).

This somewhat simplified picture includes several important elements in organisational learning: individuals, the groups to which they belong, norms and assumptions, espoused theory and theory in use. In my opinion, however, it neglects the role of organisational culture and it does not take into account the way in which power is exercised in the organisation. Sometimes the conflict that manifests around organisational change has more to do with the way that power is used to bring about change than it has to do with the requirements of the change itself.

Furthermore, in large organisations, the culture of learning, or lack of it, will differ from one group to another, and from one level to another in the organisational hierarchy. This can seriously affect learning, especially when collaboration across groupings is required. Organisational learning required by the introduction of a new computer system in a university may be hampered by the fact that the system is imposed in a top-down fashion. It may also be hampered by the fact that it alters the sub-set of tasks and roles carried by more than one grouping within the university, making individual learning more stressful. In my experience, it is not unusual to encounter resistance to change and the reason for this is usually found in personal and cultural considerations of organisational members.

Lastly, some practical considerations need to be taken into account: the resources that it possesses to mediate learning influence the quality of learning that an organisation is able to achieve. I believe that the existence of, or means to grow, networks of colleagues, the ability to offer training courses and workshops, as well as the means of communication used and the means of recording learning in organisational maps all effect the degree of organisational learning in that they mediate the learning task differently.

The learning-teaching situation in an organisational context is found in the process of renegotiating theory of action in use. The following section looks more closely at this process by introducing a model for adult learning. This model works well for organisational learning and includes an examination of the task to which individuals must address themselves. The model allows one to look closely at the personal and cultural factors adults bring to situations of organisational learning, as well as at the means used to mediate between learner and task.

2.3 A model for the learning-teaching situation

2.3.1 Introduction

A model for learning and teaching, based on certain concepts developed by Vygotsky, is widely used to understand the learning-teaching situation (Craig 1989, 1993). The model identifies three elements in the learning-teaching situation; namely the learner, the task and the means to build a bridge between the two. This model grew out of the Vygotskian idea of "bridging between what the learner does know and can do independently, and what the task demands in terms of its content and form" (Craig, 1993). What the learner knows and can do independently includes both previously acquired knowledge and experience, and existing cognitive capabilities and dispositions. In any learning-teaching situation, a bridge needs to be built between what the task demands in terms of knowledge and cognitive capacities, and that knowledge and capacity that the learners bring to bear on the task. The learning task is seen as one that develops over time – it can change and it can be re-negotiated by learners. In fact, adults are more likely to re-negotiate a task than are younger individuals. Learning is therefore a process rather than a single act, and it is mediated by various agents that act either formally or informally in the organisational context. These mediators, together with the effort to learn on the part of the learner will result in him or her developing what is required to meet the demands of the task.

2.3.2 What the learner brings

The discussion below looks at two sources for what the learner brings to the learning-teaching situation. One source is endogenous to the learner, bringing cognitive capacities and other internal functions, structures, desires, dispositions and plans to bear on learning. The role of these factors is often ignored or underestimated by trainers. They are not easy to work with and require additional resources and skills that trainers often don't have. However, they need to be well understood by trainers so that teaching will mediate appropriately between learner and task. With experience, the trainer can guess at certain dispositions and plans the learner is likely to have, for example career goals are more likely to play a part for younger learners than those nearing retirement age. Those factors *exogenous* to the learner include elements from

the learner's workplace environment and socio-cultural context that have been internalised to varying degrees.

As teachers we tend to differentiate between learners in so many ways that it is important to return, if you like, to the fact that all adult minds are capable of certain levels of thought. By late adolescence, the human mind is capable of what Piaget called "logico-mathematical thought" i.e. thought that is logical, abstract and flexible, that can generate and test hypotheses about any aspect of reality, and which recognises the known reality as being part of a larger totality including the possibility of as yet unknown, even unknowable, realities (Craig 1989, p166). Two other shifts in thought during late adolescence are recognised. Firstly, adults judge knowledge on the assumption that it is context dependent i.e. it can only be understood relative to the system or context in which it is embedded. Secondly adults construct knowledge via integration and synthesis, building knowledge that encompasses antithetical perspectives (Ibid.). It is important for teachers and trainers to keep in mind that all adults have already reached this stage of cognitive development and that they all, therefore, have the potential capacity for complex tasks set before them. Piaget saw all people as possessing the ability, once a task is recognised, to meet its demands in terms of their potential cognitive ability because of the common stage of cognitive development that they had reached by adulthood (Ibid.). If one takes this view as a teacher, then all learners bring the same level of competence or capacity to the learning-teaching situation and are all capable of mastering the learning task.

There is, however, a common sense view that people perform very differently despite this common capacity. Pascual-Leone accounts for this in terms of a model that differentiates between *structural* and *functional* capacity. Structural capacity refers to the level of competence that is held consistent with the Piagetian stage of cognitive development – in adults the "Late Formal" stage. It refers to the individual's universal, biological cognitive potential (Craig 1993, p3). By contrast, functional capacity refers to the extent and ways in which structural capacity is mobilised in practice. It is the available, probably culturally determined, cognitive resource of each individual (Ibid.). There is normally a gap between structural and functional capacity during learning but any gap too large should be a concern for trainers. An overly large gap means that the learner's functional capacity has been significantly inhibited i.e. it

has not been elicited in the course of their life. This view frames the role of the teacher as one of finding ways to elicit functional capacity while minimising factors that inhibit it, and enhancing those that support learning. Some of the factors that either enhance or inhibit learning are endogenous and particular to individuals. They include individual learning style, emotionality, self-concept and life goals. Self concept and life goals are a special interest in this research as they are key motivators of adult learning. These factors are largely unconscious and are best worked with by the learner him or herself. It is easier for teachers to concentrate only on that which is manifest in the learner, but equally important to aid learning by drawing the learner's attention to that which is unconscious so that it can be controlled and worked with by the learner. Learning contracts, sometimes used with adults, are useful for getting the learner to become aware of, and to work with their unconscious learning styles, life goals and dispositions because the contracts specifically ask about these and can be used to monitor changes in these areas during learning (Saddington 1995).

Exogenous factors that limit or enhance functional capacity are a little easier for trainers to perceive. These come mostly from the workplace and social environment that the learner inhabits. She or he brings to the learning-teaching situation the beliefs and attitudes of the discourses inhabited at work, roles and modes of working, and of learning and interacting with others. If there is significant conflict between "being a learner" and existing roles this may be enough to inhibit learning despite the presence of structural capacity for the task. Although not a major concern of this study, it should also be remembered that adult learners bring cultural and class beliefs and dispositions to the learning-teaching situation. At work, many of these are complicated in that they stem from societal class roles that are modified by the position the learner occupies in the organisational hierarchy and by the kind of work that they do. Some of these exogenous factors may account for both unexpected successes and unexpected failures at learning due to the ways in which they serve to elicit or inhibit functional capacity in the learning-teaching situation.

I have made a distinction between endogenous and exogenous factors. However, in many ways this is an artificial distinction as much of what people encounter in their workplace environments becomes internalised so that it is in fact endogenous. The distinction is, however, still useful in that the degree to which an aspect of a person's

context becomes internalised varies. This will be discussed further in the section on Pascual-Leone's model of the self-structure.

2.3.3 What the task demands

It is useful to understand a task in terms of the differing demands that it makes in two aspects: form and content. Although they are inextricably linked, what the learner needs to know (*content*) is different to how that knowledge is to be used, or the medium through which it is to be used (*form*) (Craig 1993, p6). Knowing what the learner brings to the learning-teaching situation, and perceiving these separate aspects of the task, the trainer can gauge the degree of unfamiliarity of the task for the learner. Determining which aspect of a task is unfamiliar also helps the trainer decide what kinds of teaching are appropriate. For example greater unfamiliarity in the content aspect of a task needs teaching that concentrates on imparting information. By contrast, greater unfamiliarity in the form area of a task requires a concentration on cognitive skills, methods and approaches to learning by the trainer. Diagram 2 depicts the form and content aspects of a task separately and shows that a task can be familiar or unfamiliar in both or either of these aspects.

	CONTENT	
FORM	1: FAMILIAR CONTENT FAMILIAR FORM e.g. processing a purchase order for stationery on a paper form	2: UNFAMILIAR CONTENT FAMILIAR FORM e.g. reading a financial report on paper
	3: FAMILIAR CONTENT UNFAMILIAR FORM e.g. processing a purchase order for stationery on SAP R/3	4: UNFAMILIAR CONTENT UNFAMILIAR FORM e.g. running financial reports on-line on SAP R/3

Diagram 2: Categorisation of learning tasks (Craig 1993, p5).

There is some debate as to which quadrant of this diagram best facilitates learning. Arguments for unfamiliarity in one or other aspect of a task have advised that the teacher attempt to set up a task so that it falls into the most advantageous quadrant for learning. It has been pointed out that a task in which both form and content are familiar requires little change and learning. In fact it can inhibit learning because the learner is encouraged to bring all existing knowledge and capacity to the task whether

or not these are appropriate. Such a task may appear less demanding than it should do because minimal conflict is experienced by the learner due to the presence of existing knowledge and capacities. In such a case new learning becomes inhibited by this "baggage". Craig argues for "defamiliarisation" as a learning-teaching strategy (focusing on quadrant 4 of the diagram) so that it will be clear to them that learning is necessary (Craig 1993, p8). This means that for certain kinds of learner, for example under-prepared university students, learning is easier when a task is unfamiliar in both form and content because the "space" clearly exists between existing skills and those required by the task and this will alert the individual to a need for learning. This implies that the task is easier to clearly recognise when no existing "baggage" (previous experience and cognitive habits) is brought to bear. For example a typist learning to use a word processor for correspondence approaches a task in which content is familiar (she is proficient in preparing corporate letters) but form is unfamiliar (if she has never used a computer before). By contrast, a person accustomed to using a word processor for writing academic essays who must now use it to type up scientific reports (something with which he is unfamiliar) faces a task in which the content is unfamiliar but the form is not. It is generally argued that where form is unfamiliar, learning is harder. This is because form learning often calls on cognitive capacity to change, while content learning may not do this. The above examples illustrates this point: it is harder to learn to use a computer when you have been using a typewriter than it is to use a computer, with which you are already familiar, to work with new subject matter.

Some argue that unfamiliarity in both form *and* content is best of all for learning. Anita Craig states that "when both form and content are unfamiliar the situation constitutes that space, as it were, in which to teach appropriate and effective knowledge and mental operations" (Craig 1993, p7). She maintains that "defamiliarisation" i.e. actually creating a situation of unfamiliarity, is the best way to approach the learning-teaching situation particularly, for under-prepared university students.

I believe that with adult learners in the workplace one needs to take into account socio-cultural and exogenous factors that the learner brings to the learning-teaching situation when considering an unfamiliar task. Although learning would in theory be

more advantageous where both form and content are unfamiliar, if the learner resists being defamiliarised because of role derived expectations, this could undermine learning so the teaching approach needs to take this into account i.e. defamiliarisation is not always appropriate for adults. Adults need to see a task as closely related to their current work related functions and roles in order for them to apply themselves to learning. Adults often rate formal courses as inferior if they do not include exercises and examples very closely related to their work. Courses can also fall apart if adults resist learning material that they see as threatening to themselves and the way they do things (theory in use) and they may begin tackling this as an issue rather than the learning they had come to do. This example demonstrates the importance of taking cognisance of roles and expectations that the learner brings to the learning-teaching situation.

2.3.3.1 Kinds of task and levels of cognition

Another useful way of looking at a task is of seeing it as a puzzle or problem. Strohm-Kitchener distinguishes between well- and ill-structured problems and writes about different levels of cognition that are used when dealing with either kind of task (Strohm-Kitchener 1983, p224). A well-structured problem (or task) is one in which all elements necessary for a solution are knowable and known, and there is an effective procedure for solving the problem (Ibid.). Such problems have only one, final answer which is available to the learner. The job of meeting the demands of a task such as this is characterised by "applying a particular, mechanical decision making procedure to find, compute or remember the answer" (Ibid.). An example of a well-structured problem might be to learn how to process a reimbursement using a new computer system. This is a task for which there is a particular procedure to be learnt and followed in order to gain a single, desired result.

Concomitantly, ill-structured problems are the kind that are more commonly encountered by adults. An ill-structured problem is one for which there is no single, unequivocal solution that can be effectively determined by using a particular decision making procedure. For such a problem there may be more than one complementary, or conflicting solution (Strohm-Kitchener 1983, p224). The dilemma for the learner is to decide among these varied and conflicting solutions and to integrate them into a

single solution (Ibid.). This kind of mental action is consistent with logico-mathematical thought, which enables the mind to recognise a chosen reality as being part of a larger totality including the possibility of other realities. For the learner, a solution or synthesis lies in re-framing several perspectives into a general notion of the problem by synthesising diverse data and opinion, by evaluating information from imperfect data sources and by developing and arguing for a reasonable, personal solution (Strohm-Kitchener 1983, p225).

If a task like adapting to new organisational norms and a new computer system is seen broadly, both kinds of problem can be found in the task. While learning to use the computer to do something particular is an example of a well-structured problem, there are aspects of adapting to organisational change that are decidedly ill-structured. Dealing with changing job descriptions, roles, new work distributions and divisions of labour that are often inherent in organisational change are examples of ill-structured problems. In an earlier section, Argyris described how members of an organisation re-negotiate theory of action in use, which entails each members of the organisation constructing "their own picture of the whole" and "striving continuously to complete the picture and to understand themselves in the context of the organisation" by testing and modifying their mental "map" of it. This "continual, concerted meshing of individual images of self and others, of one's own activity in the context of the collective" describes the kinds of ill-structured problem solving with which Strohm-Kitchener is concerned. Organisational change is an ill-structured problem because it can be viewed (solved) in diverse and conflicting ways. There is no single, clear solution for staff of a changing organisation to approach the problem. Espoused theory of the organisation may offer an ideal solution but actual solutions, in terms of theory of action in use, will vary. The solving of ill-structured problems is very demanding on cognitive structures and results in much stress at both organisational and individual levels.

Strohm-Kitchener developed a 3 level model for the way in which people process ill-structured problems. The levels refer to levels of thought all of which are present by early adulthood, are consistent with logico-mathematical thought, and remain active throughout life. See Diagram 3 below.

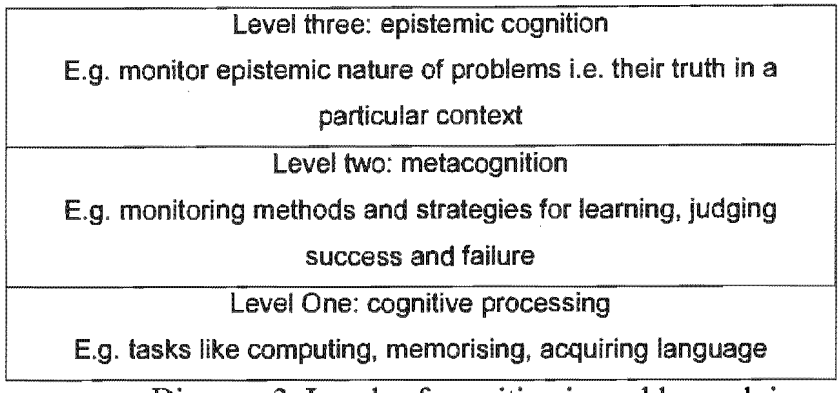

Diagram 3: Levels of cognition in problem solving (adapted from Strohm-Kitchener 1983)

The lower levels of cognition in the model provide a foundation for the levels above, but all work together. At the first level of cognition, individuals enter into cognitive tasks like computing, memorising, reading, perceiving and acquiring language (or "lingo") (Strohm-Kitchener 1983, p225). The second level, *metacognition*, involves processes that are invoked to monitor cognitive processing itself. It therefore involves knowledge about metacognitive tasks like *how* to memorise something, about *strategies* that may be invoked to solve the task, about *when* and *how* to apply these strategies and about the *success* or *failure* of these strategies (Strohm-Kitchener 1983, p225). The third level, *epistemic cognition*, refers to the processes invoked by the individual to monitor the epistemic nature of problems and the "truth value" of solutions according to a particular epistemology. It therefore includes the individual's knowledge about the limits of knowing, about the criteria for and validity of certain solutions to a problem within a particular context (Strohm-Kitchener 1983, p225). This level of cognition interprets the nature of a problem and determines the strategies that can be employed to solve it. At the epistemic level, the adult normally accepts that there are many possible solutions to the problem of change, some may even have been presented to the learner by the organisation in the form of espoused theory of action in its effort to "sell" change to its employees. The adult will be aware that their own knowing is influenced by their frame of reference within the organisation and by available reasoning and data, which may be fallible. As long as various possibilities for solution are acknowledged, the individual can synthesise possibilities and contradictions and can construct their own solution to the problem of change. Metacognitive processes follow from assumptions made at the epistemic level; they monitor strategies as they are put into practice for dealing with the problem.

A person approaching the task of adapting to changing norms and new technology at work will use epistemic cognition to evaluate the problem within the workplace context. The workplace context has its own epistemology (or culture) and values certain kinds of knowledge and action. It is activity at the level of epistemic cognition that largely determines the ability of individuals to deal with cultural change in the workplace. This activity requires that they take cognisance of a new value system and modify their own values as members of the organisation. Learning specific tasks and acquiring basic information are dealt with at the first level of cognition. When technology changes in the workplace, well-structured tasks are dealt with by gathering information, memorising and learning procedures for working with new technology. At the same time individuals tackle the less well-structured aspects of change on the two higher levels: At first, important epistemic questions like "Is the problem of change solvable?" and "If so, what would be a valid way of solving it in this context?" will be asked. The "best" strategies for embracing change will be individually chosen. Trainers of computer technology will be aware that well-structured tasks, because they are more accessible and simpler to solve, often become a vehicle for the expression of distress caused by dealing with related ill-structured problems. The dialectic process of exploring the possibilities for solution and trying them out could continue for some time. In addition to this, the workplace context means that people are required to find solutions *as groups*, and that conceiving and strategising around the problem may be shared, even formalised activities for example in working groups and committees. In ensembles such as these, individuals struggle for their own solutions, while testing them for validity against those of others.

2.3.3.2 Reflections on the task

Our analysis of a task is incomplete without also understanding that there are two dimensions to the way in which tasks make demands on learners. The first deals with emphatic demand, that is the primary things that are required of the learner in order that she can master the task. Usually, as soon as knowledge and cognitive capacity are acquired, the need to learn disappears. But learning can, and sometimes does, continue. This leads me to the second dimension, which deals with knowledge and capacities that the task *suggests* to the learner. These are not required aspects of the

task but components of it that are available to the learner and are probably "worthwhile" pursuing. In common sense terms this dimension of a task is often regarded as optional. These components of a task, in formal learning events, are often presented as "advanced" and follow on basic training. Some have used the term "education" as opposed to "training" to indicate that learning should encompass a general and deep understanding of a problem rather than be designed for coping only with the immediate needs of learners. The difference is also expressed as learning on the "high road" (broad and continuing education) versus learning on the "the low-road" (meeting needs). While many adult educators aim to get learners to go beyond the demands of the task, and aim for the "high road". They often do not realise that something other than overcoming a need to bring skills and abilities in line with a new task must drive the learner into this dimension. I believe that when a learner goes beyond the demands of the task this is due to personal dispositions and life goals brought by the learner to the learning-teaching situation. The ways in which these factors drive an individual will be examined in more detail in the section on the self-structure.

2.3.4 Building the bridge

Vygotsky called the space between the learner and task the "zone of proximal development" (Craig 1993, p170). It is in this space that a bridge must be built, by the learner and by other mediators that operate either formally or informally to bridge between learner and task. This dialectic relationship is depicted in Diagram 4.

This diagram shows how the task is *negotiated* in that there are two different understandings of it – that of the learner and that of the teacher, or the organisation. When the learning-teaching situation is set up on a large scale, for example when implementing a computer system, the bridging process may take several years and be one in which the task and the learners are constantly developing and adjusting. Across the broad field of learners in a changing organisation, the components of the task differ according to the exact aspects of the computer system that need to be mastered by each individual. The task also differs according to the job description, workplace role and location of the learner in the organisational hierarchy. The demands of the task, if not the task itself, differ from one learner to another because of the varied resources that each learner brings to bear in the learning-teaching situation. In this view the nature of the "bridge" is determined individually because learning resources and requirements experienced by each person are unique.

2.3.4.1Mediators of learning

Bridging is a process of building the capabilities of the learner towards those required to master a task. This is achieved through the agency of mediators that operate either formally or informally. Formal agents in the organisation may be teachers whose official function is be mediate learning through training courses. Adults also learn from organisational documentation such as mission statements, statements of vision and written procedures for carrying out tasks. Anything that the organisation sets up in an official way is seen as a formal mediator of learning. Informal mediators tend to be less concrete in terms of the organisational structure and are more individual and contextually based. Adults learn informally from colleagues in their departments and from their own notes or those of colleagues. Formal and informal agents of learning work together to build a bridge between learner and task. Often learning is "kicked off" by formal agents and carried forward to be consolidated informally, sometimes over a long period of time. It often seems as if most learning takes place informally, but it should be remembered that in an organisation, informal learning is always given its limits by formal agents. Learning in the workplace may several times involve formal mediation where retraining, refreshers and updates are provided. In Addition informal learning in the organisation is always given limits by rules and norms of the organisation. For example adults may attend a course to tell them how to go about

conducting a performance appraisal. Informally, from colleagues and through conducting the appraisal, they will consolidate and expand their learning. They would, however, still be able to refer to the guidelines given in the original training and in policy statements of the organisation and would not be able to venture outside of the system of rules set up by such agents.

How does the learner know when learning is complete i.e. when the bridge has been built? This is the moment when the skills and abilities of the learner are sufficient for performing the task. Theories of adult cognition are useful for understanding how adults recognise a task as something that requires them to learn in particular Piaget's theory of equilibration is useful for understanding the "moment" when learning, relative to a particular task, is complete. These are presented in the next section.

2.4 Adult cognition and learning

2.4.1 Introduction

I have examined the adult learning model, which sets up three aspects of the learning-teaching situation: the learner, the task and the necessity for a bridge to built between the two. However, in order to better understand the learner and the bridging process, it is necessary to explore theories of adult cognition. These help to explain exactly how learning takes place, how previous experience plays a part in learning, how roles and discourse influence learning and how the process is motivated by individual notions of the self. Theories of adult cognition help to "ground" the learning model, in a sense they underpin the learning model with a causal explanation for the phenomena it describes. The following sections introduce important concepts developed by Piaget, such as the way in which knowledge is stored in mental schema and the mechanism of equilibration which is so important for understanding learning. Pascual-Leone's causal modelling for mental functioning is used to explain how learning occurs. His explanation of the self-structure is especially useful for understanding the influence of workplace roles and life goals, which, together with the will, are so central to motivation in adults.

2.4.2 Piagetian notions of adult cognition

Piaget introduced the notion of schemes to account for the way in which the objective world becomes "known" to individuals. He developed the idea that pieces of sensory experience are organised into schemes that come to represent things in the world (Fabricius 1983, p333). These kinds of schemes are called content schemes; for example an adult working in a computerised environment will have a scheme for "computer". Operative, sensory-motor schemes can also be included within this collective; for example the adult will have a scheme for "switch on the computer". Pascual-Leone calls the type of learning that results in retention of knowledge in content schemes, "Content Learning" (Pascual-Leone 1995, p339). Another kind of scheme, for the structure of knowledge, is made up of temporal, spatial and causal information and thus stores knowledge about how an object works, and under what conditions. An example of a causal scheme would be "pressing the Enter button on a computer keyboard will cause the computer to do something".

Over time schemes for the structure of knowledge i.e. causal information is incorporated through habit with the scheme for the object itself. Thus content, operative and structural schemes, though habit and association, are abstracted into a single *set* of schemes that enable a person to operate in his or her environment. The ability to work with a computer is enabled by a set of schemes for the object, how to interact with it physically, causal knowledge about its use, and knowledge at further levels of abstraction that relate the use of this object in society and the workplace.

Piaget used the notion of conflict to explain the cognitive *demand* that a task presents to the learner. The recognition on the part of the learner that he or she does not have the knowledge or capacity to meet the demands of a task is experienced as cognitive conflict. In order to understand how cognitive conflict is resolved, Piaget introduced the concept of *equilibration*. This notion is very important for learning and development. It was seen to be the single endogenous driver for development and is understood as follows. When mental conflict is experienced, usually between some exogenous stimulus and endogenous schemes, structures and capacities. A person attempts to eliminate the state of conflict either by avoiding (it in any of several ways), or by adapting and changing existing resources and schemes to deal with the

new stimulus and thereby return to a state of balance - or equilibrium. The impetus to maintain equilibration is a mechanism of change and of learning.

Pascual-Leone states that in praxis, schema interact with a range of constraints both endogenous and exogenous. Among endogenous "constraints" are emotional arousal, mental attentional capacity and bodily circumstances. Exogenous constraints on development and learning include all socio-cultural circumstances and other physical aspects of the environment (Pascual-Leone 1995, p339).

Piaget described how developmental stages exhibit periods of fast change followed by plateaux because of the way in which the brain grows. Plateaux periods in development are akin to stages of equilibration, although equilibration is now also applied to "smaller moments" of learning and change. To take a simple example further, think of the adult with the causal scheme: "pressing Enter on the keyboard will cause the computer to do something." If a new computer system is encountered, where pressing Enter does not cause the computer to do something, or causes the computer to do something unexpected, then the adult will experience a conflict between the existing scheme, and the stimulus received from the environment. The adult will be compelled to reach equilibrium, and thus eliminate the conflict. They may do this, for example, by amending their existing scheme (i.e. learning), or avoiding the computer (i.e. not learning). When a person encounters new technology in a workplace environment a state of disequilibrium will come about because existing schemes and structures will not be adequate to deal with the new external stimuli in the form of unfamiliar technology. To restore cognitive equilibrium, ideally the person will mentally act upon the problem, sometimes with assistance, to lay down new- or to change existing schema so that he or she is able to cope with the new technology. When new and modified schema (and sets of schemes) are once again able to meet the demands of the new technology then equilibrium will have been achieved i.e. the process of bridging between learner and task will be complete.

Brain plasticity allows developmental growth i.e. it allows schema to change; the brain is most plastic until the capacity for logico-mathematical thought is attained at around age twenty. As the brain continues to mature it becomes less plastic. Further cognitive growth and ability becomes increasingly difficult with age. Maintaining

equilibrium, which often requires new learning, means constantly changing and updating schema, which is stressful for adults, who typically have elaborate scheme structures due to a lifetime's experience. Learning often means unbundling a set of schema that have become associated with experience, reworking them and, through new experience, rebundling them. With increasing age these scheme sets become less "plastic". This model offers a simple, if crude, explanation for why some adults, in particular older adults, find it difficult to adapt to new computer technology and organisational change. In general, the older the adult, the harder it is for him or her to change existing knowledge and ways of doing things.

The powerful notions of schema and of equilibration, developed by Piaget, are still current, but are limited by the epistemological context of individualism and linearity in which they were developed. They tend to be descriptive rather than explain how the mind actually works. Neo-Piagetians, through micro-developmental analysis, have given scholars many additional tools with which to study cognitive functioning, human development and change. Pascual-Leone has developed a theory of constructive dialectics (discussed below) which explains *how* the mind develops through the various stages described by Piaget. He also elaborates extensively on the notion of schemes and of how they function. Pascual-Leone was particularly concerned with extending the model so that it could explain how adults are able to learn and change.

2.4.3.1 Pascual-Leone: A causal model of adult cognition

Pascual-Leone expanded on the concept of schema in order to advance a causal model of development, which went beyond relying on the notion of equilibration to explain learning and change. He wanted to explain the creative ability of people to bring about novel performance (something not done before and thus learning). To do this Pascual-Leone worked on a model for two higher orders of schema: Figurative and Executive schemes.

He explains, like Piaget, that figurative schemes are abstractions of content schemes that result from habitual use. Figurative schemes often incorporate causal information, and produce new schemes that help us to generalise our experience. The dialectical

nature of this process of abstraction resides in the way that abstractions are revised by experience, and in the way that successive levels of abstraction can be built on preceding ones, as these too become habitual. The increasing abstraction of sets of schemes results in a spiral of intellectual growth that is learning.

The second additional level of schemes, which Pascual-Leone developed a model for, are called Executive schemes. Although these schemes incorporate experience, their main function is to apply and co-ordinate other schemes in practice. Pascual-Leone states that human performance is "executive-driven" (Pascual-Leone 1995, p340). He adds that it is through the dialectic operation of executive schemes that change, and novel human performance is possible. The operation of executive schemes is thus very important for adaptation. To explain how executive schemes are able to appropriately apply a set of schemes, and how they are able to bring about change by applying new sets of schemes, Pascual-Leone needed to introduce a model for certain innate (or silent) "hardware operators" in the brain. The executive schemes work with these. These are the mechanisms by which schema are applied and will not be discussed here in detail except to say that they act on available schemes in three ways. Firstly to boost appropriate ones, secondly to suppress inappropriate ones, and thirdly to draw all appropriate schemes into one whole that enables the individual to act appropriately in their environment. Where action is required to be novel (i.e. new) then it is the action of Executive Schemes that co-ordinates existing schemes and new knowledge in new ways. Performance is thus synthesised from the cluster of existing schemes at any one time through the action of executive schemes that control them by mobilising hardware operators in the brain. In this way people are able to respond to their environments appropriately and in new ways. This is an ongoing process and is influenced by exogenous constraints called, by Pascual-Leone, "reality resistances". The construction of reality and performance occurs through the human capacity to use and re-use patterns of schema that are co-activated and are influenced continually by external stimuli (Pascual-Leone 1995, p341). Re-presentation of schemes is perpetuated through action and reflective abstraction and it is through this process that growth and learning occurs. So when a person encounters a new computer terminal all existing schemes are available to interpret the situation. Executive schemes initially sort out some appropriate ones and the person begins, perhaps by sitting down, switching on, and looking at the log in screen. By this time there will be feedback and

executive schemes will boost and suppress other schema accordingly. Performance could continue perhaps by the person attempting to log in a way that is familiar from another system, and so on. If no schema apply, learning may occur. If a mediator is present in the form of a manual, or an expert computer user this mediator may act to assist learning.

Pascual-Leone differentiates between learning that results in either Operative/Procedural or Figurative/Declarative schemes. Operative/Procedural schemes result from learning about "local transformations" (i.e. small physical changes), procedures, performance and simple data (Pascual-Leone 1995, p341). These schemes would serve Strohm-Kitchener's well-structured problem. Figurative/Declarative schemes are for mental states, idealised states narratives and "scripts" (Pascual-Leone 1995, p341). As such they would serve Strohm-Kitchener's ill-structured problems, those that store, for example, narratives about the organisation's epistemology. Pascual-Leone classifies executive schemes as Figurative/Declarative. The self-concept is also an example of a Figurative/ Declarative scheme. Workplace roles and narratives of the self at work are also examples of Figurative/Declarative schemes.

Pascual-Leone differentiates between two kinds of learning. In the first, sets of separate schemes in which sign, referent, meaning and context are carried by different schemes that are simultaneously activated and co-ordinated (Pascual-Leone 1995, p343). This is a controlled process in which executive schemes are required to activate all the schemes at once. When something is first learnt, bits of information are held in separate schemes. Each scheme may be altered through executive activity during the learning phase. With habitual use the schemes stabilise, and the activation of a set of related schemes becomes more and more automated, requiring less and less mental effort and less intervention by executive schemes. Finally the set of separate schemes becomes abstracted into a single scheme (Pascual-Leone 1995, p343). This abstraction is therefore an activity in which the meaning and the object are fixed together because the separate schemes for each of these have been abstracted into one. If contextual variation was found during the earlier learning phases, then separate scheme sets would have formed, each for a different context (Pascual-Leone 1995, p343). These two kinds of learning therefore represent different *phases* in learning.

This can be illustrated by thinking of a person learning to drive. When the task is very new there are many small bits of information (schemes) that have to be co-ordinated. Separate schemes are needed when, for example, turning a corner: push the clutch pedal, change gear, indicate, brake, turn the steering wheel etc. By the time the person has become a "skilled driver" he or she has moved on and these separate actions have become automated in one scheme for turning a corner. The same applies to learning how to perform a task using a new computer system. For example, capturing the details of a purchase order on SAP R/3 is made up of many small actions and items of knowledge, each field that needs to be filled in, each function that can be performed are separate bits of knowledge when they are first learned. When the task has been mastered, the separate schemes are automated into one. Recall and application of automated schemes is easy for the individual and executive schemes are not required to work very hard. Less mental energy is used and less stress experienced. Schemes will therefore always tend to be automated in sets.

Previous experience (existing schema) need to be taken into account in learning. A learning situation is commonly thought of as one in which something new is encountered. In fact, because of the strong impetus to maintain a state of equilibrium, and because of the fact that so many existing schemes could potentially apply, people will always tend to perceive the familiar in a situation. Thus existing scheme sets which have been abstracted through habitual use will always tend to "rush forward" to be applied. It is more "comfortable" for a person to regard a situation as familiar and have existing schema apply, so unless the person is somehow alerted, or unless the situation differs radically from ones previously encountered, learning may not take place. This is the reasoning behinds arguments for de-familiarisation. Since learning always requires a rearrangement of existing schema, which is not comfortable, it will be avoided. However this needs to be balanced against the drive to maintain equilibration. The action of executive schemes, which are responsible for rearranging existing schemes (and thus previous experience), needs to be stimulated for learning to take place. The more existing schema are required to change or be rearranged, the more mental energy needs to be applied. Again, this is the reasoning behind the popular notion that it is easier to learn something totally new, than to change or replace something already known. Where learning does occur, executive schemes will

be required to work harder to boost and suppress aspects of previous experience, possibly combining schema in new ways so that novel performance is the result.

2.4.3.2 The self structure

Pascual-Leone developed a functional model for a person's notion of self i.e. the self-structure. This structure is the centre of figurative self-referential schemes that interact dynamically with each other and with executive schemes to strongly influence the behaviour of individuals. The self-structure is the source of many emotional functions and, in its totality, gives rise to personality and subjective experience (Pascual-Leone 1996, p9).

Diagram 5: A model of the self Structure (Pascual-Leone, 1996)

Pascual-Leone drew on the work of Piaget, Jasper, Kierkegard and James in developing his model for the self. His rationale for the overall "steering" function of the self-structure hinges on the function of the will – an essential aspect of the self-structure and one that mobilises motivation in adults. The self is also the location of schemes for life plans and goals and the will is the mechanism necessary to bring these to bear in life. The will acts through cognitive choice-making between an idea (in the form of schemes for life goals and plans) and experience and habits (in the

form of automated schemes for praxis) which are cued by the situation a person finds herself in (Pascual-Leone 1996, p9). Resulting performance is often a dynamic synthesis, influenced by both of these categories of schema. It is clear that the will, arising from a strong self-structure, is an agent of change. Pascual-Leone states that the will is "self aware", meaning that it is present as conscious attention applied during praxis. Specifically, it is the driving force behind executive schemes that organise new and existing schemes. He quotes Kierkegard who wrote, "The more will, the more self" (Pascual-Leone 1996, p8). The action of the will is thus essential in learning. The educator should be aware, however, that the will springs from the self structure and that its strength, as well as the directions in which it applied, depend wholly on the "content" of schema in the self structure. It is mainly towards furthering life goals that the will is activated, and it follows that if life goals are not found in a learning situation, the learner will experience limited drive for learning and the learning task may be difficult to master as a result.

The self, according to Pascual-Leone, has two categories, each with their own repertoire of schemes that dynamically interact. These are the Ego-Core and the Ego-Milieu (Pascual-Leone, p10). The Ego-Core represents the actual or "true" self derived from endogenous cognitive experience and self-synthesis (Ibid.). The Ego-Milieu represents aspects of the self that are received from circumstances in the physical and interpersonal world. It represents interdictions and prescription of others, and socio-culturally received notions of the self (Ibid.). The dynamic interaction between these categories of the self constitutes reality for the person. According to Pascual-Leone, this is essentially a two part reality made up of an inward looking, cognitively experienced, world and an outward-looking, inter-subjective world (Ibid.). Pascual-Leone promotes the idea that the Ego-Core is primary in that the self needs to be relatively permanent across varying situations and thereby constitute a working self-identity in order for a person to be self-directed in life (Ibid.). Received notions of the self are originally located in the Ego-Milieu, and direct performance from there. When influenced mainly by schema in the Ego-Milieu, a person is not self-directed. This happens with young, developing people and with people who have weak self-structures, or who have experienced less than optimal circumstances during development. Ideally, schema received in the Ego-Milieu, are integrated in the Ego-Core through reflection and constructive abstraction with other schemes of the core, at

which time they become part of the true self (Pascual-Leone 1996, p11). Pascual-Leone implies that the self-direction which comes from the Ego-Core area is "better" than that which comes from the Ego-Milieu area as the former is tied to life goals and plans, and receives greater support from the functions of the will. Again the implications for educators are that self-directed learning must be tied to life goals and plans. This implies that a working adult will not simply fulfil expectations of the organisation unless these are also integrated in the ego-core. Socio-culturally received goals are not closely tied to the will function because of their location in the Ego-Milieu, and are therefore not likely to motivate learning and retention as well as goals in the Ego-Core.

When looking at people in workplaces who are learning to adapt to new computer technology, the above arguments lead to the conclusion that unless the adaptation is tied to individual, personal life goals, learning will be difficult, and even unsuccessful. This is because the mechanism of the will is not behind it, providing the adult with motivation for learning. It is important to realise that motivating learning through promoting institutional goals, or through demanding it in terms of institutional roles will have only limited success as these are both represented in the Ego-Milieu. There is, however, little the trainer can do at the level of individual self-motivation, as a lack of resources make it difficult to access the life goals and plans of each person in a large organisation. Instead ways need to be found to encourage people to see the task and their learning in terms of their own life goals, whatever these may be.

The use of emotions in the learning-teaching situation, for example through the use of humour, has often been promoted in everyday training situations; its function in eliciting the will is also better understood using Pascual-Leone's model of the self. Although it has not been explored in detail, the interaction between individuals and groups of individuals is also better understood via the self-structure and the model of the ego-milieu. The importance of other individuals and rule based environments for individuals helps the researcher to understand the preference for human contact while learning, and to understand the necessity for intergroup engagement in organisational learning.

Complex executive schemes co-ordinate and mediate between Ego-Core and Ego-Milieu. Some of these embody the relational aspects of objects, persons and situations and abstract functional totalities of the life-world and Core structures (Pascual-Leone 1996, p12). These kinds of schemes were first written about as "collectives" by Piaget (Ibid.). Pascual-Leone understands relational schemes as those that regulate exchanges among a person and others, with regard to objects in a particular context and its modifying circumstances (Pascual-Leone 1997, p90). Relational schemes therefore represent groups of people by means of inter-subjective roles and exchange formulas and social scripts which members of a group play out in relation to each other (Pascual-Leone 1996, p12).

2.5 Role and discourse

It makes sense that role and discourse theory follows on a discussion of the self-structure because it is this structure that is the source of role and discourse. In the self structure, roles come from narratives in the ego-core or the ego-milieu when they are received from the person's environment and are required for interacting with others in particular situations. Just as there are many discourses, so individuals have many relational schemes to deal with social situations in which they are needed. In an institution as large as the University of Cape Town, there are many discourses and staff play many roles within these. They may also operate to varying degrees of competence in more than one of them. The notion of "role" should be understood within this theoretical context as the totality of acting according to socio-cultural rules within the workplace context. These beliefs and attitudes, modes of working and of learning and interacting with others are brought to the learning-teaching situation and influence how the person takes to the activity of learning as well as to the content of learning.

Pascual-Leone's model of relational schemes compares well with discourse theory. James Gee defines discourse as "a socially accepted association among ways of using language, of thinking, feeling, believing, valuing, and of acting that can be used to identify a person as a member of a socially meaningful group or 'social network' and to signify that one is playing a socially meaningful role" (Gee 1990, p143). The

relational scheme that regulates exchange within a particular discourse results in social practice that is recognised by others who hold similar schemes, making membership of the discourse possible. Doing the right thing, in the right time and place is what inter-subjectivity is about. Of the range of roles available to adults, not all are of equal importance, or are not occupied all the time. Gee recognises the fact that there is a difference between primary and secondary discourses, the former being occupied more often and more likely to be internalised in the Ego-Core or "true-self", both having been received through the Ego-Milieu. Generally, discourses, which have become integrated in the Ego-Core, are so-called primary discourses; those learned through acquisition in the earlier stages of life.

Paralleling Pascual-Leone, Gee states that discourses are always embedded in a medley of social institutions, and they often involve props in the form of objects, physical spaces and locations, tools and technologies (Gee 1990, p143). As members of workplace discourses, adults are required to interact with any new object that enters their discourse. In workplace discourses, this is especially important with regard to computer technology, as it is central to the performance of work. Computer technology is no insignificant object in workplace discourse and is often changing. Learning to use a new object such as a computer system within a discourse is, according to Gee, essential to maintaining membership of that discourse. It follows that the inability to learn to use the object requires renegotiating membership of the discourse, perhaps changing the role one plays in the discourse, perhaps abandoning membership altogether. The relational schema that inform performance as a member of a discourse are required to change when something new enters the work environment. Because these schema are located in the self-structure, it is this structure that is required to change. This underscores the involvement of other aspects of the self in learning new discursive behaviour (such as self-identity) and explains the often very emotional, personal reactions encountered by trainers when implementing new technologies.

In a "double-loop" learning process roles are an important element of learning in two respects: they are both an object of learning and an endogenous factor that adults bring to learning. These roles and discourses can either be stable or changing when they are brought to the learning-teaching situation and this will also effect learning.

Adults need to relate their learning to who they are and what they do, and if this is changing, it is harder for them to learn by "hooking" new information and skills onto an unstable understanding of themselves. It is important for trainers to take cognisance of changing roles because learning to use new computer functionality can be hampered by concurrently learning new roles.

Adults occupy more than one role. Focussing only on their working role in this analysis would render it two-dimensional and incomplete. It is not only the specific working roles that adults bring to learning, but also, among others, the fundamental role of "adult" itself. From a cognitive point of view, learning may be the same for all adults (those aged about 17 and older) but in practice we know that learning is approached differently by school children, university students, working adults, or retired people. This can be explained to a limited extent by brain physiology and functional capacity, but role and discourse theory offers us a much better tool for understanding these differences. Adult learners in the workplace can be distinguished from younger learners occupying the role of full time student, by the fact that they expect the content aspect of tasks, in particular, to be as familiar as possible. This is because adults are accustomed to "being knowledgeable" - many adult roles require it - and are used to relying on their own knowledge and experience. They tend to be very intolerant of diversions from this because they need to be able to bring previous knowledge and experience to bear, or risk feeling insecure and experiencing conflict with their role as adult.

The learning-teaching situation has its own discourse in which it requires that members occupy a certain role – that of learner. The role of learner will interact with the roles and discourses brought to the learning-teaching situation. If there is significant conflict between "being a learner" and existing roles such as "being an adult" this may be enough to inhibit learning despite the presence of structural cognitive capacity for the task. It is helpful to remember Gee's point that there are primary and secondary roles for adults. The role of learner is occupied temporarily in the learning teaching situation and is thus a secondary one. That of learner is in fact a secondary role in two senses. It is secondary in a working situation because the role that is required by a person's core task is primary. It is also a secondary role for most

adults over the age of 25 who are required by virtue of their age and place in society to be knowledgeable, wise and experienced rather than ignorant and maturing.

The fact that adults enter the role of learner as a secondary one explains the strong impetus to have work related learning under their belts as soon as possible. Adults in the workplace are intolerant of being in a process of learning for too long, as the role conflict is stressful for them. If this succeeds the adult has shown that they are the masters of their work i.e. they have successfully demonstrated membership of their primary discourse. Where the opposite occurs, the adult has shown that they do not fully possess membership of their primary discourse and may become emotional and frustrated as a result. Formal learning-teaching situations often incorporate tests and exercises that show up a lack of knowledge (and membership of a discourse) more so than do informal ones that take place in normal working environments. Although there could be many reasons for the kind of learning behaviour I have described, including age difference and self-esteem, the presence of role conflict in this behaviour is undeniable. The rush to acquire skills at the expense of learning well is mediated only by the adult's access to other roles in which they play learner such as being a part time student or researcher. For working adults, being good at their work rather than being good learners remains the primary goal in work related learning.

2.6 Conclusion

The research theory began with a model for organisational change and learning which contextualised adult workplace learning in the organisation. The theory identifies theory in use as the main site of organisational learning and organisational maps as the media through which organisational learning is made concrete. The adult learning model described the learning-teaching situation by identifying the learner, the task and various mediators, both formal and informal, that help to bridge between the two. Two different kinds of task, or problem were identified, namely well- and ill-structured ones. These different problems draw on different levels of cognition to resolve them. Theories of adult cognition were used to explain exactly how learning takes place, specifically how previously acquired knowledge, roles, dispositions and plans that adults bring to the learning-teaching situation influence learning and the

motivation to learn. A discussion of the self-structure led to an examination of role and discourse as both an object of learning and a factor that adults bring to the learning-teaching situation.

Chapter 3: Research Methodology: Theory and Practice

3.1 Introduction

The research was conducted using a qualitative approach in a case study framework. The qualitative paradigm was felt to be best suited to the nature of the study, being a holistic picture of an actual situation where adult learning took place. It was decided not to use any quantitative methods apart from counting occurrences of categories of answer, as the selection was too small to be used as a statistical sample.

In the first part of this chapter I describe the history of qualitative research methodology and go on to define the approach. I describe case study research methods and go on to explain some of the methods commonly employed in qualitative research with an emphasis on the interview. In the second part of the chapter I explain how the research method was put into practice, describing how the interview questions were compiled, and how the interviewees were solicited. Important issues, including interviewer and environment effects, are discussed. Finally I describe how I went about coding the data gathered in interviews.

3.2 Qualitative research theory

3.2.1 History of qualitative research and contrast with quantitative methods

Qualitative research has gained acceptance since the 1960's and is now commonly used in the social sciences. Originally regarded as a minor methodology relative to statistical analysis, it has gained increasing acceptance (Silverman 1993, p20). Previously, a positivist view was taken of social reality and statistical analysis formed the bedrock of research, quantitative methods being the main ones used to analyse data (Mouton 1996, p166). The positivist approach looks at social structures and facts and tests for correlations between variables by quantifying the data. By contrast, the interpretive school looks at social constructions and social meaning and gathers data by observation, description (Silverman 1993, p21). By the 1980's interpretive notions such as "immersion", "description" and "exploration" had become more accepted -

even in traditionally positivist disciplines (Silverman 1993, p20). This move away from purely quantitative research methods began in the 1950's and centred on the arguments that certain features lacking in quantitative research seriously undermined it. Firstly, the lack of a theoretical base, secondly the lack of an understanding of the variables under study *from the point of view of the people being studied*, and thirdly the fact that mathematical logic ignores the common sense assumptions made by both researcher and subject in forming conclusions (Ibid.). This is not to say that the positivist school is no longer used in social studies - it is still very prevalent, but is now qualified by an understanding brought by the growth of the qualitative paradigm. In practice both approaches are often combined and many theorists argue that constructing these schools of thought as opposites, and choosing sides as a researcher, is a fruitless exercise. It is more important that the research project retains internal logic and coherence and does not use conflicting methodologies (Silverman 1993, p22).

3.2.2 Defining qualitative research

Qualitative research attempts to reach an understanding of society in terms of people's *own* definition of it. The researcher works with naturally occurring data and settings and attempts to learn first hand about people and cultures (Silverman 1993, p24). According to Mouton (1996, p130) the approach takes an insider rather than an outsider perspective and the researcher collects behavioural data through "entering the world of the subject". The aim of this type of research is to reconstruct the internal significance of structures and the self-understanding of individuals, to *understand* a particular social context rather than *explain* it. To do this the researcher must stay true to the internal logic of the world of the subject and pay attention to the concepts and language that they use to understand themselves. Thus the aim is to retain the internal coherence and meaning of the social phenomenon under study and to produce contextually valid accounts (Mouton 1996, p168). According to Silverman, many versions (some problematic) of qualitative research have been put forward during the last two to three decades. He draws up some common themes in qualitative research from definitions made at various times by Bryman, Hammersley and Atkinson:

- Seeing through the eyes of the subject, or taking the subject's perspective;
- Using naturally occurring everyday contexts or settings rather than experimental ones and thereby understanding actions in their social context, and being concerned with the meaning and function of social action rather than behaviour per se;
- Emphasising micro processes and detail;
- Emphasising time and process;
- Using a range of data sources, favouring methods such as observation and using quantitative methods in a limited way only and;
- Favouring open and unstructured research designs and inductive reasoning.

(Silverman 1993, p24-29)

In summary, qualitative research looks at variables very broadly, attempting to find their meaning and functioning in a particular social reality, and conducts data gathering in a flexible way. In many cases the research theory is only developed in the course of carrying out the research (Silverman 1993, p27-8). According to Mouton (1996, p130), "indicators" in the data (often called "variables" or "criteria" in quantitative research) are derived from the subject's world of meaning, actions or discourse and are not imposed by the researcher. The validity of qualitative research comes from it being rooted firmly in the world of the subject. Authenticity of the research is measured in terms of its "rootedness" in the world of the subject and is valued over and above issues like reliability and sample selection, the latter being important in quantitative research (Ibid.). Thus "thickness" (or richness) of the data is valued more than representivity.

Qualitative research is particularly useful for finding out about the "inner state" of individuals (Seale 1998, p202). Inner states include both attitudes and mental functioning which are "opaque to direct observation" (Craig 1988, p4). This means that one must use the "products of thinking" to reconstruct what occurs "hidden behind the facial façade of the thinking subject" (Ibid.). Qualitative research methods are best used to bring these to light. Uncovering the state of mind of the subject, in addition to, and sometimes in preference to, the factual information the subject conveys to the researcher is an important aim of qualitative research (Seale 1998,

p203). With this in mind, the interaction between the researcher and the subject, including body language and things *not* said, can be viewed as an object of study in its own right and a part of the data (Seale, 1998, 204). It is well that the researcher keep this perspective in mind because what people say and don't say in an interview is influenced by any number of individual and social "effects" that play themselves out on a cognitive level. The interview should not be seen as a vehicle for the simple conveyance of facts about the social world as the realist school sees it (Seale 1998, p203). These are important issues for researchers working in the qualitative paradigm. However, within this paradigm, these issues are not framed negatively but are regarded as rich resources, as essential parts of the data.

Mouton refines our understanding of the purposes of qualitative research by outlining four levels of analysis that can be explored using qualitative data; these take successively broader views on subjective experience. The researcher starts locally by focussing on the way in which the individual constructs meaning from the environment and by exploring "ways in which the self renders its environment socially significant, is transformed by this and construes the environment anew" (Mouton 1996, p167). The next level of analysis focuses on the way in which constructed meaning is constantly negotiated, and redefines reality. At a broader level the researcher looks at how social worlds - or discourses - interact with and influence each other "making new constellations of meaning possible" (Ibid.). Finally the researcher can go to the broadest level and take a look at the "relationships between such worlds and the larger, overriding symbolism that lends coherence to society" (Mouton 1996, p168). However, as the subjective experience of individuals remains the primary source of data where interview methodology has been used, the broader levels can only be inferred from this data where possible. This demonstrates how inductive reasoning in qualitative research can be put into practice.

Mouton focuses on three fundamental aspects of social life that cannot afford to be ignored and can be brought out by qualitative research. The first aspect refers to the fact that people make reflexive use of the "symbols" they employ to interpret the meaning of events instead of simply reacting to them. The second refers to the fact that people are symbolic objects to themselves; they constantly construct, judge and modify themselves as social realities. The third refers to the way in which the

perspectives and actions of individuals emerge from the interplay between a socially constructed self and the socially constructed environment taking time and place into account (Mouton 1996, p166). Exploring these aspects is essential to building the holistic picture required in qualitative research. In this research I was concerned to look at adult learning, including both learning to use a new computer system and learning to adapt to cultural change in the organisation, so I could not afford to ignore the aspects of social experience described by Mouton. I therefore chose to use the qualitative approach.

Implications for conducting qualitative research are many and include the fact that a holistic picture, rooted in the detail of actual social situations needs to remain the focus of the study. In contrast to quantitative methods the researcher should avoid breaking this social world up into small bits for analysis, and likewise should avoid abstraction and generalisation. Key perspectives and meanings in the data need to be self-consciously anchored in particular contexts. It is tempting but difficult to generalise from qualitative data because of the fact that it is rooted in the subjective world of individuals and in particular contexts. Inferences, suggestions and recommendations can be made, but it is not possible to use the data and interpretations gathered using this method to estimate or predict anything in a larger population - as *can* be done using quantitative methods where large samples have been used and representivity established (Mouton 1996, p168).

3.2.3 Case study research and qualitative methods

Case studies are often used as the framework for qualitative research. Case study research isolates a particular real life "case" for in depth study (Mouton p92, 1996). The case is not created for the study but is "real". Case study research uses "non-cross sectional organising principles" for the data i.e. it does not slice the data but looks at it as a whole. Other examples of this organising principle include gathering stories, narratives, biographies and case records. Case study research requires the investigator to retain the holistic, meaningful character of real-life events such as individual life cycles and organisational and managerial processes, neighbourhood change, international relations or the maturation of industries (Mouton p129, 1996). The aim of the research is to understand the social processes and meanings implicit in a

restricted context (Saddington p75, 1985). The value and strengths of case study research lie in the rich detail grounded in reality and in the fact the a holistic and detailed picture gives room for reinterpretation. It also allows the reader to "make refined judgements about what decisions to make in a particular context or situation" (Saddington p76, 1985). Because it is so contextualised, the only form of generalisation possible is "naturalistic" i.e. to the same or similar cases and not a "population of cases". Case studies are a highly subjective form of inquiry and so need to present their findings, data and their frame of reference for public scrutiny and not claim the status of truth (Ibid.). Procedures for conducting the case also need to be made explicit. "Research ethic", "accountability" and "good faith" are guiding principles for researchers who need to develop sensitivity to their subjects in order to gain their trust and collect data that truly reflects the internal meanings of the context under study. In this sense the researcher becomes a collector of definitions rather than a conductor of truth. Qualitative research methods are particularly suited to case study research as they are suited to real life events, to collecting narratives of experience in interviews and to drawing up holistic, contextually rich data.

3.3 Qualitative research practice with a focus on the interview

3.3.1 Overview of qualitative research practice

Particular methods have been developed for carrying out qualitative research. These include doing observation and ethnography, studying texts and documents, conducting discourse and conversation analysis, using questionnaires and holding interviews and often recording and transcribing these as events (Mouton 1996 & Silverman 1993). These methods are frequently used in combination to ensure data integrity. The methods can be used in either qualitative or quantitative research; the choice of approach, however, shapes how they are put into practice (Silverman 1993, p9). The method I chose to use was the interview, with transcribed and coded results.

3.3.2 Interviews

In quantitative research the interview is normally conducted in the form of a survey with fixed choice questions given to large, random samples (Silverman 1993, p9). In

qualitative research the interview takes the form of open-ended questions posed face to face in conversational, in-depth interviews. A small sample is the normal requirement. As suggested in the previous section, the interview is not regarded as a simple conveyance of social facts but an object of study in itself, the relationship between interviewer and interviewee being an important topic for investigation and being often defined in political terms (Silverman 1993, p10). Seale agrees that the interview can be analysed as a social event in its own right, as a topic rather than a vehicle for an objective reality to be conveyed to the researcher, and therefore as an opportunity to conduct "direct observation" (Seale 1998, p204). Using open-ended questions and allowing the respondents to answer in their own terms often results in the researcher discovering unexpected things about the way people see things. The language of the respondents is also seen as a resource for finding out about the person's life outside the interview, particularly in discourse analysis (Seale & Filmer 1998, p133). Interviews and questionnaires are often seen as alternative methods or may be used in combination. Although conducting interviews is time consuming, expensive and is more likely to be biased, this method has the advantage over questionnaires in that it is a richer source of contextual and individual information. It has practical advantages too in that it allows the interviewer to explain questions that are not clear, to ask for elaboration and is more rewarding for respondents (Seale & Filmer 1998, p128). In qualitative research, interviews are often flexible in form and have the potential to gather information of great depth. They are also very sensitive to contextual variations in meaning (Ibid.). When the method is taken to its extreme in the qualitative paradigm, interviews can be flexible and completely open, often using only a "topic guide" and being invented as they take place. An important focus is eliciting the respondents' personal and unique "stories" in whatever form they come (Ibid.).

The researcher's task as interviewer is to observe, monitor, guide and clarify with the aim of drawing the interviewee out. The interviewer may need to invite more, to give verbal cues and to encourage the interviewee to open up and to speak freely i.e. the recommended interviewing style is non-directive (Seale 1998, p207). So-called Feminist perspectives have given researchers an awareness of the unequal, often exploitative power relationship in the interview situation. This approach recommends that unequal power be played down in qualitative research through the researcher

striving to achieve trust between themselves and respondents, by being allowed to reveal things about themselves in the interview, by being open about their research agendas, about the purpose of the research and about how narratives will be used. Interviewees are encouraged to ask questions of the interviewer and the interviewer may even follow up by sharing results with those interviewed (Seale 1998, p208-9).

3.3.3 Issues and problems in the interview method

The kinds of self-awareness that I have discussed in this chapter are intrinsic to the interview situation, and necessary for producing results that have integrity. Although the case is real, the interview is not a natural situation and participants themselves are very aware of being objects of investigation. They tend to react to this and their reactivity can manifest in resistance, the giving of inaccurate information, apathy, wilfulness, deliberate misinformation and any other kind of modified behaviour (Mouton 1996, p 154). As stated this is more of a threat to validity in quantitative research than it is in the interpretive paradigm where the reactivity I have described is often seen as an object of study in itself.

Despite efforts by Feminist researchers to bring the unequal power relations in the interview into balance, it is important to note that this power relationship cannot be done away with. It is part and parcel of the interview set-up and inequalities arising from class, gender or racial differences between researcher and subject will always be a factor despite attempts to play them down. Basically, the greater the difference (or "distance") between researcher and subject in terms of criteria such as race, gender, status and even style of dress, the greater the chance that interviewees will show bias *towards* the category that the researcher is perceived to represent (Mouton 1996, p150).

An interview is a moral arena in which reputations are displayed and contrasted with others outside the interview situation (Seale 1998, p213). This means that an interview inherently "generates various versions of preferred self-identity and contains moral elements" of which the interviewer needs to be aware (Ibid.). This is both an aspect of the interview itself and an element of the data collected especially when the interviewee describes how he or she reacted to certain events that threatened

the coherence of a secure personal narrative or self-identity (Seale 1998, p214). I was certainly interested in this kind of information as it is pertinent in situations of organisational change, which often call upon an individual's role or self identity in the organisation to change. I needed to be cautious with this kind of information because usually only versions that reflect well on the teller are told. This is particularly true where politically "sensitive" topics are under discussion. If the interviewee mistrusts the interviewer for any reason then they will fear exposure and will make an effort to appear more than moral particularly in relation to organisational policy (Mouton 1996, p149). It has been found that most individuals will try to give positive answers in which they make themselves out to be well adjusted, unprejudiced, rational, open-minded and democratic (Mouton 1996, p154). If particularly intimidated by the interviewer they may also tend to acquiesce with everything the interviewer says or attempt to please them by giving what they see as the desired answer (Mouton 1996, p155). The gaining of trust, and establishing of rapport - often in an extremely short time - becomes important for the interviewer as it can neutralise distrust (Mouton 1996, p158). Other contextual effects include the spatio-temporal interview setting, especially its perceived neutrality and familiarity to the parties involved. The researcher should take into account the junction in time at which the interview took place, as well as any external events that impact on the interview and local customs and political factors which could effect responses (Mouton 1996, p155). One such example is "interview saturation" which is relevant in urban settings and particularly at a university. This is important because individuals who have become conditioned to answering surveys may offer mechanical, superficial narratives (Mouton 1996, p153). At the University of Cape Town staff are frequently targeted by students conducting research and the SAP R/3 implementation is very topical at the moment, many studies having been conducted by students in Computer Science, Information Systems and Business Studies.

The focus in qualitative research on contextual variations and the construction of meaning requires that the researcher be aware of discourse. The interviewee represents a particular group of people in society and, as a member of a particular discourse, will "speak" that discourse in the interview. Their linguistic repertoire describes the discourse on which they draw when constructing their account of events. Their use of words, phrases and ideas will be characteristic of the "population of

discourses" to which they belong (Seale 1998, p212). This makes it necessary for the researcher to identify elements of an explanation and the way they are put together, noting any omissions, and thereby attempting to isolate elements of discourse. Discourse incorporates norms and roles and a member of a discourse will construct accounts of their experience by appealing to these norms and roles (Silverman 1993, p90). It is important to find out about the context of the interviewee so that the researcher can ask these questions about the relationship between the interviewee and the world that they describe. Similarly we need to apply this lens to the relationship between interviewer and interviewee. In this way the interview itself becomes a discursive playing field and a source of information for the researcher. According to Silverman (1993, p90), the researcher needs to be aware that the interviewee assigns features and phenomena to their world and makes it out in a particular way when talking to another person *in relation to* the discursive position and assumed knowledge *of that person*. Thus both interviewer and interviewee actively construct the social world in the interview through exchanges that take each other into account (Ibid.). If we take this seriously then the identity and relative discursive position of the researcher to the subject becomes very important. Being aware of the discursive position of the interviewer includes noting the effect of stated or implied aspects of his or her presentation that indicate affiliation to groups and discourses in society as this will bias narratives and may even effect the "truthfulness" of answers or may trigger suspicious or negative responses (Mouton 1996, p149). In the research I have not performed a full discourse analysis, but because I was looking at organisational change and the way that different groups interact, and because I interviewed representatives of those different groups as an insider to the organisation, I did take discourse into account.

3.3.4 Coding the data

It is useful if the interview data is tape recorded and later written down verbatim. These transcripts provide an "excellent record of naturally occurring interaction [and give a] highly reliable record to which researchers can turn to develop hypotheses" (Silverman 1993, p10). Although this is a laborious task, it brings about a closer appreciation of the meanings in the data and can be used to code and analyse the results. Coding the data helps the researcher to find patterns in language and recurring

themes in attitudes and ideas. Through counting occurrences of categories, it can show up consistent answering and highlight exceptions (Seale & Filmer 1998, p135). In practical terms, coding reduces the mountain of data making it more manageable for the researcher and it renders the data more accessible, giving it greater clarity through the act of categorising answers which is useful for developing and testing theories (Seale & Kelly 1998, p153). Two methods adapted from the quantitative school can make this task easier. They include standardising the interview (wording questions in exactly the same way for each interview) and scheduling it (asking questions in the same order). Coding can also provide new data in that by counting how many times something is said and under what circumstances, contradictions and negative answers emerge (Ibid.). Coding means identifying themes and categories in the data and this cannot be easily done before the data is gathered as the codes should relate closely to themes the interviewees themselves put forward, and should use the language of the interviewees. They will therefore emerge as the data is analysed, and one code may branch into a few as the researcher becomes familiar with variations in the data (Seale & Kelly 1998, p154).

The next part of the chapter describes how I put this methodology into practice, and responds to some of the issues raised above.

3.4 Operationalising the study

3.4.1 The case

The case was the University of Cape Town during a "real life" situation of adaptation and learning brought about by the implementation of SAP R/3 computer system, which took place from 1995 to 1999. A range of staff of the university were the "units of analysis" and their narratives about learning and organisational change were elicited in interviews.

3.4.2 Who was interviewed

In carrying out the research I was particularly interested in "end users" of SAP R/3. In the university, this group is defined as users of the computer system who are situated

in academic departments and other similar "units" of the university. They are contrasted with "functional users" who are members of one of the central administrative departments of the university. I decided to target "end users" because they had been the main receivers of the training programs put in place by the PRISM Project and because they had been the furthest removed from sections of the university in which organisational change had been initiated. Additional interviews were conducted with PRISM Project trainers and managers, and with representatives of "functional user" departments. These interviews provided reliability checks on the "end user" data. I also had a wealth of informal observational data to draw on that I had gained while working for the PRISM project myself, and in working elsewhere in the university. I also used PRISM Project documentation in the form of a strategy analysis and a report to the University Council (See Appendix 1). The discussion below focuses on the "end user" interviews.

3.4.3 Designing the interviews

It was decided to structure the interviews in such a way that they would fit the qualitative paradigm but that I would also be able to code them easily. I therefore used open-ended questions in a standardised, scheduled interview. The questions themselves (see Appendix X) were phrased in such a way that they would elicit the interviewee's narrative around certain topics. Although these were clearly specified by the questions, and I intended to keep the interviewee to those topics, I intended to allow the interviewees to talk quite freely, using the questions as a trigger. The questions were aimed at drawing out the following areas of experience:

- The content of work related learning the respondents had been involved in;
- How they went about doing and planning that learning, including the formats they preferred to use for learning;
- Their use of various organisational resources to help them in this process, especially their use of networks of colleagues;
- Motivational factors in their learning process;
- The practical and conceptual difficulties experienced in adapting to SAP R/3;
- Their experience of organisational change in general, focusing on the ways in which it effected their working roles and where they looked to for leadership;
- Their use of organisational communications and documentation; and

- Changing traditions in the work they did, intergroup relations and intergroup learning including any conflict that occurred.

In the characteristic manner of qualitative data, patterns in the narratives emerged during the interview process, some of which surprised me. For example, although I had expected to find that administrative staff and academics had very different experiences, I had not expected to find that technical staff would form a very distinct grouping in terms of *their* experience. The whole exercise allowed me to build a holistic picture of adult learning in the organisation that I would be able to use to answer the research questions described earlier. The interview questions were finalised over some weeks, and tested and revised using carefully selected subjects.

3.4.4 Canvassing for volunteers

I was given access by the PRISM Project to a database of staff of the university who had attended a full SAP R/3 purchasing and reporting training course in 1996 as part of the main training thrust before the system went live. This list was kept by the project administrator and was up to date with the names, organisational assignments, locations and email addresses of the trainees. I eliminated from this list all "functional users", those in remote locations, and those I had worked closely with or who were likely to have known me as a student. The remainder was grouped into six manageable chunks of seventy to ninety individuals. It was decided to contact each group by email and ask for volunteers. An error rate of about ten percent was found in the emailing process, largely due to people having recently left the university or having changed their email addresses. Of those messages received by staff, a ten percent positive response rate was expected. This proved to be a reasonable expectation. The messages were sent out mid-week on six separate occasions, a week apart. The timing of the "mail shots" with events on the academic calendar proved crucial in terms of how many responses were received, for example the weeks when final exam marks and departmental budgets were due were bad ones in terms of the response rate.

Careful consideration went into the wording of the email message (see Appendix X). The subject line of the message was direct but did not explain what the message was asking the recipient for so as to be sure that they would open and read it. The project

sends out communication about SAP R/3 issues from time to time so I knew that "end users" would not be surprised to see a message about SAP R/3 in their mail boxes. I began the message with a provocative question, asking the recipient if they would like to be interviewed. This placed the emphasis on their desire to be involved and not on my need to interview them. In the message I explained who I was but in such a way that I played down my status as a member of the PRISM project and played up my status as a student so as to minimise their reactivity to my status as a member of the university administration. I felt that while this status could be made to work to my advantage in the interview, it may work against me at the canvassing stage as I was very aware of the traditionally antagonistic relationship between the central university administration and "end user" departments. I knew that I would receive considerably more sympathy as a postgraduate student. Having this prior knowledge is an example of how my insider status worked to my advantage as a researcher. I revealed quite openly who I was and explained that I was engaged in research for a masters degree in adult education at UCT, I explained what the object of my study was and identified the case study very briefly. I then explained that I had been a member of staff in an end user department before I had moved to the PRISM project so as to highlight that I had been one of them originally. I outlined what I was looking for in an interviewee, appealing to both the administrative and academic sectors and stipulating that volunteers had to have been a member of staff from the time that SAP R/3 had been implemented. I attempted to provide motivation for them to respond by suggesting that the interview would be chance for them to put their views across, knowing that they probably had never been invited to do so and that there was some resentment about this. I also gave them information about the format of the interview so that they could consider participation in practical terms and I attempted to make it inviting by saying that the interview would be informal. I also stated that the interviews would be completely confidential, although this never proved to be an issue later on. I invited responses in a friendly manner, closing by saying that I looked forward to hearing from them. This set out my approach within the qualitative paradigm from the outset by setting the groundwork for establishing trust.

Individuals usually only replied if they wanted to be interviewed and did so as soon as they had read the message, indicating that people tend to get involved on an impulse. I received some messages wishing me luck, but declining an interview for practical or

personal reasons. As I believed a quick response was crucial to ensure co-operation, I usually called the person by telephone within a day of receiving their offer to arrange a time and place for meeting. When I called the respondent I asked that we meet in their department and that we have a venue in which we would not be disturbed. I also explained that I would be tape recording the interview so that making notes during our "conversation" would not distract me. No person backed out of their offer at this or any later stage and I usually met with individuals within a week of having contacted them. As it happened I received volunteers from all ranks and all groups of end users including administrative staff, academics and researchers, various kinds of technical officers and directors or managers. The numbers in each group roughly corresponded with actual proportions of staff using SAP R/3 but I was more concerned that the groups be represented than with true statistical representivity. Had I not received responses from a group I would have attempted to find interviewees through the volunteers that did come forward. Six faculties and eighteen departments were represented but, again, I was not concerned to get representivity across all such organisational units in the university.

3.4.5 Conducting the interviews

The interviews were conducted during working hours, at the place of work of the interviewee, usually in the office in which they normally conducted their work. Meeting on the "home turf" of the interviewee was important for setting them at ease. It was also extremely informative for me as I often got to observe how they interacted with colleagues, and to view materials they used in learning and carrying out their work on SAP R/3. I was shown organisational documentation they kept and used and could gain a general feeling for their work environments. My insider status and history of involvement in the university meant that I was able to gain rapport with them quite quickly. I was comfortable in the kinds of environments we met in. I also dressed in a style familiar on campus and most importantly, due to many years in the university. I also often knew a mutual colleague or had been obliquely involved with the person at some time in the past. I used this to establish rapport with them. For example, with two respondents in different departments, we had a history of involvement with the department of Archaeology in which I had been an undergraduate student. With other respondents, I had worked closely with the person

who trained them in SAP R/3 or assisted them on the help desk. Rapport tended to be better with administrative staff, but was also good with academic staff with whom I tended to play up my student status. Knowing so much about the organisation, speaking its language and in many ways displaying membership of organisational discourses was crucial in determining the level of openness and confidence with which interviewees spoke. The smallness of the distance between myself and the respondents was expected to reduce bias in their narratives. They knew they did not have to explain things to me, they assumed rightly that I had prior knowledge of the organisation and its work and I was aware that they spoke freely and openly to this.

My interviewing style was friendly but professional. It helped to define our interviewing relationship, cast us as equals and situated us inside organisational discourse, highlighting our identity as professionals, the identity I wished to probe in the interview. A question I needed to ask was what does it mean to work with volunteers? In practical terms this meant that the person had the time available to see me and that on a personal and individual level they were the kind of person that was curious or willing to be involved in such an exercise, or that they had a special interest in the topic of the interview. It probably also meant they were more likely *either* to feel positive about the SAP R/3 implementation, or to feel particularly *negative* about it. In other words using "volunteers" meant that I was more likely to see extremes than middle positions. Those who felt positive about SAP R/3 were greater in number among the respondents than those who didn't and I am aware that this is probably not the case for most individuals in the organisation. I also realised that some of the volunteers had already established contact with the PRISM project through having unusual problems to resolve in the course of the implementation or through having given input to the project in some way, which made it more likely that they would volunteer.

I put questions to respondents in very definite terms but then drew them out using passive, acquiescent mannerisms and speech. I was generally passive, keeping body language and physical presence to a minimum but using a lot of eye contact. I used simple, slightly colloquial language, inviting the same from them and allowing them to use their own terms and language to express themselves. I started the interview by explaining that most people found that the questions I asked covered the whole picture

and that probably they would get a chance to say all they had been hoping to say through my questions. At the end of the interview I always asked for anything that they felt they still wanted to say but usually there was nothing. Where necessary I explained a question or gave the person a hint if they didn't know where to start but I very rarely needed to do this. Many of the questions I asked were complex or had sub questions, and in order not to overwhelm or confuse the interviewee, I would use a trigger question and then introduce sub questions later if the subjects did not move on to answer these themselves. I believe that their willingness to speak openly and to co-operate with me was a direct function of their being volunteers. The interviews normally lasted for between an hour and an hour-and-a-half depending on how much the person had to say and on the number of disturbances we had. Administrative and secretarial staff, who needed to be available to academics, were often disturbed during the interview by telephone calls and requests from superiors. Interviews were conducted in private except for a few occasions; two where other staff entered the tea room in which we were sitting and the other in which I had agreed to interview two colleagues at the same time. A few respondents were disturbed by the presence of a Dictaphone, but most were unconcerned with it and with issues of confidentiality. Their trust with regard to the latter was also a function of my being a fellow member of staff. Occasionally I was given the impression that my presence was regarded with suspicion by colleagues of the interviewee. I am sure that the interviewee also perceived this and it might have effected their narrative.

3.4.6 Problems and issues

I expected a degree of reactivity in the interviews I conducted because I am a member of the PRISM project and I knew that the implementation of SAP R/3 had brought stress to their working lives. But of more concern to me were issues such as memory decay as I was asking interviewees to cast their minds back in time by two years. They were required not only to describe *what* happened, with which they had no difficulty, but also to tell me *how* they had come to learn things and how they had felt at the time. I recognised the fact that it would be very difficult for them to recall what their experience had been like at the time.

My insider status to the university and especially to the PRISM Project was felt to be a problem in another two areas in terms of bias in the narratives that I heard. The one area had to do with the inherent tendency of interviewees to acquiesce with what the interviewer suggests. I accepted that this tendency existed and tried not to make definite statements that could be agreed with but I feel that organisational power relations were at play in this aspect of the interview. The PRISM project carries relatively enhanced power in the organisation by virtue of the image it has projected, the kind of leadership it enjoys, the degree of support it is given at executive levels and by virtue of the task that it is accomplishing. As a representative of the project, I brought that power dynamic to the interview situation and I was aware that it led to a greater than normal degree of acquiescence from subjects. On reflection I realise that this power dynamic may not always lead to acquiescence, it may in fact lead to antagonistic answering, but I felt that since the interviewees were volunteers, and since none displayed antagonism in the interview, that the former situation was more likely to be the case. In a second sense, my position as a representative of the university administration meant that when I asked sensitive questions about organisational policy and change, the interviewees were more likely to present themselves as morally correct and in line with organisational policy and organisational change. Racism is a particularly sensitive topic in South Africa and as changing staff and student profiles, and affirmative action are part of organisational change at the university, I had to assume that respondents would be concerned to present themselves as "politically correct" in these respects. It was for this reason that I asked questions about organisational change in such a way that pushed them beyond obvious statements. I made the obvious statement for them and asked them to add comments to this, inviting any criticisms of it that they had. Another, not necessarily negative influence on the interviews was that they took place in a living organisation, while the PRISM project was still in existence and SAP R/3 was still being implemented. This timing meant that events in the organisation impacted on the interview narratives. Two important such events were firstly that departmental budgets for the next three years were due and were being prepared during the interview period. This was being done for the first time in greater detail than before, in keeping with a culture of greater financial vigilance that was being promoted in the university. This new budgeting process was associated by many staff with the implementation of SAP R/3 and was causing some stress. Another important event

that occurred about half way through the interview period was the dismissal of two members of staff for financial fraud that had been committed using SAP R/3. This influenced narratives in response to a question about reasons why the university had decided to acquire a new computer system. I regarded the influence of these events as interesting in terms of the research rather than as interfering with it.

3.4.7 Coding the data

Every interview was tape recorded and meticulously transcribed in such a way that the detail and essence of the person's narrative was retained. I took care to record every word uttered, sometimes rewinding a tape several times to get it right. However, as I was not conducting a detailed discourse analysis, and would not be going to the level of conversation analysis, I did not transcribe the details of hesitant speech and did not take note of silences on the tape. I did however use the exact words of the respondents and noted emphasis with Italics.

In coding the interviews I was concerned with categorising answers and with noting recurrent themes or ideas. I took these themes from the data and only in one or two cases imposed my own where I wanted to be able to compare answers in a more structured way. For example in Question 2, where I wanted to be able to compare the number of times people were using particular resources as a first port of call when solving computer problems. In categorising statements I looked for similar ideas, words and phrases. The more open ended the question, the more categories emerged. Quite often themes were found to occur more than once in related questions, often because interviewees thought of a comment on an earlier topic of discussion when talking about a later one. This was to be expected as human experience is not naturally categorised and I always categorised these under the appropriate topic.

Themes and categories were drawn up in a matrix in which I counted the number of occurrences of each theme and in which I collected quotations that represented the varying positions within the category. I considered a count of five or more as a significant category. This question by question matrix is presented as Appendix 4. A more detailed matrix with quotes is available from the researcher. The coding exercise, although laborious, proved invaluable in the analysis of the data when it

came to answering the research questions as it was through this exercise that I got to know the data closely.

3.5 Conclusion

All care has been taken to preserve the case as an accurate record of a real life situation that can be used for research. The qualitative research method, using interviews, has proved to be the most useful for the case study.

In the next chapter I present a first level summary of the results in which the narratives are made more accessible by describing them as if in answer to basic questions about adult learning in the organisation. These basic questions cover all aspects of learning including where and when learning took place, what was learned and who it was learned from, the mediums through which learning occurred, and the ways in which adults went about learning. This holistic picture is rich with the micro level detail gathered in interviews and is descriptive rather than explanatory. It fulfils the criteria given by Mouton, Seale and Silverman in terms of delivering a "thick", descriptive picture of everyday-occurring social practice that is truly authentic.

Chapter 4: Building up a picture of adult learning at UCT

4.1 Introduction

In this chapter I attempt to make the data meaningful by asking of it six basic questions about adult learning at the University of Cape Town, during the implementation of SAP R/3. The questions are wide ranging, and are intended to sketch a holistic picture of learning in the organisation. This picture draws on the coded data and is rich with the detail gathered in interviews. It is descriptive for the most part, although some initial observations about causes are made. The questions are:

Who were the learners?

When did learning take place?

What did adult workers learn about?

Who or what did adults learn from?

How did adults carry out learning?

What motivated adults to learn?

4.2 Who were the learners?

Category of staff member	No. interviewed
"End users"	
Support Staff	15
Technical Officers	6
Academics	6
Directors/Managers	3
Total "end users":	**30**
Project staff	
Managers	3
Trainers	3
Total project staff:	**6**
Functional users	
Representatives each of different administrative departments	**3**

Diagram 6: Categories of UCT staff interviewed.

The learners in the case study are members of an institution, namely the University of Cape Town. They are studied as members of the organisation more so than they are as individuals. Although other aspects of their social identities may have come to have a part in their work identities, these are dealt with only in this sense. There are different groupings of personnel at UCT, some of which use SAP R/3. The interviews focussed on members of the organisation in "end user" departments, although I also interviewed some in the university administration. Within "end user" departments, different groupings of staff can be identified. The nature of their work, their roles in the organisation and their use of SAP R/3 differ significantly. These groupings are useful for looking at adult learning in terms of role and discourse, and at different kinds of approaches to the learning task. The groups include support staff, technical staff, academics and managers. A summary of the staff interviewed in each category is given in Diagram 6 (above) and a description of each of the groups follows.

4.2.1 Support staff

This is an official category of personnel at UCT. Support staff include (in order of rank) departmental assistants, secretaries, senior secretaries, administrative assistants, and administrative officers. Their work consists of supporting the academic staff in their department by carrying out administrative tasks. Departmental assistants, in addition to other work (such as cleaning), perform clerical work; secretaries perform secretarial and co-ordination work, while administrative assistants and officers carry out both secretarial, and financial and planning tasks such as budgeting. Not every department at the university has all of these support staff; many do not have administrative assistants or officers. Support staff are the main users of SAP R/3 at the university. For them it is central to their core work, which includes placing purchase orders, purchase requisitions and goods receipts on SAP R/3. They therefore use the system frequently, often logging in more than once daily. In practice all ranks of support staff also carry out financial reporting on SAP R/3 on behalf of academic staff whose responsibility it is to manage funds. Most support staff have at least a basic computer literacy but the demand for more advanced computer skills has come to them only during the last 5 years. Computer literacy, especially among older support staff tends, therefore, to be limited. Until lately it has also not been necessary for

secretarial staff to have accounting knowledge. The requirements of the job in terms of these skills are changing radically; according to project management, this is a general requirement for secretarial staff in the 1990's.

The role of an administrative staff member is to attend to the running of their department and to support the work of academic staff. The role requires them to be capable, practical and skilled at finding quick solutions to administrative problems, so that the administrative side of university life may be invisible to academic staff. They are required to be reliable, responsive and helpful. Support staff, apart from the acknowledged need to acquire computer skills, are reluctant to play the role of learner. It is part of their role as support staff that they be available to assist other staff with skills that are ready to be applied and they do not like to be in a position where this is not the case. Administrative staff occupy a middle to low position in the university hierarchy. Consequently there is an elusive discourse of oppression in this group. Although they regard themselves as skilled professionals, this is undermined by the way they are treated by the institution. Although this is a very valuable group of staff, it lacks power in the organisation and this means that it does not have a voice to air its complaints. Secretarial staff are not forthcoming or active about issues because of this condition. As a consequence they are reluctantly accepting of their conditions but at the same time there is a thread of subversiveness that runs through this. They can be averse to change because of this and would justify their position by arguing that they are taken advantage of, not paid well and have few employment prospects. This discourse weakens for older staff members among whom I found a definite nurturing, traditionalist discourse. The administrative discourse is currently quite unstable; it is changing towards one of greater professionalism in which the demand for computer and accounting skills is much greater. These changing standards for support staff effected the learning process as SAP R/3 signified that change because it demanded skills that are associated with the new standards.

4.2.2 Technical officers

Technical staff are actually a sub category of support staff according to official groupings of personnel at the university. In practice their work differs significantly from support staff so I have used a separate category for them. They include network

support staff, lab technicians, student lab supervisors, scientific officers, stores clerks and more. They are often highly skilled professionals working in narrow fields of expertise like Physics or Chemistry lab support. While all secretarial and administrative support staff use SAP R/3, not all technical staff use it. They are often supported by secretarial staff so using the system is sometimes a matter of choice which some of them make because they have technical or computer skills that allow them to do so. Their job descriptions in terms of carrying out administrative tasks also vary considerably. In some cases it is integral to their work and they are required to use SAP R/3 to place purchase orders, or to carry out sales functions. When they do use the system, it is usually not as frequently as other support staff. Many of them are also responsible for managing general operating and research funds and so would also do funds reporting. SAP R/3 skills and interests are very uneven across this group; among those who's work does not require a knowledge of computer systems one can find a remarkably low level of SAP R/3 skills. This is not so for secretarial staff, all of who have some skills in SAP R/3. Unlike support staff the fields in which technical staff work are quite stable and are not changing due to external demands.

The role of technical staff is to support the work of departments by maintaining networks, equipment and various kinds of labs. They are required to be specialist professionals and to find both short and long-term solutions to problems. This role is fairly autonomous and self-sufficient. Technical staff are willing to play the role of learner where it relates to their field of expertise. This being technical in nature, it is often changing fast so being in the field requires that learning be continuous. This has helped technical staff approach new learning, but they can be intolerant of learning that is not related to their field of expertise. Although a subset of administrative support staff, they have access to greater status because of their closer associations with academic and research staff, especially among scientific officers. Having access to relatively more power in the organisation, in combination with their relatively autonomous status, means that they do not adopt the discourse of oppression to the same degree as administrative staff. In fact they often are critical of change, and use their professional expertise to get involved. There was evidence of an authoritative discourse and of independent thinking which was at times unconventional and individualistic. Again this could aid learning, but only when the person saw a reason to apply it.

4.2.3 Academic staff

This group is an official category at the university and includes a diverse range of personnel. Research assistants and officers are often not permanent members of staff and usually do not get involved in teaching. Various ranks of teaching and research staff include junior lecturers, lecturers, senior lecturers, professors and associate professors. The occasional academic staff member places purchase orders but their administrative responsibilities lie mainly in managing research money. In this capacity they would be required to use SAP R/3 to report on spending in their funds. This use of SAP R/3 was officially promoted, but not enforced by the PRISM Project and the university administration. In practice both purchasing and reporting falls to the administrative staff who support academics, even where these tasks were performed by academics before SAP R/3 was implemented. This is quite a pressured group of staff in terms of general organisational change, with new faculty structures and teaching programs being put into place, the profile of academic staff coming under pressure to change, affirmative action being promoted and with the threat of retrenchment. These pressures effect academic staff directly, and this is made worse by the fact that mobility is less easy for this group than it is for support staff. For them, moving outside the organisation is not mentioned as a possibility as often as it is by support staff.

The role of academic staff is perhaps the clearest: it is to see that the institute fulfils its role to educate by carrying out teaching and research work. Academic staff are a lot closer to the role of learner in a sense because they are teachers and researchers. However, this work does not directly require the use of SAP R/3. The heads of academic departments also have an official managerial and administrative role to play but again this does not necessarily mean that they will use SAP R/3 themselves to carry out this function. If they do use SAP R/3 it is infrequently which is experienced as problematic in terms of their becoming comfortable with the system. In fact, most academic staff resent having to do any kind of administrative work; they do not see this as part of their roles. Stemming from an intellectual discourse and a relatively powerful position in the university hierarchy comes a critical attitude to their work environment with the confidence to be open about it. They have been openly critical

of SAP R/3 and the implementation of it, and display confidence in doing so even if they are not as well informed as technical staff. The university executive made a policy decision, with out much consultation, to devolve administrative tasks to "end user" departments and so it is becoming increasingly necessary that the role of academics be revised to accommodate more administrative responsibility. This has caused some discontent and is taking a long time to be accepted because of a traditional discourse of aloofness from administrative work. The consequent resistant attitude has resulted in slow change for this group of staff, and an unfair burden on the support staff grouping.

4.2.4 Managers

Heads of department really fall into this group but have been included under the academic staff heading because at UCT this is generally their focus. The role of Head of Department is often rotated among academic staff who retain their teaching and research roles when acting as Head. Thus, as I often heard repeated, HODs are not chosen for their managerial or administrative capabilities. I found that staff would like their HODs to have these capabilities and are often disappointed in them because they don't. Managers I interviewed included the director of a school, the manager of a catering section within a department and a member of the library directorate. These three were uniquely different from one another and it has not been easy to generalise for them as a group. One had a professional interest in SAP R/3, another was in a very hierarchical structure and did not use the system herself, and the third used it frequently, as she had no administrative subordinates.

The role of a manager is to lead by having a vision of the purpose and future of their department. They need to be involved with university structures and to keep their staff informed. Ultimately they oversee the running of their departments and may need to act as the catalyst for change. With two of the managers I interviewed, and with managers of the project, all showed a perspective on the implementation that was characteristic of their role and rank. They were concerned about their staff, understood how different groups were interacting, were concerned with the kinds of management information they could get from the system and could relate better to university policy and goals. Managers are willing to be learners about organisational

policy and operations but because of their rank, they do not like to be cast in the role of learner of technical skills. It seemed to me that at UCT managers use a paternalistic discourse in carrying out their role and this may spur them to keep ahead of developments by learning, while at the same time keeping them from occupying the role of learner, especially in formal learning-teaching situations.

4.3 When did learning take place?

Learning took place, for the most part, in response to a change in the working environment, which became a stimulus for learning. In the case study, the stimulus took the form of a change in the university's policy about finances. This led to a change in financial practice that required a new computer system (SAP R/3) to be implemented. The implementation brought change into the work environments of most administrative and academic staff in the organisation. Individuals were required to learn a new approach to working with finances that centred on greater financial vigilance. This required the ability to draw up 3-year budgets and to read detailed financial reports. In terms of technical and procedural skills staff were required to learn how to use the computer system to carry out tasks such as placing purchase orders. Although planning for this change took some time at executive levels of the university, and in the PRISM Project, learning only took place when change reached the immediate environments of staff lower down the hierarchy as is exemplified by the following statement:

> "What I try to find out is if there are things that will effect me and my job here and how I work and whom I relate to. At this stage it doesn't look like that. Although at one stage there was talk of having central workshops and so on and then I get hot under the collar and upset … when the threat of change is to you, yourself, then you know, you pay attention to it…"

Immediate work environments tended to vary considerable, as did the cultures of learning in them. To deal with this in the context of large-scale change, training was managed formally by the PRISM project. This meant that, initially, staff members did not learn when they themselves had felt the need to respond to a change, they learned when they were told to learn. Some respondents mentioned this specifically and resentfully. Staff members were given a choice of about three courses to attend and they had to book a place on one of them. Generally this learning took place before

they had seen the new system i.e. they saw it for the first time on the training course. Not having grasped the need to learn before receiving training was a problem for many. Interviewees also mentioned that it had been a problem to receive training so long before the system went live - they tended to forget what they had been shown (the PRISM Project began training in November 1996 and went live in January 1997).

Although, from the PRISM Project's point of view, there are good reasons why training for SAP R/3 was done in advance, this timing ran counter to the way in which adults approach learning and it effected the levels of motivation for acquiring new skills. When asked to reflect on general workplace learning aside from the change to SAP R/3, most respondents had no plans to be trained in something during the next year. Not planning far ahead with learning is common among working adults. When asked about any learning they foresaw in the next year, most said that they would "wait and see" and "respond as the need arose". This did not mean that they were unwilling learners as the same people had undergone training in the past. Those that did have plans for learning had already perceived the need to learn and were planning to do so very shortly. In many cases they were already starting to use the technology they needed to be trained in. This implies that most adults wait until something new enters their work environment, they assess it by starting to use it, and *then* they plan to go about getting formally trained. Adults seem to prefer to learn when they have "something to go on". The demand for retraining and the success of refresher courses also supports this.

Preparation and readiness for learning is an important aspect of timing and this readiness seemed to be lacking at UCT. This is an issue for managerial staff and Heads of Departments who's job it is to mediate change. Managers are the first to learn about change because of their involvement in organisational structures such as staff associations and committees that function to translate change into practical terms before it is brought into the work environment. These structures are learning forums, and the representatives who sat on them should have played a part in preparing the sections they represented for the learning that needed to take place. At UCT, however, the paternal discourse among managers and a culture of poor communication impeded this, resulting in underpreparedness for learning. Many staff mentioned being uninformed as a problem when dealing with change. It was often secretarial staff,

those who have to make the change "at grass roots level", who made this complaint. They felt that their Head of Department had not kept them well informed.

> "I wasn't given enough info. I was left out of the loop by the HOD. But those controlling the fund at grass roots level (me) had to do the actual budgeting. Communication was being done with researchers rather than those actually running the department. I needed to be warned well in advance. It might not have been a function of PRISM or Bremner, its more an internal departmental communication problem".

The PRISM Project advised Heads of Departments to prepare their staff for SAP R/3 but because of poor communications this did not take place to the necessary degree. The project itself provided information sessions in the form of lunchtime seminars to tell staff about SAP R/3 and to prepare them for the process of change. These were not well attended because they were voluntary and because they were held long before change entered the immediate work environments of staff.

4.4 What did adult workers learn about?

At a first glance, the content of learning centred on SAP R/3 skills required to carry out a job. This kind of training happened formally, the vast majority of training received being in computer skills. Learning about the culture of the organisation took place informally for the most part, although the Staff Development and Training section was at the time providing courses on unrelated topics such a performance appraisals, assertiveness and sexual harassment. An induction course attended by all new staff covered university policy. With the change to a new financial system and to using SAP R/3, learning took place along a range of themes (See Diagram 7). Learning was conducted increasingly informally towards the top of the diagram.

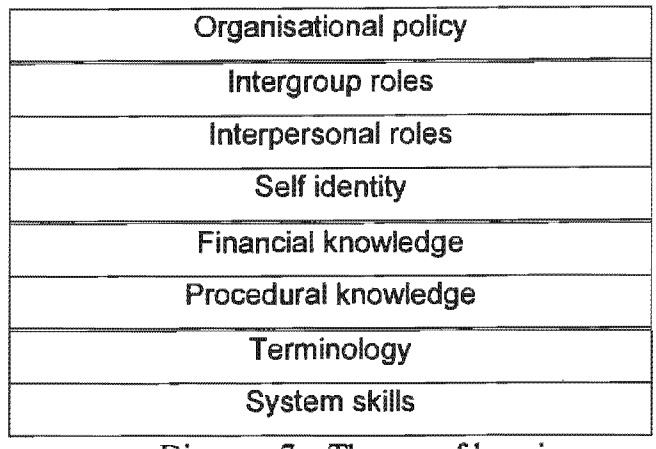

Diagram 7 – Themes of learning

Starting at the bottom of the diagram, learning the skills needed to use the computer system was a primary need for many staff, especially those who had not used a Windows system previously. They needed to learn how to navigate the screens using a mouse, to use menus, buttons, keyword searches and drop down pick-lists, as well as the concept of "drilling down" from report items to transactions as exemplified by the statement:

> "With funds reporting there was just the page, you just got the page, then afterwards I realised you must click here and click there and that type of thing."

In this quote terms are used that might be unfamiliar to someone who has not used SAP R/3 and this indicates another basic theme of learning, that of terminology. This took some getting used to for adults as the terminology used on the system had been translated from German into American English and was consequently not intuitive for English speaking South Africans. At the same time adults were required to learn procedures for carrying out tasks on the system such as placing purchase orders and entering goods receipts. An academic staff member passed the following illustrative comment:

> "The whole issue around generating purchase orders, that sort of thing, and then the whole goods receipts thing. R/3 has maybe taught me that there are several steps in-between what goes into a fund and what comes out of it. Its important to take those into consideration."

Reading on-line financial reports also meant that they needed to learn about the way in which financial figures are presented and about general accounting principles. Learning system skills, terminology, procedural and financial knowledge was the minimum learning that a person needed to achieve in order to be able to work with SAP R/3.

Although I heard many complaints that the system can only be used in one way, that it is very "rigid" or very "linear", it is in fact a little flexible and there are more than one ways of using it. Some of these options were provided purposefully, such as having one-time vendors in addition to the list of vendors on the system. Having these options meant that although the task of using the system was well defined, there was room to use it in a variety of ways. In support of this is the fact that the Purchasing Department is constantly campaigning to change the "bad habits" of "end users". A few interviewees mentioned (with a smile) that they are always "in trouble" for using the system badly. One person, a scientific officer, proudly told me how he had found a way to cheat the system so that he could carry out his work in the way that he wanted to. A director I interviewed had his own view on this issue and passed the following statement:

> "You might train people and come back a few days later to find them using the system in a slightly different way to that which you intended and what they're doing is expressing their own individual identities with their job - its their job and how does this new system interface with it? If they express their control over their own job, their own identity, by actually changing the way they use the system, very slightly ... it's a natural thing."

This points to the fact that what was learned was *negotiated* and not simply fulfilled by the learner. Adults acquired skills selectively and used them according to their own needs and desires. If this was done with something as rigid as SAP R/3, then what of learning about other less well-structured aspects of working life?

Knowledge about who we are (at work) is often called upon to alter during times of organisational change. Renegotiating self and work identities is a process of learning that is often underestimated. As suggested in the preceding quote, people "expressed their own individual identities" in their work. They constantly reassessed their work

and self-identities relative to change. The secretaries who said that working with SAP R/3 had made them feel "less like a secretary and more like a finance person" had learned new work identities that clearly impacted on their self-identities also. Those who resisted the demand to change their identities were negotiating change by expressing a contentedness with who they were. This understanding may only have been consolidated when faced with change.

> "A secretary or a typist should not have been subjected to something like this, I feel very strongly about that. You've become a typist or a secretary because your mentality is that of a typist or a secretary, okay? You are not an accountant, you are not happy with figures ... otherwise you would have become somebody who worked in an accounting firm. Your *choice* was to become a secretary and a secretary is not an accountant and now we have been dumped in an accounting environment where I know absolutely nothing about it. And that was a very big point of frustration. I am by choice a secretary because this is the type of environment that I enjoy."

A working identity is defined by the role the person occupies. These roles incorporate the rules and norms of the organisation. This was another area of learning for adults, especially where their roles or the roles of others were changing. Because working adults do not operate in isolation from others, they learn new expectations of themselves and of others as working relationships are redefined during a period of change. When administrative staff expressed disappointment at their Heads of Department for not managing change well, and for not learning to read their own financial reports, they were talking about role expectations. I asked interviewees about changing workloads and changing relations between academics and support staff and heard many statements to indicate that this area of learning was still being negotiated.

> "Some of my colleagues plead ignorance when it comes to R/3. There's no reason at all, it places extra burden on the admin. staff which they don't need. I have suggested it to them but they say it isn't their problem. Responsibility lies with the HOD. The HOD should lay down rules, or there should be a university policy about it. If you're responsible for a fund, you should administer it and don't expect an administrative staff member to do that. So if the university has supplied you with a computer, with the forces to help you use the system, there's no reason why academic staff shouldn't do it themselves. And I think it's the HOD who should make them. The HOD here has not played any role at all."

This process of negotiating changing roles takes some time. While most people felt fairly comfortable with the procedural side of things and with using the system, they were still learning new roles. I heard some secretarial staff tell about how they were trying to "bully" or "encourage" academic staff to run and read their own reports indicating that roles have by no means settled down. This was especially evident in departments where changing roles had not been discussed openly. For a few, new roles had been openly and amicably rearranged:

> "In the department, the secretary does the ordering and the running of reports on items received, journals posted etc. So I'm really concerned with the funds reporting side. I might ask her for help from time to time. We discussed this division of responsibility between us, we thought it was sensible."

Just as learning was about roles and responsibilities within departments, so learning also occurred between *groups* that played different roles in the organisation. Change often interrupts intergroup relations, forcing new ways of interacting to come about. This entails a learning process in which the roles of the groups are the focus. With a university policy to "devolve" administrative tasks to "end user" departments, the issue of work distribution and workloads came into focus for those whose roles changed to accommodate increased responsibility for administration.

> "People were feeling burdened, that they had more work to do. As if Bremner was offloading work on them. Work that should be handled by a financial person. But it makes more sense to me to place the purchase order for the work I am doing."

Renegotiating job descriptions involved, of necessity, a better understanding of what each other's roles in the organisation were to be. At the very least the effect was to increase the frequency of contact between administrative departments and "end user" departments. This was due to many "teething troubles" initially, involving the sorting out of transactional queries. SAP R/3 also makes central administrative processes more visible to "end users" which meant that roles became more clearly defined rather than blurred as they had been in the past.

I asked "end users" about their contact with central administration to find out how they had learned about their own roles relative to this group. I asked them about the

increased visibility, about their network of colleagues in central administration, about whether this had changed and whether there was a greater mutual understanding between the groups. From the responses I received it was clear that contact had been more frequent, that the network of people whom they were in contact with had expanded and that there was a better mutual understanding by "end users" of "what happens in Admin".

> "Everybody has got a job now. Before there was all this paperwork and you didn't know what was happening. Before you would fill in your invoice and send it to Bremner and what happens there, you didn't know. Now at least you know what is happening down there. Now the call comes back to you, something's wrong and you know what is happening.";

> "You know what's going on that side and they know what's going on here. You don't just delete a purchase order; there's a reason why. You call them up and tell them, look I'm going to do this and this is the reason why. Then they understand why. If they look at it from their side they are going to wonder what's going on so I phone them. Its good for communication."

When adults take on a new role at work, they like that role to become their own completely as there is a certain amount of power and satisfaction to be gained in ownership of roles. Although greater responsibility for administrative tasks had been devolved to "end user" departments, these departments had not been able to feel completely in command of their new roles because of actions in central administration that undermined them:

> "My biggest frustration, and this also applies to the other ladies here, is that things happen down the hill that we are not in control of. It's very difficult to manage your funds sometimes because amounts just come off. This undermines us, Purchasing will do something and I wonder how do they know to charge it to this particular fund? I've queried things but don't get definite answers."

A related issue is where adults looked to for leadership during the process of learning new roles. The question of responsibility for ensuring learning came up in connection with this. While many of the respondents stated that responsibility ultimately lay with the staff member themselves, just as many felt that the responsibility lay with the Head of Department. Others felt that the PRISM Project and the Finance Department were ultimately responsible for leading them to change.

There was some indication that conflict emerged between individuals representing different groups or roles during the initial months after the system went live. Conflict is normal under these conditions and can be used creatively for learning. It is significant that it never seemed to occur between individuals who had the same roles indicating once again that intergroup learning has been the most complex and highly negotiated learning process. The following statements exemplify conflict between "end users" and central administration in the first instance and between academics and support staff in the second:

> "The Prof.'s assistant was handling more than one fund of his and she had done the course but was making the same mistake over and over and was getting quite a lot of flack for that from admin. It was right in the thick of things and admin. was learning to use the thing just as much as we were and so tempers got a bit frayed. Then Prof. stepped in because he didn't want someone from admin. being rude to one of his assistants. It was just over the phone really but it got quite heated. In the end someone fairly high up the hierarchy came and spoke to Prof. and explained the situation, tempers were a bit thin all round. It was an explanation and an apology from admin. It was fine after that."

> "I know of some secretaries who have had snide remarks passed about them because they didn't have the time to process an academic's research entity for them. And I've known of secretaries who were told they were stealing the money out of somebody's research account - and it wasn't so! The guy didn't understand the report. He said "I didn't ask for that" and "I didn't ask for that" ... and she was very upset. There was a lot of ill feeling. In the end he apologised but she is a very sensitive girl and she was very upset, she sat here crying. It has never happened to me because I refuse to work on any SAP R/3 document unless they are standing right here next to me because I feel that its human nature after all ... that is a very negative thing that happened because of R/3. All this creates ill feeling"

I have discussed how people learned about others in relation to carrying out their work. This is grounded in work practices i.e. in the theory of work in use. This is the level at which most learning occurs. But what of learning about the espoused theory of the organisation? Visions and policies of the organisation were publicised and employees came under a moral obligation to accommodate them. While in private they negotiated acceptance of them and may even have rejected them, in public they at least needed to know about them so that they could appear to be in line with policy. This was therefore also an area of learning. The university was undergoing changing

policy in many areas, for example with regard to its faculty structures and teaching programs, employment equity and staff development. The areas of change most often commented on by interviewees was the faculty structure changes and the related issue of job security. Staff were well aware that new policy existed and that change was imminent. However, when I asked them about how they felt about this and other organisational change they tended to voice organisational policy rather than their own opinions. In an attempt to appear politically correct, many stated that they agreed with policy changes being made and expressed the willingness to change in line with policy.

> "About change in general, we are not unhappy, we realise that old structures have got to go. In the 6 years that I have been here, things have changed a lot. I'm quite happy with the way the university is going."

Another common response was to comment that change was relevant for some other group such as younger or full time staff. Comments that *other* people were unhappy with change were also common. Responses indicated at least that they had learned what the polices were and the "correct" ways to behave. When pushed to voice their personal opinions they might have said, "I know I shouldn't say this but ...", however, they by and large kept these to themselves as it felt safer that way. This kind of learning relates to being able to operate in the social environment of the organisation, rather than to carrying out work per se. Learning about policy is therefore not strictly necessary for performing one's work and as a result I found that people's picture of the espoused theory of the organisation was often only partially complete. For example quite a few people did not know the reasons why the university had acquired and implemented SAP R/3 although they were using it daily. These reasons are strongly linked to the university's financial policy and so a lack of knowledge about this policy was indicated.

I have discussed several themes of learning starting with system skills and new lingo and moving on to interpersonal, intergroup and organisational learning. Attendant to the questions of what is learned is another: How *much* is learned? In my experience as a trainer, and through interviewing project trainers, I have come to the conclusion that most people learn just enough to get by. This implies that they learn in order to

maintain a fine balance between their knowledge and skills and what is required of them in terms of their work. This is especially true of the acquisition of computer skills and of knowledge about organisational policy. The fact that interpersonal and intergroup relations were still being negotiated, however, indicates that the balance in this area, a state of comfort, has been more difficult to achieve because so many different people are involved in mutually negotiating it. People do not tend to learn beyond this point of comfort unless they have personal, often non-work related goals in which case they continue to learn until they achieve them.

4.5 Who or what did adults learn from?

Various agents mediate a process of learning. Some of these are officially provided, others are found in contexts where work is actually carried out. This section discusses the use of these agents as found among the interviewees. Before beginning this discussion it should be noted that the interviewees often stated a preference for learning on their own, by "trial and error" as shown by statements like:

> " I don't like the rigid scenario of going on courses. I like to do what I want to do when I want to do it, I like teaching myself"

> "I did this all myself without any assistance. I learned it simply by trial and error, just sitting and experimenting with the package."

This was true for a lot of adults but not for all, and not at all times. In a well-structured environment such as UCT, learning was more often mediated by various agents. These are discussed below.

4.5.1 Human agents of learning

There was a definite preference for learning in a face-to-face situation from another human being. Contact with another person, and human dialogue, seemed to be favoured particularly in the initial stages of learning. Designated teachers and trainers provided this human contact at training courses. Human contact was an important feature of the structured training received and may account for why some people preferred going on courses. Some of the qualities most valued in trainers hint at the

fact that it is the ability of the trainer to relate to the trainees that was just as important as the ability to teach. One of the highest rated qualities of a trainer was simply "kindness" or "friendliness". Openness, the ability to communicate, patience, charisma, a sense of humour and a non-condescending manner were also frequently mentioned. This points to the importance of good human relations for learning as well as to the fragile nature of the adult self- and work identities in a training situation. This type of category was more frequently found when coding the data than categories like knowledgeability, the ability to pace the course correctly, hands-on training or use of relevant examples. Most ideal for human contact and dialogue is one-on-one training, but this is hardly ever possible because of scarce resources. The training team came close to this ideal however with the weekly workshops for staff who wanted to "run through their own financial reports with a trainer". The workshops were run for a few people at a time and places had to be booked so that each person would receive individual attention. The workshops have decreased in size to smaller and smaller groups but are getting ever more popular. Many people mentioned how much they value them, and often mentioned by name the person who runs them.

> "The most beneficial were the one-to-one sessions, phoning up and making an appointment with Liz."

It was implied that this kind of contact was better for their learning than had been the training course on which they had been among twenty others and received only limited individual attention.

Something that was especially valued was contact with trainers after the training course had finished, indicating that continuity of contact was also important. The PRISM Project set up a training team whose success was due in part to the fact that the trainers also operated the help desk. It was very satisfying for "end users" to call the help desk and find themselves speaking to the person who had been their trainer. This brought the usually faceless person at the other end of the help desk line closer. Help desk is an important resource and was used as a second or third port of call by "end users" needing assistance. The human contact was valued by some people who developed close relationships with help desk personnel, often calling daily when they first started to use SAP R/3. The help desk was explicitly regarded as a training

resource by the PRISM Project. Help desk personnel were instructed not to simply give a caller the solution to their problem but to teach them what they needed to know in order to help themselves the next time. Explanations of concepts and functionality were often given. However, the service was a little difficult to reach at times and other sources of human contact and assistance were closer at hand.

A far greater human resource was that of networks of colleagues. This resource was not formalised by the project and operated purely in actual workplace contexts. In informal ways, networks of colleagues supported and taught each other. Interviewees mentioned learning formally from colleagues in workgroups set up in departments but most learning was informal. People learned from colleagues by sharing and receiving information and by asking for and giving assistance. Despite other resources (such as help desk and on-line help) being set up formally by the university, colleagues were nearly always the first port of call when a person was trying to solve a procedural problem.

> "I immediately pick up the phone or go across the passage to see my friend Karin".

There were several instances in the data both of people being asked for and of people seeking assistance from colleagues. Networks tended to include people in similar roles, especially for administrative staff but also included people with technical skills such as the local network administrator. Often a local expert user, usually an administrative staff member, was known and formed the kingpin of the network. I spoke to eight people who were known as experts in their departments. All enjoyed having this identity and possibly responded to my request for interviews because of this. Two quotes from local experts are given below, one who was formally set up as the local expert, the other having emerged as such with time:

> "I enjoy playing the role of assisting people. I tell people about things I discover on R/3. I try to do this as soon as I can but it's not always possible so I "file it away" and tell them when it comes up. I am supposed to be the expert in this department. I was marked out to be that person because I had been handling the accounts all along. I was the obvious one. I do try to make people feel more positive about R/3 because there are certain aspects of R/3 that I think are very good."

> "But in the end, if I may say so myself, I got so good at it that people were running to me. I don't know that I was seen as an expert as such ... the computer liaison officer was regarded as good with R/3 so I can't say for sure if I was regarded that way. I would like the idea if I knew that I was regarded that way myself."

These colleague networks often rested on friendships built up in the course of carrying out daily work and were difficult to formalise. In fact one trainer felt she had no right to formalise these networks because this would constitute interfering in people's friendships. The networks tended to be extensive and highly developed among administrative and technical staff, but not so for academics. Academics tended to call on a single person, usually the local expert or a secretary, for assistance. The training team encouraged the use of colleague networks by mentioning them as a problem solving resource and by encouraging colleagues to work together on training courses. The project also tried to give some exposure to local experts in the PRISM Newsletter.

Contact with another individual is favoured even where assistance is received from remote groups of people. Support networks that included people in central administration are crucial for problem solving and for the learning processes of new staff who don't always receive adequate hand-over from their predecessors. To put this contact in perspective relative to that with local colleagues, it should be noted that the university administration is both physically and culturally distant from "end user" departments. These networks of support were therefore not usually based on friendships between individuals. Networks ranged across departments in the administration rather than staying within one as they do with networks of colleagues. However, relationships with *particular* individuals were favoured and had often become quite friendly without the participants ever meeting. Most respondents said that they preferred to cultivate relationships with one person in the administration and relied on these individuals to help them time and again. Often these individuals were asked for assistance with problems not in their areas, indicating that it was the relationship that was more important than the knowledge the person held.

> "In creditors I only deal with one person, you know they have this alphabetic system there, but I only deal with one person. I address things directly to her and she sorts it out afterwards."

> "I've got a special 'friend' when it comes to orders and that kind of stuff. Creditors ... I know who I can ask for what kind of thing. If she's busy then I will go to someone else. You see, she knows what kind of person I am and she always helps me. We've only known each other since R/3."

The PRISM Project itself has also acted as an agent of learning firstly by setting up the training team but also by the project management getting directly involved in the learning process of the university. The project managers were both formally and informally approachable to "end users". They received many emails asking for solutions to problems or clarity on issues during the life-span of the project. The Change Manager in particular played this role. More formally, an offer was made and widely advertised to all "end user" departments for departmental visits to be made during the difficult period following live date. This fell within the Change Manager's portfolio of communications and change management. Over 125 such sessions took place. These visits took the form of meetings, workshops and discussion forums in which those who had called them could "get things off their chests". Usually it was technical and academic staff, and Heads of Departments who attended these sessions. Unfortunately administrative staff, those who use the system more, were frequently not included and so, unfortunately, staff lower down the hierarchy did not often enjoy the explaining, teaching, and pacifying function of these sessions.

The above discussion dealt with human agents of learning and ranged from individuals acting formally such as trainers to those acting informally such as local expert users. The part in the learning process played by groups of staff in different organisational roles was also discussed. Human agents were preferred in learning but widespread use was also made of non-human resources, especially by staff wanting to work on their own.

4.5.2 Non-human agents of learning

Often the availability of non-human resources is a measure of the extent to which organisational learning has taken place as documents, especially formal ones, stay in the organisation when people leave. Before discussing the documentation that does exist, it should be noted that there was a weak tradition in the university of committing policy and procedure to paper, especially in central administrative

departments. The Human Resources Department has perhaps set the best example with a Staff Manual printed and filed in every department. It is up to date and has lately been made available on the university's web site. The Finance Department, which is relevant to this case study, also had a manual but it was not kept up to date and, although it was distributed to departments, the majority of staff still made a phone call to the Finance Department in preference to using the manual. Many knew of the manual but didn't use it because it was out of date. The result was a culture of dependency in "end user" departments. Interviewees were unable to contemplate finding information on their own without access to the Finance Department and many did not even know of the existence of the Finance Manual. Without using the manual, and with a heavy reliance on access to the Finance Department the habit has developed for staff to carry out their work as they see best and to rely on the Finance Department to let them know personally when they are doing something wrong. This is obviously very inefficient.

> "We still work on doing things our way until somebody reprimands you because you've done it wrong! I don't think I am very knowledgeable, I probably need to learn lots and lots and lots, but to a large extent we go our own sweet way until something goes wrong and somebody notices that its wrong and comes back and says, You can't do that!"

The PRISM Project made an effort to change this tradition using, largely, electronic media to disseminate information. The project had a web site that was used to make the history and mission of the project available and to provide procedural information. A popular newsletter, also distributed on paper, was available on the web site. This newsletter announced events in the project but also dealt with practical issues at the procedural level. Notices are regularly posted to the campus network notice board that is checked weekly by many staff members, making available important information about changes to procedure and policy. It was also used to advertise services such as the departmental visits and training sessions. The training team made use of emails that were sent to all "end users" of the finance module to tell them about changes to procedure. Most staff made selective use of the emails, which were designed to facilitate this. They could easily determine if a message was relevant and focussed on the parts they needed. Many interviewees had printed and kept the messages on file for future reference. These were an excellent source of information necessary for staff

to carry out their jobs and it was risky for a person to ignore such communication from the PRISM Project.

> "I usually just glance at the beginning 5 or 6 lines, if it has something in it that I feel I might need to know, about what's on SAP R/3, then I'll read further. Especially what they say about something new that's been added. If its something new that I want to go and have a look at then I'll print it out and when next I'm on SAP R/3 I'll have a look at it otherwise I'll just delete the email"

The permanent location of all procedural information relating to SAP R/3 and finances was, however, the on-line help written by the training team for use at UCT with SAP R/3. It was decided to use an electronic medium for this information because it was cheaper and could be kept up to date centrally. The on-line help was comprehensive, up to date and maintained to high standards by the training team. This resource for step by step procedural information will continue to be maintained by an administrative office that has its origins in the training team and is separate to the Finance Department after the PRISM Project ends. The on-line help was promoted on training courses and was used almost as much as colleagues as a first port of call when problem solving.

> "With R/3 this is the first place I look for solutions to R/3 problems. Why bother people when they're going to say, You could've found it under the help function".

In many ways the on-line help was the best record of organisational learning in the financial area. Its value overshadowed its disadvantages, which related to practicality of use - it was an unfamiliar medium to many people.

No manual was available on how to use SAP R/3. This method of learning procedural information was commonly used with other packages, especially by older staff members and academics who were familiar with the paper medium. A course manual from the initial courses offered was still being used by some but it had become out of date, with frequent changes being made to the on-line help. There was still a general liking for paper based information so many staff had files in which they kept printed on-line help topics, emails, notice board messages, newsletters and examples of orders placed. They added their own notes to these files, which become essential records of

the work that they did. A departmental assistant who preferred to use a manual commented as follows:

> "Maybe in a manual I would prefer it. To tell the truth, if I don't know something then I've also got my SAP book [his own file] rather than to use the help. With the manual you have the book in front of you. I think that's the reason I like it. I just want to know how the process works and I have got those things photocopied, I don't want to know about the rest, like what is a fund and all that. So I copied certain pages from the course manual. I added some procedures from the help as well and put them in my file."

This informally collected resource was often used by more than one person in a department and would have been a crucial resource for a new staff member. In this sense the files can be seen as records of organisational learning in local contexts.

4.6 How did adults carry out learning?

I have discussed the timing, content and agents of learning for adults in the case study. These aspects of learning were easier for respondents to reflect on than the process of learning itself. Although many could comment on how well they had learned and the fact that they were now more comfortable with using SAP R/3, it was difficult for them to describe *how* it had been to learn, to *not know* and then *come to know* something. The discussion that follows is therefore from the trainer's perspective.

Trainers experienced a preference for hands-on training in adults and an impatience and boredom with conceptual and background information. This indicates that adults like the content of learning to relate directly to their work experience. For example adults didn't want to learn a generic procedure for placing purchase orders, they wanted to know exactly how to perform very specific tasks that they carried out regularly like how to place a purchase order *to a particular travel agent for an air ticket overseas*. They also liked to learn by doing, and more specifically by *having done it right* indicating a necessity for being able to demonstrate their skill. This is consistent with the preference for learning on their own by trial and error and for at least trying something out before attending a training course. This habit reinforces working adult's identities as independent and able, notions they do not associate with

being a learner. What I saw in these preferences is a desire in adults to spend as little time as possible learning, to very quickly reach a state (or at least the appearance of having reached a state) where they were masters of a skill. There was little tolerance for a lengthy process of learning, despite all of the interviewees having said that they saw themselves *as learners*. With the current high profile of discourses of development and life long learning, I believe that the interviewees were attempting to appear morally correct. In practice, the role of learner in work based training seems to be secondary to the role of professional as only this explains the rush to acquire skills at the expense of learning well. This is mediated only by their access to other roles in which they play learner such as being a part time student or researcher. The reason for this was that being good at their work, rather than being good learners, related to their core role – that of being a capable working person.

> "I want to do my job properly. I don't want there to be parts of my job that I can't do because I haven't been on the R/3 course. I would have felt awful because of that; I would have felt like Cinderella probably. Having to send my work to someone else to do … I would have felt so inadequate, can you imagine?! That is what has motivated me. So I see R/3 as very much part of my job. I've got to know how to use it to get my job done properly. I've mastered it and I enjoy doing my work."

Trainers also experienced adults who had a strong dependence on previous experience. Central to the working roles for the different categories of staff that I described earlier is having knowledge and ability that is ready to apply. Adults learning to use SAP R/3 became insecure when their previously acquired knowledge base was threatened by something new. This was displayed in long discussions which disrupted training about their existing work and how it would be replaced by new procedures, about new roles and responsibilities, and about what would stay and how it would be rearranged. Trainers often had to reassure adults by presenting what was new in such a way that similarities to what they already knew were highlighted. This had the effect of making adults more open to learning. The approach was formalised in project documentation with every new (or "to be") procedure contrasted with an old (or "as is") one. This showed exactly where the newness lay and helped learners to identify with and find meaning in what they were being taught. It helped them to feel that they could still rely on what they already knew i.e. that the knowledge base central to their role as adult professionals was not threatened significantly.

4.7 What motivated adults to learn?

There were two kinds of motivators in adult workplace learning. One was related to received attitudes from the work environment, the other to personal goals.

In terms of fulfilling their workplace roles and identities adults were motivated to learn so that they could adapt to changing work conditions and remain capable and expert professionals. This was "reaction" learning, a means of surviving in the workplace. Keeping up with computer technology is a good example of this. For some it was closely connected to their work roles, for example those working in technical fields who needed to keep up with new developments all the time. Researchers also needed to keep up with developments in their fields. For many different kinds of professional, the desire to be efficient i.e. good at their jobs was a motivator for learning. For others the role they have chosen to play at work e.g. "the SAP R/3 expert" compelled them to learn more so that they could maintain this status. This is demonstrated by the following:

> "I don't know for what reason, but they have decided in this building that I know everything about computers. I don't! I probably know less than they do but for some or other reason they have *decided*. It's flattering but scary. But I'm not going to tell them ... when they phone me up I will make a plan and that, in fact, has rescued my days for me. I had to learn every new package that came up because when they asked me, I wasn't going to look stupid! So it's helped me quite a lot."

This may have motivated adults to learn enough to "keep swimming", but it was personal goals that pushed them beyond this.

Personal goals are linked to life plans, and so I asked interviewees what their plans were for their working lives over the next few years. Although some had no goals, or wanted to keep things unchanged, others had plans to bring about significant change. Their goals ranged from retiring to starting a home business, from completing research projects to part time study, from pursuing a career path inside the university to leaving the organisation to pursue a career elsewhere. For some staff near

retirement, who did not yet want to retire from working life, their goal was to keep their jobs for as long as possible. I asked respondents whether they could see learning to use R/3 as something which could further their goals as I wanted to ascertain whether this was a motivating factor in their learning. A few mentioned that it hindered their goals, others that it was unrelated. *Their* goals tended to be academic ones rather than administrative ones, or related to the desire to maintain a status quo. Quite a number of people, however, were able to see learning R/3 as something that could further their goals. *These* goals tended to be starting a home business, improving the efficiency of their work, starting an administrative career outside UCT, or pursuing a career inside the organisation. These kinds of goals encouraged adults to approach learning differently, and pushed them beyond learning the minimum required to survive change. It was difficult to work formally with these goals as so many of them were personal or did not relate to the work of the organisation. Another learning motivator that is personal and individual is a disposition that appreciates stimulation and challenge. A few people mentioned this as a general reason for seeking out learning situations.

4.8 Conclusion

I have discussed various aspects of learning in the organisation by posing a set of questions to the data. I have identified who the learners are and discussed when learning takes place. I have presented the varied content of learning, ranging from system skills to organisational policy and I have outlined the agents that mediate the learning process, both human and non-human. I have described and attempted to explain adult learner habits relative to workplace roles and previous experience as observed by trainers. Finally I have outlined the factors, both those received from the work environment and those which are personal and individual that motivate adults to learn. Quoted examples from the data have been provided and a rich, contextual picture of adult learning in the organisation has emerged.

Chapter 5: Adult learning practices and theory in use at UCT

5.1 Introduction

This chapter returns to the research questions and discusses each, drawing on the research theory and the data. The research questions were:

5.2 What organisational learning took place?
  5.2.1 What new organisational norms did adults need to learn about?
  5.2.2 What is the organisation's theory in use of finances and SAP R/3?
5.3 According to the adult learning model, what adult learning practices were found at UCT?
  5.3.1 What the learners brought to the learning-teaching situation: role and discourse.
  5.3.2 What the task demanded: well-structured and ill-structured problems.
  5.3.3 Building a bridge: what mediators worked for different aspects of the task.

Theories of adult cognition are used to illuminate aspects of the answers to all questions, while role and discourse theory and the adult learning model are used in discussions around the second set of questions. Organisational learning theory is the focus of the first research question. The research questions are answered to the extent that the theory is able to offer explanations and where data was found to illustrate these.

5.2 What organisational learning took place?

In answering this question, the focus is on learning around the financial aspect of the organisation's task and the espoused theory of action that relates to this. In this section I examine changing norms in the organisation and describe how these entail changes to roles inhabited by different groups of staff. Next I discuss theory in use, contrasting

evidence for actual practices with several points of espoused theory. Finally, I evaluate the extent to which learning was encoded in organisational maps and the extent to which it was coerced or avoided. Use is made of the data gathered in interviews, as well as of PRISM Project documentation.

5.2.1 What new organisational norms did adults need to learn about?

Financial norms in the organisation are being self consciously changed as part of a process of BPR (Business Process Re-engineering) of which the implementation of SAP R/3 is a major consequence. The financial area of the organisation is not the only one in which there is change, however this is the focus of the research. New financial norms are being promoted through espoused theory and are being laid down as rules of the organisation. These norms are changing towards a scenario in which:

- there is one integrated financial system;
- a better culture of service among administrative support staff;
- a decentralisation of authority and responsibility for financial processes from central administrative to academic departments;
- increased access to information, especially management information; and
- greater financial vigilance.

  (PRISM Project Strategy Analysis, November 1995)

This scenario contrasts with a situation the university is trying to move away from in which many different and inefficient systems were involved in financial processing. This had resulted in poor communications and duplication of work. There was also a poor culture of service in central administration and centralised authority and control of procedures and information. The final impetus for change came when it was realised that these loose controls on spending had resulted in a serious budgeting error.

The PRISM Project recognised that these changes to financial norms required change (and therefore learning) in several different aspects of the organisation. These included a new approach to human resources in which the management of people, the acquisition of skills and training, job descriptions and roles, service orientation and career pathing came under focus. The university also implemented a performance

appraisal system during this time. A new approach to "tools and materials" was required and the implementation of SAP R/3 (in this context - a "tool") was seen as a "key enabler of change" (PRISM Project 1995, p4). Change was also crucial in the area of processes and procedures, for example purchasing, which needed to become less paper-based and more automated and needed to involve on-line budgeting and the checking of funds availability on placing a purchase order. It was recognised that the devolution of authority and responsibility to "end user" departments required a change to the role of Departmental Head as well as that of Academic, and any other workplace role that involved the management of funds. Finally, it was recognised that some of this would require the shifting of processes between departments, and a possible re-examination of existing hierarchical structures (Ibid.).

The SAP R/3 software itself has enforced some of these norms, for example funds availability checking. Others have been harder to enforce as they have relied on a change in culture, or on compliance with new rules. The culture of the university would not tolerate forced compliance; it has a culture of individuality and independence in "end user" departments, especially among academics, which has meant that new norms have not been slavishly complied with. There is also a sense in which financial norms are being self-consciously changed without the underlying cultural assumptions changing. It was hoped that a change in culture would follow a change in norms however, in practice, unchanged culture has tended to pull theory in use back towards the old espoused theory and habits, and away from the new espoused theory.

Argyris described a situation where not only theory in use needed to change but also underlying norms and assumptions of the organisation as one of "double-loop" learning. At UCT, the enquiry into new norms occurred, as Argyris suggests often happens, at management level. Later other sections of the organisation like academics departments began the struggle to bring their norms in line with that of management, in the process revising theory in use. There certainly was evidence of the inter-group and inter-personal conflict that, according to Argyris, often results from the stress involved in making such a change. Inter-group conflict occurred between administrative and academic staff in "end user" departments around changing roles and workloads, and between "end user" departments and central administration

around issues of procedure, efficiency, service and the devolution of responsibility. All of these points of conflict were anticipated by the PRISM Project when it recognised that roles and responsibilities would have to change. The project managers often had to mediate in conflict situations. Not all interactions between groups resulted in outright conflict however, in fact interviewees were reluctant to classify some episodes as conflict, stating that they saw them rather as problem solving and learning situations. There was also evidence of the collaboration between groups of which Argyris wrote, collaboration in which members of the organisation strove to reconstruct their "mental maps" of the organisation and their place in it. In so doing they reconstructed their understanding of their roles and those of others. This is the process of "continual, concerted meshing of individual images of the self and others, of one's own activity in the context of collective interaction" of which Argyris wrote when he described how theory in use comes to change. It is also the process of problem solving, particularly of ill-structured problems, which Strohm-Kitchener describes.

5.2.2 What is the organisation's theory in use of finances and SAP R/3?

In order to answer this question, it is necessary to outline espoused theory in the organisation, as theory in use is given shape by the epistemology under which it operates. Espoused theory for finances and SAP R/3 is only one aspect of espoused theory at the university. The university itself has a mission statement and an espoused theory that operates at a higher level. There are a few points in the espoused theory of finances that refer to points in the university's espoused theory so in a sense it is the overarching epistemology under which the espoused theory of finances finds its own truth.

The espoused theory of the organisation for finances and SAP R/3 encompasses the new financial norms I mentioned earlier. This theory is summarised in the PRISM Project's objectives (see Appendix 1, p1). According to this document, the espoused theory of finances and SAP R/3 is that the university has a streamlined, integrated and efficient financial system that is put into practice using SAP R/3. There is improved financial vigilance and better management information available. The responsibility for funds is increasingly held by end user departments in line with the university's

structure and ethos. Administrative staff in central departments are increasingly developing a culture of service to end users, who have been empowered through their greater involvement in business processes and increased responsibilities. These staff have been able to maximise their skills and abilities through learning to use SAP R/3.

As might be expected, the research process brought to light a different picture of the organisation's theory of action. This was the theory of action *in use* and this difference, as suggested by Senge, was to be expected as a function of the creative tension between espoused theory and theory in use. Although espoused theory applied to all sections at the university, theory in use tended to be context- and role specific. Theory in use is vast and complex, as well as situationally specific, and I do not attempt to cover all of it in this discussion. The dicussion concentrates on contrasting the actual working practices of adults in the organisation with major points of espoused theory.

5.2.2.1 "The university has a streamlined, integrated and efficient financial system"

This point of espoused theory is certainly true in practice, especially relative to previous systems. However it should be borne in mind that theory in use for "end user" departments does not have the same outlook on SAP R/3 that theory in use for "functional departments" has. "End users" see particular transactions on SAP R/3 and don't have the opportunity to appreciate the integration seen in "functional" areas. I did, however, find a common recognition that SAP R/3 has given UCT a better, more integrated financial system but this was an acceptance of espoused theory, a taking of its word at face value, rather than something they themselves experienced. Most illustrative of this were comments that SAP R/3 is a system that is "good for the university but not for me". This kind of comment recognises the integration and power that SAP R/3 brought to the university's financial systems but qualifies it with theory in use which finds it *overly* powerful and complicated in terms of the everyday tasks done by most administrative staff in "end user" departments. These everyday tasks are the site of theory in use.

Theory in use also holds that, while system efficiency is certainly good, it is meaningless without human efficiency. The university's administrative processes remain bureaucratic and there are many manual procedures that surround those carried out on SAP R/3. According to theory in use these manual processes are not as efficient as they could be and SAP R/3 tends to show this up. The perceived degree of "streamlined, integrated and efficient" processing has also been damaged in certain areas where there have been particular, contextual problems during the implementation. I found this to be the case with the Chemistry Store, and to some extent with the Library. In addition, there are problems with year-end procedures that tend to damage the perception that R/3 is streamlined and efficient for staff who have encountered them, or who have the financial knowledge to understand them. In general however, this point of espoused theory does not differ too much from theory in use. There may be a "gentle" cynicism about it, especially among academics, but it has played the role of setting a standard for staff to work towards, especially in "functional" departments, and on the PRISM Project.

5.2.2.2 "The university practices financial vigilance"

This was a point of espoused theory that referred to the overarching espoused theory of the university, which has changed to reflect a new norm of accountability. This accountability is sometimes more financial than ideological. According to the director of Research Support Services (a "functional" department), the university's current mission statement recognises an economic climate in which it has become necessary to assess the cost of activities on campus. The demand for accountability has resulted in an array of costing activities including new budgeting exercises, with detailed allocation of costs and the need for writing up strategic planning documents in all departments. These activities are an attempt to focus the collective mind of the organisation on research activity, especially, in which there is no "waste". This is also the philosophy behind the devolution of responsibility for finances to "end user" departments. Where financial responsibility was centralised, costs became blurred to the "end user" community and this, together with deferred responsibility for spending, contributed to the previous culture of loose financial control. A new culture is emerging in which there is a recognised need for thorough and careful costing so that the allocation of resources in the university will support activity which is considered

to be worthy in terms of the overall objectives of the university. If, as suggested by Argyris, theory in use is encoded in organisational maps, and these maps include the physical organisation of the university, then there is evidence of financial vigilance becoming part of theory in use. The university has approved, in a few experimental cases, the position of Financial Manager in a department. I interviewed one such person. There are also new Financial Manager positions in each of the faculty offices that are currently being set up. This supports in everyday, practical terms (i.e. theory in use) devolved financial responsibility in faculties and departments of the university.

This change in norm has been a fundamental one for members of the organisation. Perhaps the most obvious way they experience it in terms of their daily work on SAP R/3 is through funds availability checking. In this way, vigilance has been controlled by the software itself, and may account for why some people found the system very "rigid". They no longer have the room to play that was allowed on the previous, manual purchasing system. The functionality has prevented overspending and has brought about an awareness that one may only spend what one has in one's budget. This functionality was most frequently mentioned as a reason why the university acquired SAP R/3 (as understood by the staff member). Most staff regard this functionality positively, commenting often they thought it "a good thing". This indicated to me that funds availability checking if not other forms of financial vigilance had become part of theory in use. It was easy for staff to understand why the functionality existed, and they accepted it happily for the most part. Not so with the budgeting process, however, about which I heard many complaints. This indicated that they had not "bought" the espoused theory fully.

Financial vigilance in theory in use is undermined only in a few instances, and mainly among staff in "functional" departments or those with better technical or financial knowledge. These staff may understand that budget on SAP R/3 is an artificial figure, and that there are still ways of getting around it, for example there are bridging funds, and funds that allow retrospective spending for staff who have run out of budget. In effect this means that overspending is still possible. At the time of writing this, there is also no funds availability checking on staffing costs, a major expense in the research area. This has undermined financial vigilance in theory in use to a small extent and resulted in some confusion in SAP R/3 reporting but for the most part

greater accountability has become part of theory in use and is reflected in organisational maps.

5.2.2.3 "There is better on-line information about finances available to staff"

Staff agree that this is the case, at least theoretically. They appreciate having on-line access to up-to-date financial information, instead of having to wait for printed reports to be sent to them monthly, and to consequently be out of date. Most interviewees agreed that there is greater visibility in the financial area in general. This aspect of theory in use came not only from functionality in SAP R/3, but also from greater contact between "end user" and "functional" departments, and the consequent greater awareness of "what goes on in Admin".

As is nearly always the case, however, theory in use fell short of the ideal set up by espoused theory and this was mainly for practical reasons, not anticipated by the PRISM Project and the training team. SAP R/3 reporting, through which much of the on-line financial information is made available, has not been used to its best advantage. I have already mentioned that organisational learning has been poor in this area. Some staff simply don't want to use the reports for on-line information because they do not want the information itself. The rationale behind this is that staff do not want to be "accountants", they want to remain "secretaries" or "academics" i.e. they are resisting accepting and learning about a new role. For others, the problem is even simpler; they find the reports difficult to use in terms of their "system skills". In order to gain the full information available in a report, one often has to manipulate it to display certain factors, columns or aspects of financial information that are not apparent when the report is first displayed. Or, to get specific details, one has to "drill down" from items displayed on an initial screen to another screen. Many people find the reports hard to use for this reason. For some the on-line medium is uncomfortable and they prefer to use a paper-based medium. While the reports can be printed out, this undermines the up-to-date, dynamic nature of the on-line medium, thus also undermining the quality of the financial information. The fact that staff have not learned to use the full functionality available in on-line reporting on SAP R/3 is an example of how people learn just enough to get by, and no further. In general, however, theory in use comes quite close to espoused theory when it comes to better

on-line information. However, this is undermined on a very individual basis by the level of "system" skills and the disposition to learn of individual people. This effects the degree to which on-line information is "better" for an individual. The accuracy of on-line information also depends on information having been captured timeously and this has sometimes not been the case.

5.2.2.4 "The responsibility for funds is increasingly held by end user departments in line with the university's structure and ethos"

The source for devolved financial responsibility has already been discussed. This particular point has been accepted to a relatively limited degree in theory in use. Devolution hinges on a change in norm, which requires work roles to change quite significantly. These roles are still being learned and negotiated, and consequently theory in use, at this point in time, differs significantly from espoused theory. For one thing, staff are not very aware of the university's espoused theory in this area, their daily work is quite far removed from it. In terms of renegotiating their roles to accommodate greater responsibility, most staff, and especially academic staff and Heads of Department, do not want greater financial responsibility. They often argue that it is not appropriate in light of their *existing* workplace roles, indicating that roles are not changing easily. Administrative staff and technical officers argue that the increased burden of work brought with responsibility is unacceptable. So while they have been forced to take on greater responsibility, it has not become part of theory in use to the degree that was hoped because underlying norms and assumptions have been slow to change. The "ethos" of responsibility is also undermined by the fact that final authority and the ability to post transactions in a fund still reside centrally in the university. The rolling out of responsibility has therefore been limited as a result of an unchanged culture of central control that acts like a gravitational force to pull responsibility back to central administrative departments. Some tasks, for example the purchasing of assets, have even been taken back by central admin departments after having first been rolled out to "end user" departments. Overall, theory in use does not signify that responsibility for finances lies with "end user" departments, although technically, and to a limited degree, responsibility *has* increasingly come to lie there.

5.2.2.5 "End users have been empowered through their greater involvement in business processes and increased responsibilities."

This point is difficult to evaluate in terms of theory in use because the word "empowerment" is not one that exists in the discourses inhabited by most administrative staff at the university. The term has currency at the level of the espoused theory of the university with its roots in the anti-apartheid struggle. Even there, however, the term has been devalued through over-use, and would only have meaning for administrative staff where they had access to the "struggle" discourse, or perhaps to Feminist discourse, through an organisational or societal role other than their core work role. I did not interview any person who seemed to have such a role to draw on, and in fact most interviewees were confused by the term. They either could not say whether they were empowered or not, or said that they were definitely not empowered.

The latter comment spoke of the increased workload and unwanted responsibility rather than disempowerment itself. The term empowerment carries positive connotations, and many interviewees did not feel at all positive about SAP R/3. Perhaps one could also conclude that the process of implementing a new computer system, and of dealing with extensive organisational change itself is disempowering in that it shakes up old ways of doing things and results in stress which certainly is experienced as disempowering by many. The fact that members of the organisation felt stressed and disempowered indicates a weak ability to solve ill-structured problems at the epistemic cognitive level. The only exceptions to this that I found were among younger staff who felt empowered because they could use their SAP R/3 skills, which are very valuable in the marketplace, to advance their careers outside the organisation. This does not, however, relate to theory in use for their existing work.

Some secretarial staff who craved the status and power that is generally not inherent in that occupation did comment that they felt empowered by SAP R/3 and increased involvement in financial tasks. Again, they tended to be younger rather than older. It is difficult to draw conclusions about theory in use from this kind of data. Further research is needed, particularly in the area of epistemic problem solving, but for the moment it is possible to say that theory in use seems to hold that staff are *not* personally or professionally empowered by the implementation, by SAP R/3 or by

increased involvement in financial processes. Staff are only empowered when they themselves see things that way.

5.2.2.6 "End users have been able to maximise their skills and abilities through learning to use SAP R/3"

What does it mean to "maximise one's skills"? The phrase implies that skills are taken full advantage of, that the most is got out of them. It also implies that skills are extended, augmented, raised or boosted. This implies an enhancement of skills, a taking of skills beyond a rudimentary level. Certainly staff have had to acquire new skills and knowledge to work with SAP R/3 and sometimes this has been quite extensive especially for staff who had no prior accounting knowledge. There is no doubt that the availability of SAP R/3 skills in the organisation increased dramatically with implementation and in the year that followed as staff learned to use the system. The interviews showed that computer skills are increasing dramatically in general, especially for secretarial staff, and that staff feel relatively comfortable now with using the system. Theory in use holds therefore that news skills have been gained and are being used.

The degree to which these skills have been "maximised", however, is questionable. In the experience of the PRISM Training Team, people tend to learn just enough to get by and this does not support espoused theory as there is no sense in which "getting by" can be seen as "maximising" skills. Piaget's model of equilibration supports this finding. The task of using SAP R/3 for reporting and purchasing does not demand that a person's skills be "maximised" in the sense I defined above, so in meeting the demands of the task this will not take place. The exception was found among expert users, those who took on the role either officially or unofficially of expert and advisor in a particular context. These people tended to update their skills, and make it their business to find out about anything new, to solve any problem that a colleague had. *This* was more like "maximising" a skill. For them, it was not equilibration that motivated their learning, but probably narratives found in figurative schemes of the self-structure. Needing to fulfil a role derived from the Ego-Milieu ("the R/3 expert"), or to satisfy a self concept (for example "computer fundi"), or to bring about a life plan (for example "leave UCT and become an accountant") elicited the will which would have acted to drive their learning beyond a rudimentary level, i.e. to

"maximise" their skills in the true sense of the word. Thus theory in use around skills differed for individuals depending on unique roles and expectations. Overall the learning processes of hundreds of organisational members added up to good levels of skill in the organisation for using SAP R/3. However, it cannot be said that these skills have been maximised in the true sense of the word.

5.2.3 Evaluating organisational learning

One way of measuring organisational learning is to investigate the extent to which new norms and procedures have become bedded down in organisational maps. These maps crucially indicate organisational- as opposed to individual learning. There was an existing culture of dependence in the organisation on central administrative departments for information about policy and procedure. This dependence was conducted via networks of support and through email and telephone conversations. The finance manual was hardly used and had admittedly become out of date, many administrative staff in "end user" departments being unaware of its existence. There is now a recognition in central admin departments that they need to move away from this culture to one of independence, in which staff help themselves by using written procedures and information made available to them, for example on the university web page. Consequently, there is now an interest in bringing the finance manual up to date. However these efforts are yet to change the culture of "end users" towards one of independence and self-reliance.

The PRISM training team put a great amount of energy into developing on-line help for use with SAP R/3. This resource documents new procedure, and to some extent new policy. The on-line help is evidence that organisational learning has taken place, as procedure and policy are bedded down in this particular organisational map. However, the continued reliance on networks of colleagues in central admin indicates that underlying culture has not changed. Argyris did not write about a situation where theory in use is encoded in organisational maps but where organisational culture dictates that members of the organisation make only limited use of these maps. Consequently it is difficult to judge organisational learning against his criteria. It seems that greater learning was concentrated among those who wrote the documentation and among those who have opted to use it. I would have to conclude

that organisational learning has taken place at a procedural level, but not at a cultural one. It is a concern that staff do not rely on organisational maps as this means that organisational learning will not reach all members. Perhaps the files that so many staff have compiled for themselves out of official and unofficial documents are stronger evidence of organisational learning being encoded for particular contexts.

Argyris cautioned that circumvention of incompatible requirements and coercion of organisational members through power imposed in a top-down fashion does not constitute true organisational learning. There is some evidence of the former condition, especially in the area of reporting. The project acknowledges that management reporting, and individual reporting requirements have not yet been met by SAP R/3 (See Appendix X, p5). An executive reporting module is being implemented and may satisfy some requirements but the interviews indicated that ordinary reporting requirements are also not being met. This is because firstly, staff have not learned to use the reports properly, as they require system skills and financial knowledge that have not been insufficiently developed. Secondly, a report was developed by the IT department to work from SAP R/3 and this report mimics an old report that was used under the previous system. This report – the Ad Hoc Line Item report – was mentioned as being the one most frequently used by interviewees. So although the report runs from SAP R/3, the fact that it mimics an old format (and that it is so popular) indicates that there has *not* been a paradigm shift to SAP R/3 reporting formats by members of the organisation. There were also a few cases where staff were still maintaining their older systems for tracking funds, either on paper or in another computer system *in addition to* using SAP R/3. This was often because they still did not feel comfortable using SAP R/3 reports or because those reports did not present figures in the way they required. These practices indicate an avoidance of SAP R/3 for financial reporting (in the way that the system requires it be done), as these requirements are incompatible with those of UCT staff. Avoidance of R/3 for reporting in favour of using old or alternative systems would probably be classified as "circumvention" by Argyris and as such indicates that organisational learning has been poor in this area.

The hierarchical nature of the organisation tends to suggest that coercion into change, through it being imposed in a top down fashion could have been the case. It is

interesting to note that although outright coercion is not acceptable in UCT culture, this is nonetheless what took place. Although the project made the effort to get staff to "buy into" SAP R/3 and new norms of financial vigilance, there was no doubt that they had no choice but to comply and that the change was imposed from upper levels of the university administration via the PRISM Project. Many comments were passed in the interviews about this fact. The resentment that some staff feel about central admin undermining the new responsibility of end departments by posting transactions in their funds seemed to me to also be about power. It was as if they resented having been coerced into taking responsibility for their funds, only to find that their authority could be undermined and that central admin still held the ultimate power. The top down fashion in which the system was implemented also constitutes a reason for the resistance to SAP R/3, especially among academic staff. It is very difficult however, and beyond the scope of this study, to measure the effect of coercion on the nature of individual or organisational learning.

5.2.4 Conclusion

The analysis of organisational learning began with a discussion about new financial norms in the organisation that staff were required to adopt. It continued with an examination of the organisation's theory in use of finances and SAP R/3. This was explained in detail by contrasting it with certain key aspects of espoused theory. The gaps between espoused theory and theory in use have been discussed and the degrees of creative tension or real divergence between these extremes have been noted. Organisational learning was also evaluated in terms of the extent to which theory in use has become encoded in organisational maps, and in terms of any evidence of circumvention of learning or coercion. It is important to note that the organisation has been going through a process of double-loop learning that is essentially unfinished, this analysis has therefore been conducted at a point in time that is within the learning process.

5.3 According to the adult learning model, what adult learning practices were found at UCT?

The adult learning model is comprised of three elements: the learner and what they bring to the learning-teaching situation, the task and what it demands and the agents that bridge between learner and task. The analysis is broken down into three sections that discuss a key issue around each of these elements.

5.3.1 What the learners brought to the learning-teaching situation: role and discourse

Of the endogenous factors that adults bring to the learning-teaching situation, functional cognitive capacity, existing knowledge and experience, self concept and life goals are the most important for learning. Of the exogenous factors, workplace role and discourse are key. This discussion focuses on workplace roles and discourses as exogenous factors that are brought to learning, and that can have a significant influence on the learning process. The most important roles in this discussion are those of "learner", "adult" and "professional". It should be noted that the role of "learner" is still associated with scholars and full time students, and adults associate learning with stereotypical images of these.

For most working adults, the role of "adult" is fundamental and primary, and will be inhabited in most aspects of the person's life. The role of "professional" is also primary in the organisational context and usually does not conflict with the role of adult, although this depends on the particular work role. The role of learner, however, is secondary and is temporarily and reluctantly inhabited, especially in formal learning-teaching situations. Such situations, as opposed to informal ones, create a space in which, temporarily, the role of learner becomes primary and this brings it into direct conflict with other primary roles such as "adult" and "professional". At UCT many adults were prepared to go along with this change in primary role, temporarily suppressing role conflict, but others had difficult with this. Probably, this was exacerbated by the fact that they were involuntarily in the formal learning situation. This involuntary status was a key factor for many adults in their approach to SAP R/3. The data showed that adults like to remain in command of any learning they

need to do, preferring to decide without being told by anyone else that they need to attend a course. Being involuntarily in a formal learning situation undermined this command (a disposition consistent with the role of "adult") that they normally have when volunteering for training. Role conflict was therefore both due to having to make the role of learner primary, and due to having their role as "adult" undermined through attendance being involuntary.

While most adults complied with the requirement for training, and were willing to be learners, if not completely comfortable with this role, others displayed behaviour that indicated role conflict. This behaviour ranged from not respecting the spatial and temporal boundaries of the formal learning discourse to interrupting the teaching program with their concerns about changing role and discourses in the workplace. Often the content of learning highlighted the fact that roles and discourses were changing and the trainer sometimes had to deal with heated discussion among attendees about new work requirements and responsibilities. Fairly often, attendees would ask whether it was necessary to learn something, as it did not apply to the work they currently did. This behaviour indicates that the adult's main concerns in the learning teaching situation were with their core roles outside of it. I do not wish to imply that adults should not relate new learning to roles they occupy outside the formal learning-teaching situation, only to show that in learning, these roles are their primary concern. The data also showed that adults do not like trainers who patronise them, and prefer those to whom they can relate as equals or who allow them independence in the formal learning context. These findings are also consistent with adults favouring their role as "adult" over that of "learner". Trainers were aware of this to some extent, and the attempt to always relate new content to existing knowledge and experience, was effectively an attempt to "speak to" their working identities by bringing that role into the learning situation.

The way in which adults tended to rush learning is also explained by referring to role conflict. When they are in a position of not knowing, it is the role as learner that is brought to the fore. As soon as they can demonstrate that they have mastered a skill, however, this role recedes and they are once gain masters of their work, which brings the role of "professional" to the fore. Adult learners avoided following step by step instructions which they felt slowed the learning process and showed them up as

novices and learners. They often performed exercises in a rush, almost blindly, and without referring to notes. Cognitively this indicates a rush to abstract information from the smaller steps and elements first encountered into a single scheme for a task. This is a natural process in learning, but normally happens more slowly. The fact that adults tended to rush this process indicates an awareness of meta-cognitive processes.

By contrast, informal learning, which occurs on the job, does not present the same level of role conflict. With learning on the job, the working role remains primary as the context requires it to be and does not introduce the conflicting role of learner in a formal way. When working out a problem or learning new procedures, either on their own or from colleagues, adults retain their working identities as primary and this is more comfortable for them. The command, mentioned earlier, is easier to retain in self-motivated learning, for example using a "sand-pit" database or training materials geared for self-teaching. There was certainly a demand for this kind of training facility, but the PRISM Project decided not to take that route as it is less well controlled.

SAP R/3 can be seen as a new object that appeared in various discourses at UCT alongside other physical aspects of workplace technology. Ultimately it effected almost all staff and in so doing, penetrated almost all discourses in the university from financial to academic, from social to administrative. In order to renegotiate membership of those changing discourses, adults had to learn to use that tool or risk losing membership. In fact, some opted out of this learning process and left the organisation but most stayed and learned to accommodate SAP R/3 in their working roles. First, SAP R/3 had to be accepted as a legitimate object in workplace discourse and this meant that it had to fit the overarching epistemology of the discourse. The academic discourse is one that rejects administrative tasks and because SAP R/3 is an object that relates to administration, its status and therefore the need to accommodate it, was undermined by the existing epistemology. Effectively, academics were able to protect their membership of the academic discourse by framing this new object as one that was not of primary importance to them. Generally academics have been the most unwilling learners, not because they do not have access to a discourse of learning, but because they do not see administrative work as being part of their core role. Technical Officers were under greater pressure to accept SAP R/3 not because their core work

was administrative but because their core work was often technical and they needed to demonstrate that they could accommodate new technology in order to show that they were technically proficient. This was especially true for technical officers on the computing side such as computer lab supervisors and network supervisors. Technical officers could be willing learners, but only where their core work required them to demonstrate computer related technical ability. Secretarial and support staff had the least choice when it came to learning SAP R/3, as their core role is administrative. They needed to demonstrate that they could use the system to retain membership of the administrative discourse, indeed to keep their jobs. Administrative staff were the greatest in number among those staff leaving the university as a result of having to use SAP R/3. It was also interesting to note that it was this group that kicked the hardest against changing roles brought about by SAP R/3's requirement that they be able to work with financial figures. This indicated that although they accepted it as a legitimate object in the administrative discourse, they rejected the role changes that it brought to that discourse. This effected learning, especially following formal training and while learning was being solidified in the workplace. Many of the issues of devolution and of changing roles and workloads, especially between administrative and academic staff were not yet fully evident when the original, formal training courses were run. They therefore did not effect learning when staff were introduced to the technology, but played themselves out in the workplace and the learning process that followed in that context.

Perhaps the strongest evidence for the importance of roles brought to learning comes from the local SAP R/3 experts. These staff were often identified prior to training, or otherwise emerged in the first year after implementation. They were required by their role as expert to be willing learners, to be able to find solutions to SAP R/3 problems, to keep themselves up to date and to make sure that they had a good understanding of SAP R/3 functionality. Their learning was motivated by the fact that they inhabited a role as local expert. It also meant that they were more likely to volunteer for formal learning situations and that they were more willing to adopt the role of learner as it complemented that of local expert. This role crystallised the organisational goal of learning SAP R/3. For other staff, the desire to improve their efficiency at work motivated learning. In both cases, this related directly to their roles as "professional", which would have supported their stepping into the role of learner temporarily. Other

staff were motivated by roles they had uniquely adopted such as "computer fundi" which required that they keep abreast of any new computer technology in their environments. In these cases, a role that was brought to the learning-teaching situation was complementary to that of learner and this made the role of learner easier to inhabit.

5.3.2 What the task demanded: well-structured and ill-structured problems

The learning task had many facets, but could be summarised overall as learning to use a new computer system for financial processing and reporting. Each adult in the organisation had to approach this task and recognise what it demanded in terms of new knowledge and skills relative to their existing skills and knowledge. For most, however, the newness of the task lay partly in content, but mostly in form. Most staff were already familiar with an existing purchasing procedure on a paper based system, with SAP R/3 they had to learn how to carry out a similar process in a new form, namely an on-line computer based system. The financial reporting side of the task presented unfamiliarity equally in form and content as most staff had very limited financial knowledge and had only dealt with one paper-based financial report. The greater overall unfamiliarity in form than in content required an approach to learning that emphasised system skills and conceptual knowledge that could be applied generally. This approach was used by the PRISM Training Team but it was found that adults in the workplace, probably because of the roles they brought to learning, tended to prefer procedural instructions that were directly related to their work. This meant that they did not acquire generic skills initially and often had a poor conceptual understanding of the system outside of the specific tasks they carried out. This is also why learning in the area of reporting has been poor. SAP R/3 reports cannot be used in a strictly linear way; they require a general understanding of system functionality and of accounting principles and need to be used flexibly and creatively. A preference for procedural instructions and a resistance to conceptual topics meant that adults dealt better with the content aspect of the task than the form one.

Strohm-Kitchener identifies well and ill-structured problems and describes how these are approached differently by learners. There were both well and ill-structured aspects to the learning task at UCT. In the last chapter I presented a diagram listing the

various themes of learning. I present this again as Diagram 8, this time indicating what kind of problem, whether well- or ill-structured, the different themes are.

From the diagram it can be seen that well–structured problems tend to be the least complex and are best solved using memorising and computing mental operations. These problems also tended to be handled in formal learning situations. Solutions to ill-structured problems tended to be sought in informal learning situations, to take longer to solve and to be far more complex requiring higher cognitive operations than simple memorising.

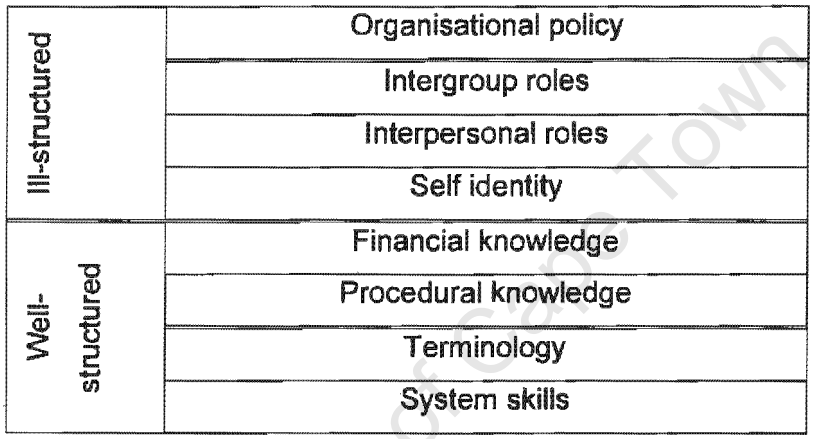

Diagram 8 – Themes of learning as types of problem

The first level of problem solving, called cognitive processing, involved acquiring system skills and SAP R/3 and financial lingo and memorising new procedures for carrying out tasks. System skills were soon learned (over three to six months) and could be applied all over SAP R/3 as the interface is standardised. SAP R/3 and financial lingo took a little longer for staff to become familiar with, but again this was soon acquired. Learning new procedures also required memorising, but the cognitive operations were more complex as variations had to be taken into account. To a limited extent staff were also able to find their own ways to carry out purchasing tasks.

The metacognitive level of problem solving involved monitoring strategies for learning and judging their success or failure. There was plenty evidence for this level of cognition in the data. The way in which staff used voluntary training events indicated that they chose these as a learning strategy, at a time that was most advantageous for them. The demand for refresher courses and they way in which staff

slowly came to use the funds reporting workshops indicates that they judge the use of these resources as good strategies for learning. Staff also strategised around learning SAP R/3 by keeping their own filing systems of procedure to which they could refer. These files, many of which I saw in the interviewing process, were often organised in a highly individual way, indicating that the adult had worked out his or her own method for keeping and referring to information. Many staff also explained to me that taking notes, and keeping examples of completed orders, was the best way of learning. Staff were not officially encouraged to do this, so the fact that they did indicated independent strategising around learning. The way in which staff decide between using resources of support such as the on-line help, help desk and networks of colleagues also indicates metacognitive strategising. A definite pattern could be discerned in the way these resources were used, and under what circumstances. Talking to colleagues was perhaps the most often used strategy for learning. This interaction involved both talking in the tea room about how they felt about issues around the implementation and asking colleagues to help them solve procedural problems. From keeping notes to "having a moan" in the tea room, from attending workshops to calling the help desk, these behaviours all indicate that staff have been very active at the metacognitive level to strategise around learning and to assess when and how to use these strategies.

Epistemic cognition refers to monitoring the epistemic nature of a task, paying attention to the value of solutions in a particular context. The espoused theory of finances and SAP R/3, together with the espoused theory of the organisation, embody the epistemology of the organisation. They provide the limits within which staff can find solutions to problems and in the case of UCT needed to be monitored carefully as they were also changing. The fact that adults observed political correctness in interviews indicated that they understood what was acceptable in the UCT context. When staff said that they knew a procedural solution they had found was not generally acceptable, this also indicated that they were able to relate their solutions to the epistemology of finances at the university. But they had difficulty consciously describing this epistemology, and there were gaps in their knowledge about the espoused theory of finances. This implies that they do not learn epistemology in a conscious, objective way, but through feedback from other people, or from documentation in their environments. Adults were definitely actively engaged with

the task at an epistemic level, but to a lesser degree than metacognition and for some staff more than others. Managers for example were more likely to be engaged with a task at the epistemic level being more in touch with university policy and its implications for their staff.

5.3.3 Building a bridge: what mediators worked for different aspects of the task?

It is often assumed that formal training courses offer the best kind of mediation and given that this is the bread and butter of adult educators, it is not surprising that other forms of mediation, over which educators have little control, are not as well understood. However, given the fact that adults have certain role derived problems with formal learning situations, and given the fact that a course lasts for perhaps a few mornings when most learning occurs on the job over extended periods of time, these other mediators need more research attention.

At the time of writing this dissertation the bridging process at UCT was not complete, especially for ill-structured aspects of the task such as learning new roles and adopting new organisational norms. Such problems take longer to solve than well-structured ones, and the agents of those learning processes are not as focussed, or as directed as formal ones. In the previous chapter I wrote about the various agents of learning, ranging from several forms of human contact to various kinds of inanimate support. I list these again in the table below, stating whether they are formal or informal agents, what areas of learning they serviced best and whether they addressed well- or ill-structured problems.

Type of mediator	Formal/informal	Worked well for ..	Well/ill-structured
Designated trainers on training courses	formal	procedures, concepts, policy	well-structured
Help desk	formal	procedures, policy	well-structured
PRISM Project	formal	policy, roles, epistemology	ill-structured
Networks of colleagues	informal	procedures, policy, roles, epistemology	well & ill-structured
Policy documents, missions statements, visions	formal	policy, epistemology	well & ill-structured
Procedure manuals & on-line help	formal	procedures, policy	well-structured
Own notes and files	informal	procedure, policy	well-structured

Diagram 9: Mediators of learning

From the table it can be seen that different mediators address different aspects of the task. No one form of mediation, least of all formal courses, can address the full spectrum of learning demanded by the task. Procedural and financial knowledge, through which system skills and terminology are also taught, are best mediated formally through training courses, help desk and documentation such as the on-line help and finance manual. This mediation can continue informally through networks of colleagues and by way of the notes and documentation kept and referred to by staff. Intergroup and interpersonal roles and working identities were best mediated formally by the PRISM Project, which disseminated policy information and reformulated roles by being the agent through which devolution of financial responsibility was brought to departments. As these new responsibilities were taken up in departments, the process of negotiating roles and responsibility in interpersonal relations was continued informally amongst colleagues and associates. This was a major aspect of the task, and being an ill-structured problem, signified that extensive learning was required in informal contexts. Sometimes the PRISM Project was called in to resolve issues in informal workplace contexts, maintaining their involvement in bringing about role change and taking it to the informal context in which it was being negotiated. Organisational policy was promoted through formal means such as training courses but was ultimately best mediated through policy documents and statements of vision. These had obviously reached staff but their understandings of it were passively expressed and incomplete, indicating that this was perhaps not the best medium for learning. However, as the epistemology of the university changed and was taken up by staff they would have provided feedback informally to their colleagues by endorsing or rejecting certain behaviours or opinions according to the "truth system" now in place.

This discussion suggests a dialectic interchange between formal and informal mediators that is essential. One mediator stands out as being the most widely applicable and consistently used, that of networks of colleagues. But it has to be said that this agent of learning relies on the prior involvement of more formal mediators such as PRISM Project intervention, training courses, documentation and help desk. There is no doubt that while colleagues play a vital and underestimated role in mediating learning, they could not do this alone.

5.4 Conclusion

Two main research questioned have been answered. The first asked what organisational learning had taken place at UCT. I discussed the process of double-loop learning by emphasising both the norms and procedural information that needed to be learned by adults. Changing norms required learning by adults in order to cope with devolved responsibility for finances and greater financial vigilance. SAP R/3 was the tool through which these norms entered the world of daily work, and adults needed to learn how to carry out their tasks using the system and to use it for access to on-line financial information. Some of this change was enforced by the system itself, other aspects of it are still being resolved in terms of the university's culture. I described and discussed theory in use by contrasting it with certain key points of espoused theory, pointing out where learning had brought theory in use close to espoused theory, as well as where learning had been poor. Finally I evaluated the extent of organisational learning by examining the way in which it had become embedded in organisational maps such as the on-line help. I also looked at the issue of coercion into change as this, as well as avoidance, indicates that organisational learning has not been good. This analysis provided the context for the rest of the chapter in which I turned to the second research question. Here I used the adult learning model to ask what adult learning practices were found at UCT. The analysis centred on discussing a key issue related to each of the elements of the learning model. The learner is the first of these elements and I discussed the influence of role and discourse as an endogenous constraint brought to the learning-teaching situation. Role and discourse were factors that both influenced learning and were objects of learning. In looking at the task, the second element of the learning model, I was interested in examining different aspects of the task and discussing them as well or ill-structured problems. I also discussed the different levels of cognition involved in problem solving. The final element of the learning model, that of the bridging process between learner and task, continued this discussion by considering the various mediators of learning and arguing that different mediators worked better with different aspects of the task. The emphasis on training courses that is often found in practice was contrasted with the importance of networks of colleagues as a good all-

round, informal, learning resource. It was concluded, however, that formal and informal mediators of learning interact dynamically to support the bridging process. The analysis has therefore covered most of the important learning practices engaged in by adults in the organisation.

Chapter 6: Implications for practice

Implications for practice are tackled on two levels, one with the aim of advising further practice in the case of UCT, the other with the aim of advising other institutions that are embarking on a process of business process re-engineering with the implementation of new computer technology.

6.1 Organisational learning

In a process of double loop learning, it is very important that those steering the change understand the organisational culture within which they work. It has been shown that where organisational culture significantly contradicted new visions, these were very difficult to put into practice. This implies that staff who understand the organisational culture be heavily involved in planning change. The onus should be on this group of staff for predicting the viability of certain changes rather than on IT staff or outside consultants. Developing this understanding is part of a process of preparing for change and can start well in advance of implementation. Exploring organisational culture and assessing its likely impact on aspects of change could be workshopped among project and university staff and should include trainers well in advance of training. It should be remembered that a new vision will not bring about a new culture in an organisation by simply being written up in a statement of vision.

New norms, which follow on new visions, need to be prepared for and consistently applied. Any act that undermines a new norm will adversely effect organisational change. For example the fact that the university administration has retained ultimate central control, and that staff are well aware of this, undermines their willingness to accept devolved responsibility for finances because they see this as central administration dumping their work on departments rather than a case of true cultural change. Some changes, like the devolution of responsibility for finances, need considerable "buy in" from staff of the organisation; it cannot be gained by coercion. This implies that they be educated to understand and accept the reasons for the change and that a genuine process of consultation occurs, even though this may be a lengthy and costly one.

Many formal courses were provided to help staff learn procedures and concepts, but a large part of the task was to adapt to organisational change, accept new norms and definitions of work, new roles and different understandings of the roles of others. These issues could not be addressed formally on courses geared to teaching computer functionality. Staff struggled with these ill-structured problems for some time and although networks of colleagues helped, many did not possess the "tools" to cope with this kind of problem. Formal courses, perhaps even at the level of departmental workshops, should be offered by the organisation to attempt to address the need for change skills ranging from conflict management to workload planning activities.

Because of the fact that human inefficiency can undermine perceptions of a new computer system, every effort should be made to see that there are sufficient staff to carry out the work post implementation. If necessary, funds should be made available for additional, temporary staff to be hired to smooth the implementation process which is known to increase workloads temporarily, and so that "end users" receive a favourable impression of the new system.

The original impetus for acquiring SAP R/3, and this is often the case with computer implementations, was for better management information. This implies that the reporting side of the system needs emphasis, and skills and knowledge that support the use of reports need to be prioritised. At UCT, the procedural side received emphasis, with reports only being rolled out after procedural tasks were up and running. This meant that staff were not aware from the start of the benefits and outcomes (on the reporting side) of their processing tasks. Although it is difficult to run reports when data has not built up in the system, they can at least be trained with sample data. For example, the Massachusetts Institute of Technology (MIT) rolled out display and reporting facilities before it rolled out administrative tasks.

Finally, if one accepts that learning becomes organisational rather than individual when it is encoded in organisational maps, then all effort needs to be made to consciously write up such documents and distribute them. This was successfully done at UCT but was undermined by a culture that avoided relying on such maps. This implies that there must be a concurrent promotion of a culture of independence that would encourage the use of such maps. A related issue is the choice of medium for

organisational learning. This is important, as staff need to be comfortable with the medium in order to use it. UCT decided to go with electronic on-line help but it could have decided to go with a paper based filing system. The level of computer literacy in the organisation will dictate this choice.

6.2 Adult learning practices

Roles brought to learning are vital in influencing the learning process. Where these roles are in a state of flux the adult becomes unsure about where to fit the training material with their notions of themselves at work. It is therefore implied that roles need to be stable when adults come to formal training. To smooth the process of transition, and to bring roles to a state of stability as early as possible, the organisation needs to address role change in a formal way. The extended process of negotiating changing roles at UCT could have been shortened if role change had been handled formally. This could be done perhaps by new job descriptions being consciously worked out and signed by staff members with the guidance of project staff. Although it is expected that this will continue to be resolved in the work context, the high emotional content associated with working out such problems could be diffused by having an objective document to refer to.

For it to be easier for adults to take to the role of learner it is implied that they be able to accommodate this role with their working identities. If a culture of learning exists in the organisation this will be easier. One cannot at one time discourage learning (perhaps by making no time or funds available to staff for training) and then later expect staff to wholeheartedly engage in learning to use a new computer system. This kind of culture cannot be brought about overnight, however, and is a long term consideration for organisational policy makers.

Another implication of the research is that the trainer needs to respect the roles of "adult" and "professional" through using an appropriate teaching style, by not patronising the learner and by making an effort to relate training to the daily work of adults, thereby speaking to their working identities. This will help them to accept the training. Training formats that do not require relinquishing of adult roles, such as self

teaching computer based training, and the use of a sand pit system for practising in, are often better for adults who want to maintain their independence.

Perhaps the most important implication comes from the example of the local SAP R/3 experts. This staff member plays a vital role in continued training among colleagues in the workplace. I believe that such a role should be formalised prior to training and implementation, and that each and every staff member should have one such person to turn to in their immediate work environments. These experts should be rewarded financially for taking on this role.

When looking at the task, it is important for trainers to asses it in terms of its form and content aspects because they will need to choose an appropriate training approach, depending on where greater unfamiliarity lies. If it lies in the content aspect of the task, they need to impart new knowledge, but if it lies in the form aspect they need to teach metacognitive skills, concepts and generic skills. When the form of the new task is unfamiliar and where ill-structured problem solving is required, it is necessary to teach staff strategising skills for problem solving. This could range from advice about keeping a procedure file, to how to interpret statements of vision or resolve conflict.

When planning the bridging process it is important to be aware that different mediators work with different kinds of problem and not to expect one mediator to deal with all, or with inappropriate aspects of the task. One important lesson learned from the research is that formal training courses, thought to be the most instrumental form of mediation, are in fact only one of a range of formal mediators working together with informal ones. In stead of ignoring the role played by colleagues, trainers should encourage staff to attend courses with their colleagues, and could get further involved by giving advice about using the colleague network resource after training, particularly if the role of the local SAP R/3 expert has been formalised.

6.3 Conclusion

It has been found that organisational culture has a significant effect on the degree to which new visions and norms take hold. Organisational culture changes with "buy-in"

from organisational members and not by coercion. It was also found that staff need skills for dealing with organisational change and these should be catered for by the organisation. In addition, to smooth the implementation process, extra staff should be hired to deal with the temporary increase in workload. In order for staff to appreciate the benefit of data processing on a new computer system, it is important to highlight the reporting side of a system from the start. Finally, documenting new procedures in organisational maps, of an appropriate medium, is vital for organisational learning but needs to be accompanied by a culture that relies on using these maps.

With regard to adult learning practices, it was found that role change needs to be dealt with prior to formal training, and that it should be dealt with formally by the organisation, in a process of consultation between members. A pre-existing culture of learning in the organisation makes a significant difference when staff enter a situation where they have to adapt to a new computer system. Trainers need to accommodate and respect the roles of "adult" and "professional" that are primary for adult learners. It was found that so-called system experts who play a vital role in continued learning among networks of colleagues, should be identified prior to implementation. Finally, it was found that different kinds of mediators of learning work for different aspects of the learning tasks, and that perhaps the most vital mediator of learning in an organisational context is networks of colleagues. Although this resource cannot be formalised, it needs to be better understood by trainers and promoted in formal training courses.

These recommendations for practice are within reach of most organisations, requiring perhaps a little forethought and the allocation of extra resources. It is often only in retrospect, however, that one can make such observations, and so it is hoped that the experience of implementing SAP R/3 at UCT can be used by adult trainers in other organisations.

List of Appendices

Appendix 1: PRISM Project report to UCT Council

PRISM Project Report to Council,

September 1998

Last updated: November 05, 1998

I am pleased to submit on behalf of the PRISM Steering Committee, a detailed progress report from the PRISM Project Management Team.

The original PRISM Project will end on 31st March 1999, and the report records progress to date, along with a brief assessment of the successes and failures of the project and a financial report.

I would like to place this report in context. The origins of PRISM go back to serious administrative and financial shortcomings identified in the mid 1990s as a result of inadequate management information. A review followed, and a recommendation was made to Council in July 1995 for a comprehensive and integrated solution for UCT's administrative and management information systems, using the SAP R/3 system. Council approved the proposal with a budget totalling just over R22m over the period 1995–1999.

The University's objectives in establishing PRISM were set forth in the vision document, and include the following:

The empowerment of the "real" end-users of business processes

Establishing mechanism to support the decentralisation of authority and responsibility, to more accurately reflect UCT's structure and ethos.

Improved financial control and reporting of all UCT-administered funds.

Streamlined administrative processes and elimination of duplication.

Empowerment of staff to maximise skills and abilities, and to enable them to fully and effectively utilise all available tools.

Enabling the development of a "culture of service" within the administrative support function which emphasises service to users.

Implementation of best business practice wherever appropriate and possible.

Improved management information to support decision making.

Improved co-ordination of, and access to, information about students, staff, donors, funders, vendors and customers.

Achievement of targeted savings in the areas of administrative staffing, vendors, management, debt collection, and fund raising.

Many of the above objectives have been achieved, or are on the way to achievement. A fully integrated system will of course await a new student system, but real progress has been made in most of the other areas mentioned. It is important to stress that PRISM is not a panacea. We have in place something, which offers better integration, and better controls, but which is not a substitute for good management and a culture of service.

There remains much to be done, notably in the area of the student system, in developing the Executive Information System module, and in further finance enhancements, but we are on track to deliver what was undertaken at the start, less the student system, by the end of the project in March 1999. We anticipate making proposals to Council on the future of the student system before the end of the year.

I hope that the report will indicate how far we have come. It is my view that the Project Management Team, under Professor Andrew Duncan, have done an outstanding job in implementing a number of SAP R/3 modules on time and overall within budget. This is a very significant achievement, and we are certainly a leading successful implementor of SAP R/3 world-wide.

Professor Martin West

The Status of the PRISM Project at UCT

October 1998

EXECUTIVE SUMMARY

The PRISM Project is responsible for the implementation of the SAP R/3 software system at UCT and is currently 80% of the way through its planned duration. SAP R/3 is the world's leading ERP (Enterprise Resource Planning) software product, providing organisations with highly integrated solutions for managing information and securing competitive advantage in their fields. UCT is one of some 20 Universities that are now implementing R/3 and is in a more advanced stage of implementation than all but one of them (the University of Toronto).

The components of R/3 that have been implemented to date include all the main financial modules together with modules for purchasing, sales, human resource management and payroll. Implementations in progress involve adding additional financial functionality to what has already been implemented, together with installation of the asset accounting, plant maintenance and executive information system modules of R/3.

The major component of our overall future information system, which has not yet been addressed satisfactorily, is a new student information and management system. In the early stages of the PRISM project we embarked on in-house development of a student system designed to be integrated with R/3, but simultaneously attempted to persuade SAP AG to develop such a system themselves as we believed this to be the best solution for UCT in the long term. This persuasion has now yielded fruit, in that SAP AG has announced the development of a product called "IQ Campus", that is to be at the centre of their proposed "solution map" for University information management systems. We have been collaborating with them in the initial design of the system but do not yet have finality on the price to be placed on this product, or on the discount that will be offered to UCT in respect of its acknowledged contributions. Until the situation in respect of IQ Campus is clarified we are also assessing some alternative solutions, and have already embarked on adding critical new functionality to our existing Heritage Student Administrative System and ensuring that it is "Year 2000 proof".

The implementation of R/3 at UCT has brought both benefits and problems. It has been a project that has brought major change to the university, and its impact on many of our staff and the way they do their work has been considerable.

Probably the greatest benefit in the finance area has been the ability of the Funds Management module to prevent any over-expenditure by purchasing or ad-hoc journal entries. Funds Management has also led to better information for fundholders, in that commitment accounting has ensured that all expenses, which are directly incurred, are reflected immediately upon commitment, and that in these cases the current balance of uncommitted budget is visible on line. Better management of funds and of spending patterns during the 1997 fiscal year led to additional cash being retained within the system at year end estimated at R20-25m which, at a return of approximately 15%, yielded about R3.5m as a direct benefit. With these expenditure controls continuing in operation, such cash flow benefits will continue in future. Benefits from R/3 implementation in the purchasing area led to savings of approximately R1.5m in 1997 and should lead to savings of approximately R2.6m in 1998. These savings are expected to increase in future years.

Although the new financial and purchasing capabilities have brought benefits, they have also brought frustration and irritation to many users. R/3 has most certainly not fulfilled our hope and expectation of being a "user-friendly system". The increased complexity of the financial systems have led to numerous complaints (particularly from academic staff) that they were not, and had no desire to become, financial accountants! There have also been perfectly legitimate complaints from senior financial managers that some aspects of reporting were inadequate.

A specific aspect in which our vision of the impact of future information systems has been at variance with reality has been in respect of planned staff reductions. In some areas the complexity of the new processes has caused additional staff to be hired, at least temporarily. In addition, UCT staff, from ITS as well as from functional line departments, are regularly called upon to carry out testing of the R/3 software for which one might have expected SAP itself to have been responsible; this has especially been the case during system upgrades.

The various problems encountered have been analysed and various remedial actions will be taken to address them. In many cases this will consist of re-engineering processes that we now understand far better in practice than we did in theory. We will also provide additional user training, and try to reduce usage of the system by very occasional users who are far more likely to make errors and cause problems for others.

All modules of R/3 that we have implemented have gone "live" on their originally scheduled dates, or within a few days thereof, and although there have been cost over-runs in some areas of the project, these have been more than offset by cost savings in other areas. With the exception of the student information system aspect, the PRISM project continues to survive in that almost mythical zone of being "on time and within budget".

1. INTRODUCTION

The PRISM Project is responsible for the implementation of the SAP R/3 software system at UCT. At the same time it is taking the opportunity to examine all our administrative processes and to recommend where such processes should be improved or re-engineered, irrespective of whether the new process is computerised using R/3 or not. There is also an opportunity as part of this process for UCT to re-examine the administrative processes that are done in different departments and to suggest the realignment of departments or sections where appropriate.

SAP R/3 is the world's leading ERP (Enterprise Resource Planning) software product, providing organisations with highly integrated solutions for managing information and securing competitive advantage in their fields. It is the market leader in Europe, North and South America, and Asia, and commands a dominant market position in South Africa (see Appendix for selected southern African customer list). As such, it offers the assurance that UCT's system will be well supported into the future, and will remain at the leading edge of information management. UCT is one of the first universities in the world to implement R/3 across the institution as extensively as it has; other R/3 university customers include MIT, University of Toronto, Duke University, University of Newcastle-upon-Tyne, University of Leeds, University of Amsterdam, University of Geneva, and Monash University in Australia. While there are not at present any other South African universities which have chosen R/3, we have recently learned that a number of leading institutions have begun serious reviews of their information management systems, and that several have contacted SAP and are considering R/3 as one of their options.

As the PRISM Project is 3 years into its proposed 3½ year duration; it is now an appropriate time to take stock and to inform Council of the progress to date, of the plans through to project completion, and of some of the more important issues that have arisen.

2. IMPLEMENTATION TO DATE

The aspects of R/3 that have been implemented so far are the "core" of our future financial system. This includes the Funds Management, Cost Accounting and Financial Accounting aspects of R/3, together with a subset of the purchasing functionality and a subset of the sales and receipting functionality. R/3 has been the financial system of record for UCT since 1 January 1997, but the Student Fee system is still running on our Heritage system, with the resulting data subsequently transferred to R/3.

The functionality to control and manage duplication between different master data tables in R/3 has been developed in order to be able to track the multiple roles that both natural and legal persons have in their relationships to UCT. One individual for instance might have been a student, is an alumnus and a staff member, and could also be both a vendor (paid by UCT for goods or services rendered) and customer (e.g., enrolled for an executive short course). The mechanism developed to provide this functionality has been termed the "Central Identities Register". It has been extended significantly during the implementation of the HR (Human Resources) modules of R/3, but is still in its developmental stage and will continue to be extended and refined in the subsequent phases of R/3 implementation.

We have now implemented four major aspects of the Human Resources modules of R/3. The HR master data went "live" on January 12, 1998; the R/3 payroll on March 23, the recruitment and applicant tracking process on 6 April and training and event management during May. The first two of these aspects were far from simple and were only accomplished after considerable pain and extra effort on the part of staff from the HRM Department, Payroll section of Finance, and the Project.

3. WHAT IS STILL TO BE DONE

3.1 Student Information System ("IQ Campus" or Alternative)

The development of an Integrated Student Information System ("ISIS") started on the basis of it being an "in-house" UCT development that was to be fully integrated with the other R/3 modules that are being implemented at UCT. Attempts to persuade SAP Southern Africa and SAP AG (the German parent company) to join us in this development were initially unsuccessful, but SAP has now formally announced the development of a product to be called "IQ Campus". This will incorporate a student management and information system, and will also encompass additional developments of existing SAP modules to better adapt them for University requirements.

SAP has recently released a higher education "solution map", which attempts to comprehensively address the information management needs of universities. IQ Campus will form the heart of such a higher education solution. The solution map is still at a fairly high level, but we have been promised further detailed specifications by early October. Such detail (which we have been requesting for quite some time) will be crucial in allowing us to assess what functionality will be included in the core IQ Campus product, what functionality will be left to (as yet unspecified) third parties to provide as "country-specific components" and what functionality will be left to individual Universities to develop.

IQ Campus will be a separately-priced product. Our pricing negotiations with SAP AG have been fairly prolonged, and we do not yet know what price they will place on the IQ Campus product, nor the magnitude of any discount that UCT may be offered in recognition of our contributions thus far. Here again, we have been promised some further information by early October.

Until the above issues of the pricing, functionality, and delivery timetable of IQ Campus have been firmly resolved, we have felt it prudent to initiate an investigation to assess our options. Three possible solutions for achieving UCT's vision of an integrated and significantly enhanced Student Management and Information System are under investigation, these being:

To proceed with implementation of IQ Campus as currently planned, but at a yet-to-be-determined cost beyond the existing PRISM budget.

To implement an alternative student management package from a third party supplier other than SAP (such as PeopleSoft, SCT or ITS), and to integrate this with SAP R/3.

To revert to developing a solution in-house at UCT, but with significantly fewer development constraints than those imposed on the previous ISIS project (as the resulting system would not be intended to be recognised, and possibly marketed, as an SAP-based product.)

3.2 Additional Financial Functionality

3.2.1 *Bank Reconciliation*:

One of the process areas that proved particularly problematic after implementing the R/3 financial modules was that of reconciling our bank accounts with the R/3 system. The finance department addressed this problem during the last eight months with significant tuning of the manual process, which made major improvements in both ease and speed of the reconciliation process. This has now been taken a step further by using the CATS system to download our bank statements on a daily basis, followed by an automated clearance process for a large proportion of items, thus reducing the manual process to a minimum.

3.2.2 *Extensions to the implementation of CO (Controlling Module):*

The Strategic Planning Framework recommended that UCT should implement an activity-based management information system, and that costs and overheads be allocated to all activities to allow for informed management decisions. The mechanism for doing this within R/3 lies in the CO (Controlling) module, which provides for cost centre accounting, cost allocation cycles, activity-based costing, and profit centre accounting. Our initial implementation of CO provided a relatively simple structure of cost centres and allowed certain areas of the University to utilise CO for more detailed budget planning and reporting than could be achieved with FM (Funds Management).

A team was established to substantially extend the CO implementation to address the recommendations in the Strategic Planning Framework. This team has not been able to proceed on their original schedule as the Team Leader and a key member of the team have had to return to the Finance Department due to severe shortage of personnel in certain key positions. The team believes that they will complete their analysis of the situation by the end of October, and will submit both a

suggested cost allocation framework for UCT and an overall plan for the extended implementation of the CO module at that time.

3.2.3 Student Fees:

As noted above, the Student Fee system is still running on our Heritage system, with the resulting data subsequently transferred to R/3. Because of the magnitude of the amount of money involved, it was decided not to wait for the implementation of a full R/3 student system to address the issue of fees handling, but rather to proceed with an interim solution. The testing for an effective method of better managing this interface is now almost completed, and it is anticipated that student fees for the 1999 academic year will be able to be directly receipted into R/3, thus tightening financial controls and ensuring better management of fee income received.

3.3 Asset Accounting

The implementation of the AA (Asset Accounting) module of R/3 is now underway, and this has recently led to policy proposals for the scope of a future asset management system at UCT and for migration from our existing asset system to an R/3-based one. The scope proposal has been approved, and detailed design and prototyping will now commence. It is clear that the functionality of the AA module will cater for UCT's requirements in most respects; but the best way to handle the process of purchasing assets, and of recording information about some of them that is more appropriately stored under the control of the PM (Plant Maintenance) module, will be determined during the detailed design phase.

The milestones for this implementation are to complete stocktaking and cleanup of the existing asset register by the end of 1998, with migration of these assets to the R/3 asset accounting system during January 1999 and the start of the new asset purchasing system in February 1999.

3.4 Plant Maintenance

The Finance and Services Department has recently decided to proceed with at least a partial implementation of the R/3 PM (Plant Maintenance) module. This will be required to support some aspects of Asset Accounting, but the proposed scope of the implementation includes the use of PM for planning and controlling planned maintenance, and for the recording and cost assessment of all maintenance. These proposals are under consideration prior to proceeding with implementation.

Current planning is for the implementation of the Plant Maintenance module to be completed by the end of March 1999.

3.5 Management Information System(s)

One of the key aspects of the PRISM project is to significantly enhance the University's access to critical management information. In part this will be achieved through the implementation of R/3 and the use of standard R/3 reports, but it will also require significant customisation and report development to address needs that are specific to a University or to UCT, rather than those that might be standard in a conventional commercial environment. We have started to implement the R/3 EIS (Executive Information System) module and are hopeful that this will address many of our reporting requirements. Three "target areas" have been chosen for initial implementation and testing. These are to provide an information and report infrastructure to support the decision making process in the Admissions Working Group, the Quality Assurance and Planning Information Working Group, and the Department of Communications for the production of the Vice Chancellor's annual report.

Initial progress has been good, with processes having been developed for the loading of key student-related data from the Heritage student administration system into EIS "aspects", and development of some reports to address requirements of the Admissions Working Group. EIS has also been used in conjunction with the personnel cost planning tools in the HR module of R/3 to provide budgetary forecasts of personnel costs for 1999.

There is a significant possibility that UCT may require additional tools, such as SAP's recently announced "Business Information Warehouse", in order to fully address its information requirements. However, such tools will come at an additional cost, and a major purpose of our EIS implementation is to see just how far we can go with what we have already paid for.

3.6 Current SAP Developments for FM "Grant Year" and Position Management

The Public Sector IBU (Industry Business Unit) at SAP AG is undertaking two major developments in response to requests co-ordinated by the International Higher Education and Research User Group, of which UCT is a founder member.

The first of these is to provide for fiscal years being associated not merely with a "Company" in SAP terms (in our case, UCT and its Jan-Dec fiscal year), but also with each individual Fund. This will allow us to handle research funds and contracts in such a way that the fiscal year of the fund is coincident with that of the company/institution providing the monies. This will significantly improve our ability to provide reports in line with the donor's fiscal year, which is a common requirement and which currently requires considerable staff time on the part of Research Support Services.

The second development will greatly enhance our ability to budget for and control expenditure in the area of personnel salary costs. Position Management represents a major extension to the integration of the Human Resources (HR) module with Funds Management (FM). It should make it much easier for us to identify areas where savings against salary budget are possible, and it should very largely preclude the possibility of persons being appointed without salary budget being provided in advance.

We have participated in testing of these developments at SAP AG headquarters in Walldorf, Germany and will be returning for additional testing in mid-October. The new applications may be delivered to us before the end of 1998 (though SAP's track record in delivering such new functionality when promised is inconsistent), but in any event we will only be able to implement them when we upgrade to release 4.5B of R/3, a process which is currently scheduled for August-September 1999.

4. PROBLEMS ENCOUNTERED

4.1 Software Quality

We reported in October 1997 that one problem that we had not anticipated was the extent to which the SAP software has contained "bugs" that seriously compromise its functionality. During the final stages of "going live" with the financial modules we were continually picking up errors and problems in software functionality. This was a particular problem in the Funds Management module (a relatively new product), and required the installation of many software patches either supplied by SAP AG or developed in place by SAP AG on our system (via remote login from Germany). We have noted some improvement in software quality in the R/3 release that we are currently running (3.0F), but recently encountered major, and extremely time-consuming, problems in loading the next release, which we are likely to use in a production system (4.0B). These problems have required considerable effort on the part of UCT staff to assess and resolve, and have contributed to the inability to realise the expected reduction in programmer and other staff resources required to sustain the use of R/3 (see section 4.4., below).

4.2 Knowledge Transfer from Consultants

In retrospect it became clear that the process of transferring detailed knowledge about R/3 and its configuration from our consultants (Coopers & Lybrand, SAPSA, Spearhead) to the UCT members of the finance teams was not as successful as it should have been. This was addressed by a major change in the implementation process during the HR phase whereby UCT members of the team, mainly those from the HRM department (rather than the programmers from Administrative Computing Services), did the actual system configuration of the R/3 system with advice from the consultants. This ensured that UCT people had knowledge transfer from consultants at a much earlier stage and became far more effective "owners" of the new system.

4.3 Insufficient Budget for Posting of Retrospective Charges

Under UCT's previous financial system, charges of various sorts were processed during the course of a fiscal year, and only at year end would any problems of insufficient budget to cover such charges be discovered. Under SAP R/3, any *prospective* charges to be incurred through the normal purchasing process are governed by the "availability control" mechanism, which will not allow the purchase to be processed if there is insufficient uncommitted budget in the fund to cover the cost. However, a problem still exists with the posting of all journals that raise *retrospective* costs. This includes salaries (posted from the R/3 payroll system), telephone charges, photocopying, Maintenance Department charges, and so forth. These can all encounter a situation where there is insufficient uncommitted budget available in the fund, which has, been designated. The current solution has been to turn off the check for sufficient uncommitted budget during the posting of the research-related salaries journal (mainly contract appointments), which does at least ensure that the cost is raised in the correct fund and in the correct accounting period. Other journal charges which "bounce" because of insufficient

uncommitted budget in a fund are charged to a temporary suspense fund, from which they then must be posted to their correct funds when budget is available. Another approach would be to adopt a management mandate that fundholders simply must ensure that adequate uncommitted budget exists in their funds to cover any and all charges expected to be incurred thereupon.

The largest of these problems is in the posting of payroll for research appointments. This can be addressed by changes in process (e.g. requiring that a fund have sufficient budget for the appointment at the time that it is made) and by the implementation of the new Position Management capability (see above) that will allow the raising of a salary commitment and thus block spending of salary budget for other purposes.

4.4 Programming Resources

The implementation and support of R/3 has required far more skilled resources from the Administrative Computing Services (ACS) section of Information Technology Services than we anticipated prior to the start of the PRISM Project. This has meant that we have had to train existing staff in the ABAP/4 programming language and in the different R/3 modules, as well as to attempt to recruit new staff who already have such skills or the capacity to learn them. The success of SAP products in South Africa and world-wide has assured that there is an intensely competitive market for people with such skills. During this year we have lost several skilled programmers and are having considerable difficulty in replacing them. Since we had intended to increase the programming staff by 3-4 people this year and had been awarded the budget to do this, it has been a major problem that we have not been able to hire the people we need at the rate at which we can afford them. In addition, UCT staff, from ITS and ACS, as well as from line departments, are regularly called upon to carry out testing of the R/3 software, for which one might have expected SAP itself to have been responsible. This has especially been the case during system upgrades, but also during the difficult implementation of immature modules such as Funds Management (FM).

5. UCT PERCEPTIONS OF OUR R/3 IMPLEMENTATION

The PRISM project at UCT has successfully implemented two major areas of R/3 at UCT, well within budget and essentially on time; these are the Financial and Human Resource Management areas. The implementation process consisted of configuring R/3 to do the various administrative processes in a way that UCT staff, as advised by business and technical consultants, considered appropriate. It also consisted of migrating data from the University's existing "Heritage" systems, capturing new data where required, and training of University staff to carry out the new processes with R/3.

We have now been running the R/3 financial systems for 21 months, the main HR system for 9 months, and HR payroll for 6 months. During this time we have been able, with input from our colleagues, to make a judgement in respect of those aspects of the new system that have been beneficial to UCT and those that have caused problems. Some "problems" have been due to the natural reluctance of people to change from one system to another, while others clearly indicate that additional work needs to be done in addressing how UCT does certain processes, how we train and support the people doing the processes, and in assessing which processes clearly do not work as well in practice as had been anticipated.

In the following two sections we try to summarise the responses of many of our colleagues who were asked to express their views on the benefits derived from our implementation of R/3 and the problems that it has caused.

BENEFITS DERIVED FROM IMPLEMENTING R/3 AT UCT

The Director of Finance has indicated that the new system, with respect to some core financial functions such as purchasing, receipting, debtor management, and payroll, is "satisfying the financial administration needs of UCT reasonably well", although he has reported a number of specific concerns about system shortcomings, especially with regards to management of funds and reporting. (These are discussed in the various sections of this Report). He has also recommended a reassessment of certain UCT policies and practices in light of the experience we have now gained. Probably the greatest benefit in the finance area has been the ability of the Funds Management module to prevent any over-expenditure by purchasing or ad-hoc journal entries. Funds Management has also led to better information for fundholders, in that commitment accounting has ensured that all expenses, which are directly incurred, are reflected immediately upon commitment, and that in these cases the current balance of uncommitted budget is visible on line.

In his review of the cash flow benefits achieved by this improvement in expenditure control, the Manager: Financial Accounting estimated that better management of funds and of spending patterns during the 1997 fiscal year led to additional cash being retained within the system at year end estimated at R20-25m which, at a return of approximately 15%, yielded about R3.5m as a direct benefit. With these expenditure controls continuing in operation, such cash flow benefits will continue in future.

Some of the key benefits in the purchasing area are:

- Price maintenance for the whole community via the material master catalogue.
- Ease and efficiency of doing purchase orders using materials and prices listed in the catalogue.
- Payment process improvements resulting in increased settlement discounts and improved prices.
- Ease of tracking payment details and powerful reporting capacity in the purchasing area has provided crucial information for, among other things, negotiating discounts and prices. Suppliers were sometimes dissuaded from imposing proposed price increases when shown the ease of "comparative shopping" by UCT staff, who now had the benefit of full visibility of all suppliers' prices on-line.

The Purchasing Officer has estimated that these benefits from R/3 implementation led to savings of approximately R1.5m in 1997 and should lead to savings of approximately R2.6m in 1998. These savings are expected to increase in future years.

Some less quantifiable, but nonetheless significant, benefits have been:

- UCT's computer hardware resource base has been significantly improved and strengthened. The need for a separate "Disaster Recovery Platform" was not recognised in the original planning and budgeting for the Project, but it soon became apparent that provision of such a back-up system would be essential to ensure the continued smooth functioning of the University's administrative processes in the event of a major catastrophe. As a side benefit, this second system also gives us a powerful testing environment separate from the main R/3 production platform, which has proven essential to the complex task of managing a sophisticated integrated information system. As a result, the University now has a very robust and sophisticated information system infrastructure upon which to conduct its business. The University's network and its components have been greatly strengthened to ensure that they are capable of efficiently running the R/3 production system, and in addition there has been a concomitant significant increase in the quality and number of personal computers on all campuses. UCT is now very well prepared to deal with emergency situations which might arise and threaten its ability to carry on with business, and is well equipped to effectively assess and test potential new R/3 developments in future years.
- Significant improvement in computer skills levels of UCT staff in general has occurred, with large numbers of staff, driven by the need to work on R/3 as part of their jobs, now able to operate in the Windows environment, and thus be well-positioned to utilise the most current software programmes available.
- UCT has proven its ability to develop some of our own components and functionality (such as the Central Identities Register, and a number of modifications to ensure the correct handling of VAT) which integrate very well with the R/3 system and which thus far have proven sufficiently robust so as to retain their full functionality through R/3 system upgrades.
- Implementation of R/3 has brought a significant reduction in the Year 2000 problem for UCT.
- A greater measure of control of misallocated expenditure has been achieved through a rational fund structure and spending rules applied by commitment item group templates.
- A contract tracking system to record due date for research contract deliverables is in place.
- The system's "drill-down facility" enables easier tracking of the source and destination of transactions.

- The HR Phase has brought about improvements in key aspects of the UCT payroll system, such as the automation of calculation for certain benefits; the ability to do payroll simulation to check the results after data take-on in the HRM Department; and the automatic retrospective payroll calculations.

- Automatic processes in the loans area have reduced the required workload.

- On-line and up-to-date reporting as the general case (though some specific report requirements are still outstanding.)

7. PROBLEMS ASSOCIATED WITH IMPLEMENTING R/3 AT UCT

The largest overall problem associated with R/3 implementation has been that the magnitude of change, particularly in respect of the purchasing process and in financial reporting, has been very considerable. This has led to long and steep learning curves amongst end-users of the system, and a common view that the new systems are far more demanding of both personnel time and skills than was the case with the old systems, which were paper-based for end-users and which did not require the disciplines associated with commitment accounting. Departments and research groups that had developed their own mechanisms for commitment accounting have seen some direct reduction in processing load, but for many of the staff using R/3, this has not been the case in these early days of implementation.

The increased complexity of the financial systems, along with the need to understand the role of "budget" not merely as a plan of expenditure but as imposing a *mandatory* spending ceiling, plus the reports that reflect both actual expenditure and commitments, have led to numerous complaints (particularly from academic staff) that they were not, and had no desire to become, financial accountants!

The increased requirements for computer literacy and proficiency were particularly tough in the "engine room" of the Finance Department itself, where there was a huge change in process for many sections. Not all the training in these areas was as successful as it could have been, and this led in the early months of implementation to major backlogs in processing accounts payable and accounts receivable. These backlogs in turn led to frustrations in all other departments who were depending on the Finance Department in its service role. The same sections in the Finance Department have had to bear the brunt of end-user misuse of certain aspects of purchasing, sales, invoicing and receipting under R/3, which has led to large additional workloads, many of which are unnecessary. These problems have prevented any of the planned staff reductions in sections of the Finance Department, and in some cases have caused additional staff to be hired (at least temporarily) instead.

Some specific problem areas have been:

- The excessive use of the "one-time vendor" facility in the purchasing process, which negates the benefits of negotiated prices and leads to major processing problems in accounts payable.

- The need to interface R/3 to ongoing Heritage functionality in such areas as student fee processing. This can cause significant delays and make reconcilliations extremely difficult.

- The very high level of processing via journals carries the risk of funds incurring expenses which circumvent their spending rules (which are automatically enforced in the purchase order process).

- Due to very large volumes of purchases, some of which contain errors in input data which only become evident at the invoice processing stage, the expected reduction in the magnitude of the task of matching and processing creditors invoices has not occurred; it still requires considerable staff resources each month.

- Due to limited scope of the initial implementation of CO (Controlling) module, inability to flex budgets or to have a comprehensive costing system. (See 3.2.2, above.)

- The combination of balance sheet and income statement entries in the FM system is confusing and creates problems at financial year-end.

- Promised interfaces to external systems (e.g. those in the Department of Communication) have not always been achievable due to technical differences in database design between R/3 and the external system.

- The lack of visibility of items in stores when a user might request issue of a stores stock item as an alternative to a purchase from an external vendor.
- Delayed posting of retrospective charges (e.g. salaries, telephones, photocopying, maintenance charges, etc.) is not reflected by prior commitment and can lead to overspending. (See 4.3, above.)
- Increased workloads in RSS, Finance and HR to explain new procedures to users.
- New payroll system is perceived by some users to be less user friendly and more complicated to use (though it does deliver significantly more functionality than the old system).
- Lack of specific reports required by different sections of the user community.

8. ACTIONS TO BE TAKEN

There are several actions that will be taken to address, and to rectify, the major problems noted above:

- To carefully examine those processes which are clearly not working efficiently and to re-engineer these as appropriate.
- To reduce the number of end-users who are using R/3 on an infrequent basis by promoting the sharing of skilled R/3 users between Departments, leading to a form of "cluster processing" where possible and desirable.
- To considerably extend the existing portfolio of reports, to assist in management control of the system and to provide managers and staff with additional reports to support their primary activities.
- To re-focus and extend the training of UCT staff so that R/3 users can better understand the context of, and business background to, certain processes, and to extend the R/3 skills of all levels of R/3 users. Provided that we can reduce the total number of R/3 users (currently about 1,750), it becomes more practical to extend both the breadth and depth of the training offered.

9. PROJECT COSTS

9.1 Summary

In the report to Council provided in October 1997, a cost overrun of some R250,000 in consultancy for the HR Phase was anticipated. This overrun actually totalled R492,000. However, the overall financial situation in the project as a whole was relatively healthy, with savings of R1.9m relative to budget at the end of 1997. Most of these savings were made against budget for implementation of a Student System, and additional savings will be made in the same area this year. We currently estimate that when the PRISM Project finishes on 31 March 1999 we should have total savings against budget of approximately R3m. These will then be available as an initial contribution towards the ISIS project. On the earlier advice of the PRISM Steering Committee, a contingency provision was created from savings achieved within the originally-approved PRISM budget; this provision has been used in part (to fund the R300,000 for additional ACS resources in 1997), but R518,000 remains.

9.2 Areas of Financial Concern

The implementation of IQ Campus (or an alternative solution to the requirement for an integrated Student Management and Information System) is an area of considerable financial uncertainty. Until we know how we are going to proceed from the existing situation, this uncertainty will remain. (Section 3.1, above).

We do not yet have a clear definition of what will be required to provide the anticipated extensions to the CO module. This represents a significant extension to the scope of the PRISM Project and costs incurred to date total R91,000. The Finance Department intends to approach the University Finance Committee for funding for this project. If that is not forthcoming, the costs of this implementation could be met from the existing PRISM budget, but would then reduce the amount left for the succeeding ISIS project. (Section 3.2.2, above).

Assoc. Prof. Andrew R Duncan
(Project Manager, PRISM)

Dr Jim McNamara
(Deputy Project Manager, PRISM)

Appendix: Selected List of SAP R/3 Customers in Southern Africa, Sept 1998

ABSA	Denel Infomatics	Namibia Post	SAPPI
AECI Explosives	Distillers	Namibia Telecom	SAPREF
African Cables	Engen	Namibian Brewery	SASOL Fertilizers
Air Zimbabwe	Eskom	Natref	SASOL Oil
Alpha Ltd	Fidelity Guards	Nissan	SASOL SMX
Alusaf Bayside/ Hillside	Gencor	Nordberg	Sasko
AMKA	Grain Marketing Board	Novartis	Sentech
Amplats	Henkel	Persetel	Siemens Ltd
Anglo American Corp	Hi-Performance Systems	Petronet	South African Breweries
Anglovaal	Hoechst	PFG	Spoornet
Autonet	I & J	Plessey	Stellenbosch Farmers W.
Avtex	Iscor Mining	Polifin	SwissRe
Bayer	Iscor Steel	Portnet	Syfrets (NIB)
BMW SA	ISIS	Premiere Foods	Telkom
Bokomo	John Deere	Promat	Tetrapak
Botswana Water	Kentron	Richards Bay Coal	TMC
Bromor Foods	KWV	Rossing Uranium	Toyota
Cadbury Schweppes	Kynoch	SA Mint	Transnet Group
Caltex	Lesotho Highlands	SA Nylon Spinners	Transvaal Sugar
Ceramic Industries	Lever Brothers	SA Post Office	Transwerk
Coca Cola	Liberty Life	SAA	Twistdraai
Consol Glass	Mercedes Benz (SA)	Safmarine Industex	UCT
Daewoo	Microsoft	Saldhanha Steel	Unilever Group
Datavia	Mondi Paper	Samancor	Volkswagen SA
Delta	Mossgas	Sanlam	Wella

Appendix 2: Interview questions

1. I'd like to start by hearing about what kinds of work related learning you've done over the last few years, say up to 5 years ago. I'd like to hear about courses you've done as well as any on-the-job learning. You can give me quite a broad picture, it doesn't have to be computer or R/3 related.
   What is your preferred way of learning about something?
2. When you are going about learning that new piece of software, or perhaps when something you already know doesn't work as expected or you need to find out how to do something you've never done before with a package you already use … describe for me exactly how you go about that. Where do you turn for assistance?
   What about getting help from colleagues?
   Tell me about your experience of the help desk? When did you use them, how did you find the service?
   You haven't mentioned the on-line help for R/3. Have you used it, how did you find it? What exactly was good/difficult about it? Did you find it easy to get to the topic that you needed?
   In what order would you use these resources in getting assistance for yourself?
3. What were the most important conceptual things that you needed to learn about finance in order to understand the way in which R/3 presents financial information to you?
4. What about the interface with R/3, getting around the screens and so on, what have been the most important things you needed to learn how to do? How did you find it in the beginning? Has R/3 changed or expanded your knowledge of computer systems in general?
5. The PRISM project provided various formal learning events during the implementation … the full course that you went on being the most obvious. But there were also Q&A sessions, seminars when new things came out, presentations before R/3 came along, as well as the weekly funds reporting workshops that are still running. Which of these have you been to and how did you find them? Which format, or combinations made for the most valuable learning experience for you?

6. We've already spoken about colleagues, but I'd like to ask you a bit more. Who were the people you asked for help? Did these relationships exist before R/3 came along, or did they come about as a result of R/3 being implemented? Do you ask anybody for help who is outside your department? Are there any acknowledged experts, people who are thought of as being good with R/3, in this department?
   Who has asked *you* for help? How did you feel about helping the person? Do people around here share new information as soon as they hear about it? If you are the local expert, how do you feel about playing that role and how do you carry it out?
   Is R/3 a topic of conversation around here between colleagues, for example in the tea room? What kind of talk was there about R/3 in the beginning? What kinds of concerns were people expressing?

7. A change of subject now! I'd like you to think of a trainer who has impressed you. I don't want to know who it was, or what they trained you in, they could even have trained you outside UCT or some time ago. I'd like you to tell me what it was about the trainer that impressed you, what it was about them as a person, or what it was about their methods that worked for you.
   What qualities do you think a trainer of computer technology should have?

8. Another subject change, on to the topic of change at UCT! There is a lot of change in our environment at the moment, some people say too much! Faculty structures are changing and new programs are being devised, the staff and student profiles are changing a lot, people are having to work out their own budgets looking further into the future than they've had to do before, and of course we have a new financial system and SAP R/3. That's a lot of change! How are you personally effected by the things I've mentioned, and how do you feel about change in general?
   Do you feel well informed about change? How does information get to you?
   Do you have any specific criticisms of the changes that are being made, or of the way in which they are being made?

9. What is your understanding of why UCT needed to get a new financial system in the form of SAP R/3? What was it about the previous financial set up that was the impetus for change?

10. The PRISM has been there to implement R/3 and steer the whole project of changing over to R/3.

    In the beginning there were presentations and later departmental visits if needed. Did you go to any presentations or have any department al visits? What prompted them, how did you find the sessions? Did you learn or resolve anything through them?

    How have you found the communications from the project to you, or from admin to you? There's been a lot of email, postings on the UCT notice board and the PRISM newsletter. What value did they have for you, what did you do with them?

11. If you had to think about a person, or a group of people who's responsibility it is to guide staff and help them make the change to R/3, who would you say should carry that responsibility.

    What about the Head of Department, do you think that is a role the HOD should play?

12. Where would you go to look up policy information or rules and regulations about financial procedures at UCT? Say it was a Sunday and you couldn't get anyone on the phone. How do you go about getting that kind of information and where would be the first place you'd look?

    Do you know about the existence of a finance manual at UCT? If you know about it, do you use it?

13. Tell me about your relationship with admin departments (Bremner). What kinds of R/3 related things do you need to get in touch with them about? Do you have a network of people who you usually use? Has the frequency, nature of the relationship, kinds of queries or people you connect with changed since R/3 has been around?

14. One of the visions the project had was to make administrative processes more transparent, more visible to everyone at UCT, especially to staff on academic departments. Do you think this has happened?

    You now have up to date information on your desk top, and you can look up the progress of your purchase order or requisition, do you like having that kind of information available now?

15. We've spoken about some of the frustrations that people have had with R/3. I'd like to hear about any real conflict that sparked out of those frustrations, or any that you have witnessed between people in your department. For example there could have been conflict between admin staff and academics, or between a secretary and an admin department at UCT? Is there anything that you can think of?
    Describe to me what happened, I don't really want to know names. How was the conflict resolved?

16. What are your own goals for your working life, what would you like to achieve over the next few years? If you don't have any specific goals, that's okay, just tell me what shape you would like your working life to have if you look ahead. a little What are you currently doing to help bring this about?
    How does R/3 fit in with all that? Do you see it feeding into what you want, does it conflict with what you want at all, or does it bear no relation to what you want?

17. We've reached the end of the interview, I've asked all my questions. Was there anything else you were hoping to say, or anything that occurs to you and is related to the kinds of things I've been asking?

Appendix 3: Email message to "end users"

Hello,

Would you like to be interviewed about the SAP R/3 implementation?

I would like to interview you if you are a current users of R/3, whether you're academic or support staff, and whether you hate or love R/3. As long as you were at UCT from late 1996, and you still use R/3 (even infrequently), I would like to hear your story as data for my Masters dissertation in adult education …

I'm interested in adult "learners" in large organisations who are having to learn about new computer technology and adapt to organisational change. My study focuses on the implementation of SAP R/3 at UCT. I currently; work as a trainer for the PRISM Project, having started out as a secretary at UCT in 1995. I am also a masters student in Adult at UCT.

In the interview you will have a chance to put your story across in response to questions about how you coped with financial change at UCT and how you learned to use R/3. The interviews are informally conducted and completely confidential. An inte4view takes about an hour to complete, and your time would be greatly appreciated.

If you are willing to be interviewed, please reply by email, providing a telephone number where I can contact you to make arrangements.

Looking forward to meeting you,

Elaine Pieters

Appendix 4: Coded data

Question 1:

What kinds of work related learning have you done over the last few years? I'd like to hear about courses you've attended as well as any on-the-job learning. You can give me quite a broad picture, it doesn't have to be only computer or R/3 related. What is your preferred way of learning something new?

Category/Theme	Count
Going on courses is not encouraged	5
Encouraged to go on courses	6
Specific learning planned for the next year	9
No specific learning plans for the next year	12
Need for training is a recent thing	3
Nature of occupation has changed requiring learning	4
Most learning is computer related/It is necessary to learn to keep up with new computer software/technology	21
I have fallen behind in my learning about computers relative to others	1
Non-computer related courses	4
Learn to keep up in a field of speciality (academic)	3
Learn to keep up with requirements of the job (technical)	5
Learning about how the organisation works	2
Learning is self initiated	13
Learning initiated by both person and/or their manager	4
Like a mixture of learning methods	2
Prefer to learn on own, by trial and error	11
Attend courses given by the organisation (ITS, HR etc.)	6
Attend courses outside the organisation	3
Prefer to learn on a structured course either for new software or for polishing	7
Having prior knowledge before going on a course helps with learning	3
Need to work through it on your own after a course to consolidate learning	4
Learn from colleagues – formally	4

Category/Theme	Count
Learn form colleagues – informally	7
Learn through helping others	1
Learn on the job	6
Learn from on-line help or tutorials	2
Learn from manuals, books, technical magazines	6
Learn from the Internet	3
Learning by making and keeping notes, files of work done.	2
No need for learning as near retirement	3
Too expensive to go on courses	2
Too busy to go on courses, not enough time	6
Pace of courses is too fast	2
Difficulty getting support after a course when you need it	2
Got bored on a course	1
Cannot leave office to go on courses	2
If learned skill is not used it is forgotten, no use learning something you won't use.	4
Future job is uncertain so not sure what to learn	2
Learn out of interest or for advancement	4
Learn for stimulation or a challenge	5
Learn to advance career/change jobs	1
Engaged in learning outside of work for non work-related interests	3

Question 2:

When you have to go about learning something new or problem solving with computer software, or when something you already know doesn't work as expected or you need to find out how to do something you've never done before with a package you already use … Where do you turn for assistance?

What about getting help from colleagues?

Tell me about your experience of the help desk? When did you use them, how did you find the service?

Tell me about the on-line help for R/3. Have you used it, how did you find it? What exactly was good/difficult about it? Did you find it easy to get to the topic that you needed?

In what order would you use these resources in getting assistance for yourself?

Category/Theme	Count
Seldom/never use colleagues.	0
Use colleagues as 1st port of call	11
Use colleagues as 2nd port of call.	8
Use colleagues as 3rd port of call.	3
Seldom/never use help desk.	8
Use help desk as 1st port of call	0
Use help desk as 2nd port of call.	8
Use help desk as 3rd port of call.	6
Seldom/never use on-line help.	8
Use on-line help as 1st port of call	11
Use on-line help as 2nd port of call.	6
Use on-line help as 3rd port of call.	2
Work the problem out on own, by trial and error.	12
Use Internet to find help	1
Am asked to help colleagues find solutions to problems.	6
Ask secretary or other assistant to find solution.	2
Ask an expert colleague or technical person	7
Phone colleagues in other institutions	1
Check with colleagues generally.	5
Ask friends relatives or family for help.	1
Turn to file of own notes/course manual/other paper documentation/manual	11
UCT on-line help is good	7

Category/Theme	Count
On-line help becomes easier with use.	3
Terminology makes help difficult to use	5
Help is too full of detail/multi-layered to find relevant parts	5
There is not enough technical detail in the help.	2
Have difficulty finding the right topic.	3
No difficulty finding the right topic.	5
Prefer to work with printout help topics.	3
Unhappy using search function in on-line help	2
Happy using search function in on-line help	3
Use help as a reminder or reference.	2
Too time consuming to use the on-line help	3
Difficulty getting through on the help desk line.	4
Help desk is good at grasping problems	1
Difficulty getting problem across/being understood with help desk.	3
When calling help desk the problem is usually unique or obscure.	3
Call help desk for specific things only e.g. hardware.	4
Delayed response from help desk is a problem.	7
Cannot get directly to the person you need when phoning help desk.	3
Like to speak to a particular person on help desk.	3
Often bypass help desk and go directly to the expert.	2

Category/Theme	Count
Go directly to a person in an administrative department	2
The PRISM help desk is good.	1
Needed to take problems to PRISM Project itself.	2
Used to need PRISM help desk but not lately.	3
Make use of a local help desk.	1
Visit the central help desk in person.	2
Help desk personnel paid a visit to the person.	1
Phone software company direct.	2

Question 3:

What were the most important conceptual things that you needed to learn about finance in order to understand the way in which R/3 presents financial information to you?

Category/Theme	Count
Knowledge of finances was not really changed by R/3	4
R/3 unlike previous accounting experience.	2
R/3 taught me basic accounting principles/can recognise basic accounting principle in R/3.	5
The reports are good, enjoyable to use.	4
The reports are cumbersome to use.	3
R/3 has not made understanding finances easier. Financial information still unclear.	9
Use other checks when reading reports.	2
Calls unfairly on secretaries to become accountants	2
I run the reports for myself	1
I have others run the reports for me.	2
I run the reports for others.	3
Now comfortable using reports but was not initially.	6
The reports were easy to adapt to from the beginning.	1
Immediacy/accessibility of financial information is good.	4
Can't get the information that is wanted from the reports (e.g. staffing information)	5
Better reporting shows up human inefficiency.	7
Prefer to have information on paper	2
The purchasing process was unfamiliar.	1
Working with UCT financial structures was new.	3
Financial vigilance, checking on expenditure in funds was a new requirement.	4
Report layout difficult to read.	5
Understanding the difference between revenue and budget/revenue not increasing budget.	3
Finding the balance on the report.	5
Understanding the terminology.	6
Document numbers difficult to understand.	1
Minus sign for income was confusing.	3

Category/Theme	Count
Idea of categorising expenditure and using GL accounts	3
Use the Actual/Budget Comparison report	1
Use the Ad Hoc Line Item report	5
Use the drill down reports	2
Use downloads	2
Still use other systems to track or translate finances	3
There is more to get out of reporting on R/3	1

Question 4:

How did you find the R/3 interface, getting around the screens and so on, what have been the most important things you needed to learn how to do? What aspects of using the system did you have difficulty with? How did you find it in the beginning? Has R/3 changed or expanded your knowledge of computer systems in general?

Category/Theme	Count
No problems adapting to R/3 interface, enjoyable to use	7
Similarity/Dissimilarity to Windows	4
R/3 has changed/expanded knowledge of computer systems of its kind	4
Refusal to see R/3 as having changed knowledge of computers	5
R/3 is not user friendly, cumbersome, linear or rigid to use	11
More learned from other PC packages	2
Frequency of use an issue	6
Comfortable now but was not initially.	6
Human attitudes are the problem	4
Powerful functionality is too much	4
Too many levels/stages/screens	3
Screens too busy	4
Double line items	1
Sorting out mistakes afterwards is difficult	1
Drilling down	3
Searching for materials is difficult	8
Using G/L accounts is difficult	1
Searching for currencies is problematic	1
Warning and error messages are difficult to understand	2
Funds availability checking	4
Can't rely on the catalogue prices	2
System going down	3
Printing problems	2
Ordering photocopies on R/3 a problem	5
Ordering from the book shop on R/3 a problem	1
Slowness of the system	2

Question 5:

The PRISM project provided various formal learning events during the implementation … the full course that you went on being the most obvious. But there were also Q&A sessions, seminars when new things came out, presentations before R/3 came along, as well as the weekly funds reporting workshops that are still running. Which of these have you been to and how did you find them? Which format, or combinations made for the most valuable learning experience for you?

Category/Theme	Count
The training course was good or necessary	11
The training course was not good	5
Course notes were made use of	4
Alternative training arrangements were made	1
Did not attend any training courses	3
No other sessions attended apart from original training course	12
Received or gave feedback from other events	1
Change workshops/seminars	2
Q&A sessions attended / and were good	7
Q&A sessions not good or not needed	4
Later seminars attended & were helpful	8
Later seminars not good or not needed	3
Funds reporting workshops attended & were good	6
Funds reporting workshops not good or not needed	3
Need for further training	1
Need for retraining	8
Break between training and going live was a problem, also subsequent breaks	7
Lack of hand-over is a problem	1

Question 6:

We've already spoken about colleagues, but I'd like to ask you to talk about this some more. Who were the people you asked for help? Did these relationships exist before R/3 came along, or did they come about as a result of R/3 being implemented? Do you ask anybody for help who is outside your department? Are there any acknowledged experts, people who are thought of as being good with R/3, in this department?

Who has asked you for help? How did you feel about helping the person? Do people around here share new information as soon as they hear about it? If you are the local expert, how do you feel about playing that role and how do you carry it out?

Is R/3 a topic of conversation around here between colleagues, for example in the tea room? What kind of talk was there about R/3 in the beginning? What kinds of concerns were people expressing?

Category/Theme	Count
All departments going live all at once was a problem	6
Networking was formally encouraged	1
Information learned is shared	11
Generally assist one another in the department	11
No real network of support in the department	4
Drawn into a new network since R/3	1
Academic staff not included in networks	6
Networks are less important now	4
Network extends outside department	2
There is a local expert user in the department	11
I am the expert user	8
No particular person emerged as an expert	4
No local expert users known	3
Administrative personnel are used as experts	2
R/3 is no longer a topic of conversation but it was in the beginning	15
R/3 is still a topic of conversation	8
People have accepted R/3 now	7
R/3 used as a scapegoat	3
Rumours	2

Question 7:

I'd like you to think of a trainer who has impressed you. I don't want to know who it was, or what they trained you in, they could even have trained you outside UCT or some time ago. I'd like you to tell me what it was about the trainer that impressed you, what it was about them as a person, or what it was about their methods that worked for you.

What qualities do you think a trainer of computer technology should have?

Category/Theme	Count
Individual attention	2
Correct pace/level	6
Openness to questions	9
Honesty	2
Knowledgeability	9
Ability to explain/communicate	11
Kindness/friendliness	10
Patience	7
Charisma/strong personality/confidence	6
Enthusiasm for subject	3
Use of humour	6
Willingness to repeat themselves	5
Allowing you to be independent	3
Use of relevant examples	3
Hands on	5
Giving the opportunity to learn informally by observation	1
Course notes	1
Not condescending	7
Not assuming prior knowledge	5
Providing the tools for surviving after the training	1
Attempt to imitate good trainer when training others	5
Not able to imitate qualities of a good trainer when training others	1

Question 8:

I'd like to talk generally about change at UCT! There is a lot of change in our environment at the moment, some people say too much! Faculty structures are changing and new programs are being devised, the staff and student profiles are changing a lot, people are having to work out their own budgets looking further into the future than they've had to do before, and of course we have a new financial system and SAP R/3. That's a lot of change! How are you personally effected by the things I've mentioned, and how do you feel about change in general?

Do you feel well informed about change? How does information get to you?

Do you have any specific criticisms of the changes that are being made, or of the way in which they are being made?

Category/Theme	Count
Change is a concern for the new generation	3
Change is a concern for full time staff	2
Other people are unhappy with change	8
Indications of change stress	6
General employee discontent	4
Change happened too fast, too much in too little time	8
Look for personal advantage in change	3
See UCT change in terms of general societal change	6
Personally involved in making change happen	3
Focus on own work environment, only concerned with change when job is directly effected	11
Accepting, willing to adapt to change	15
Student or staff profiles changing	8
Standard of education	2
Faculty structures changing	15
SAP R/3 & Financial vigilance	7
Job security	9
Budget process	5
Desire to be well informed (officially) about change	2
Not well informed (officially) about change	13
Well informed about certain areas of change only	8
Information about change received informally	3

Category/Theme	Count
Responsibility for keeping others informed	3

Question 9:

What is your understanding of why UCT needed to get a new financial system in the form of SAP R/3? What was it about the previous financial set up that was the impetus for change?

Category/Theme	Count
Don't really know	5
Upgrade financial computer systems	9
Integrated systems	7
Better information	3
Up to date, accessible, on-line purchasing and reporting	11
Reduction of work load or staff in university administration	5
Efficient data capture, paying of UCT vendors	5
Reduced work load in end user departments	2
Devolution of responsibility for admin tasks to end departments	6
Financial control	12
Prevent financial fraud	5
Better security	3
Facilitate better budgeting	2
Student system	3
Empower the end users	3
Paperless office	6

Question 10:

The PRISM has been there to implement R/3 and steer the whole project of changing over to R/3.

In the beginning there were presentations and later departmental visits if needed. Did you go to any presentations or have any department al visits? What prompted them, how did you find the sessions? Did you learn or resolve anything through them?

How have you found the communications from the project to you, or from admin to you? There's been a lot of email, postings on the UCT notice board and the PRISM newsletter. What value did they have for you, what did you do with them?

Category/Theme	Count
Attended a presentation on R/3 and found it useful	2
Attended a presentation on R/3 but did not find it useful	1
Did not attend a session or did not see a need to attend	4
The change to R/3 was not handled well by the PRISM Project	1
The PRISM Project made an effort to help staff change toR/3	15
Read project communication on the UCT notice board	3
Do not use the notice board to keep up with project communication.	1
Do not read the PRISM newsletter	7
Read the PRISM Newsletter and find/found it useful	16
Read and used emails from the PRISM project	14
Do not read or use emails from the PRISM Project	7
Help desk psychologist was appreciated	2
Departmental visits took place (but did not participate in them)	2
Lack of consultation	7

Question 11:

Where does the responsibility lie for making the change to R/3?

If you had to think about a person, or a group of people who's responsibility it is to guide staff and help them make the change to R/3, who would you say should carry that responsibility.

What about the Head of Department, do you think that is a role the HOD should play?

Category/Theme	Count
Responsibility lies mostly with the staff member	9
Responsibility is shared between staff member and management or the PRISM project	6
Some responsibility lies with the HOD	9
The HOD should not be responsible for helping staff change to R/3	6
Technical staff in the department could play a role	5
Responsibility lies with the upper management of the university administration e.g. Finance department	6
Responsibility lies with the PRISM Project	7
Responsibility lies with ITS	1

Question 12:

Where would you go to look up policy information or rules and regulations about financial procedures at UCT? Say it was a Sunday and you couldn't get anyone on the phone. How do you go about getting that kind of information and where would be the first place you'd look? Do you know about the existence of a finance manual at UCT? If you know about it, do you use it?

Category/Theme	Count
Don't need to look up information very often	1
Phone someone in an admin department	16
Carry on working and rely on an admin department to let you know when you are doing something wrong	3
Find information by asking colleagues.	5
Use the Internet	6
Use the finance manual	2
Know of the finance manual but don't use it	7
Don't know of the existence of the finance manual	11
Refer to the on-line help	7
Refer to course notes	2
Ask the help desk or PRISM Project for help	1
Check the UCT notice board	1

Question 13:

Tell me about your relationship with admin departments (Bremner). What kinds of R/3 related things do you need to get in touch with them about? Do you have a network of people who you usually use? Has the frequency, nature of the relationship, kinds of queries or people you connect with changed since R/3 has been around?

Category/Theme	Count
Don't have much contact with admin departments	2
Human contact is important	4
E mail used to make contact	2
Have working relationships with particular people in admin	13
Have a network of people in different admin departments	8
Network includes vendors	1
Need to speak to a few people before finding the answers	8
The network has expanded since we have had R/3	9
Communication network has not changed significantly since we have had R/3	7
Frequency of contact with admin has increased since R/3	11
There was increased contact for a while, but not any longer	2
Staff turnover in Bremner makes it difficult to develop a network	5
Learning occurs though this contact	3
Less than good attitude to service in admin departments	3
Service attitude has improved	4
End users need to have a better attitude towards admin staff	1

Question 14:

One of the visions the project had was to make administrative processes more transparent, more visible to everyone at UCT, especially to staff on academic departments. Do you think this has happened?

You now have up to date information on your desk top, and you can look up the progress of your purchase order or requisition, do you like having that kind of information available now?

Category/Theme	Count
There is more visibility and transparency now	9
There is no more visibility or real transparency now	6
Accountability and transparency via having up to date, on-line information	10
Visibility is not complete	1
More visibility due to devolution of admin work	1
More visibility due to enforced financial vigilance	1
Administrators find greater visibility but not academics	1
Better mutual understanding, especially for ends users of what happens in admin departments	11
No better understanding of what happens in admin departments	6
Transparency is undermined by actions of admin staff	3

Question 15:

I'd like you to tell me about how the volume and the nature of work has changed for you and for your administrative staff [or for you and for the academic staff in the department] since we have had R/3 and devolved administrative tasks.

Category/Theme	Count
Admin work load has increased for academics who are unhappy doing it	5
Work load has increased for support staff but it is accepted as part of their work	5
Support staff are doing everything	23
Academics who do their own admin tasks	6
Division of labour by arrangement	1

Question 16:

We've spoken about some of the frustrations that people have had with R/3 including changed work relationships. I'd like to hear about any real conflict that sparked out of those frustrations, or any that you have witnessed between people in your department. For example there could have been conflict between admin staff and academics, or between a secretary and an admin department at UCT? Is there anything that you can think of?

Describe to me what happened, I don't really want to know names. How was the conflict resolved?

Category/Theme	Count
There has been no conflict	7
There has been conflict – no examples given	1
People complain a lot but its doesn't amount to conflict	2
Conflict between end user departments and the university administration	10
Generalised animosity towards the system	1
Conflict between secretaries and academics or others in end user departments	6
Conflict around job description	1
Conflict resolved through the PRISM project	1

Question 17:

What are your own goals for your working life, what would you like to achieve over the next few years? If you don't have any specific goals, that's okay, just tell me what shape you would like your working life to have if you look ahead. a little What are you currently doing to help bring this about?

How does R/3 fit in with all that? Do you see it feeding into what you want, does it conflict with what you want at all, or does it bear no relation to what you want?

Category/Theme	Count
No specific goals	7
Goals unrelated to working life	2
Goal is to retire from working life	3
Goal is to remain in working life	3
Goal is to keep up with a changing job	2
Have goals indirectly related to work	1
Goals related to a home business	5
Work related study goals	2
Research goals	5
Goals related to career outside UCT	7
Goals related to career path at UCT	5
Goals related to improving efficiency in existing work/field	5
R/3 hinders achievement of goals at work	4
R/3 not related to goals for working life	10
R/3 fits in with goals	16