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**Using Qualitative Methodology in Ergonomics:
theoretical background and
practical examples**

By Sue Hignett

**Thesis submitted to the University of Nottingham for
the degree of Doctor of Philosophy, May 2001**

ABSTRACT

Qualitative methodology offers the opportunity for ergonomists to investigate work problems and research questions using context-sensitive tools for data collection and analysis. This is particularly useful in contexts with complex social and cultural dimensions, for example the high level of emotional and intimate personal interactions between staff and patients in the health care industry.

Two aims have been achieved in this thesis. The first is to set out a clear process for using qualitative methodology in ergonomics by taking a middle ground position with respect to the background philosophy. A generic process for carrying out qualitative research is described and shown in detail in the two case studies.

The ergonomists case study found that there was considerable interest in expanding the ergonomics tool box to include qualitative methodology. However concerns were raised about a perceived lack of knowledge with respect to the process for doing qualitative research. This needs to be addressed by including teaching qualitative methodology in ergonomics courses.

The second aim is use qualitative methodology to identify characteristics of hospitals with respect to the practice of ergonomics. Three themes emerged: organisational issues (complexity and size); staff issues (multiplicity of professionals and gender); and patient issues (dirty and emotional work; patient expectations; and life, death and mistakes). These themes were also found in the practical case study on manual handling problems in occupational therapy. This suggests that knowledge of the characteristics of an industry can help the ergonomist to understand the context of the work problem or research question.

A final dynamic model of ergonomics is proposed to bring together the internal dimensions of a person (representing physical, cognitive and spiritual levels) and the external dimensions of their interactions at a micro level (e.g. tasks) and at wider organisational and societal levels (macro). This model shows the importance of using qualitative methodology to achieve a more complete understanding of human interactions: the basis of the definition of ergonomics.

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ACKNOWLEDGEMENTS

My first thanks must go to Professor John Wilson for agreeing to supervise this thesis. A very close second thank you is to Lynne Mills for encouraging John to take me on! Both John and Lynne have enabled me to arrange supervision meetings around my work commitments.

The interviewees for both case studies were very helpful when I was trying to squeeze in interviews as well as working full-time for most of the last four years. They gave generously of their time for the initial interviews, the follow-up sessions and some have even read parts of this thesis.

Nottingham City Hospital has provided the flexible working environment which has enabled me to juggle my working hours, for which I am grateful.

The National Health Service Executive (NHSE) Research and Development Group (Trent) has supported my thesis for the last two years by paying my registration fees.

The Graduate School at Nottingham University has had relevant and timely courses which I have used to gain information about qualitative methodology in different disciplines (psychology and sociology). They have also provided excellent workshops on the process of doing a Ph.D.

Finally this thesis would not have been possible without Michael's encouragement and patience. He has let me drivel on about the thesis at various times over the last four years and has even read the whole thing (!!). We have both benefited from our new dog, Winnie. She is a wonderful source of unconditional love and has facilitated plenty of mini-pauses by asking for walks and the occasional stroke.



Chapter One

Introduction

*From 'A Dialogue of Self and Soul
(Final stanza of section II, spoken by 'My Self')*

*I am content to follow to its source
Every event in action or in thought;
Measure the lot; forgive myself the lot!
When such as I cast out remorse
So great a sweetness flows into the breast
We must laugh and we must sing,
We are blest by everything,
Everything we look upon is blest.*

William Butler Yeats (Albery, 1994:212)

1.0 Introduction

This thesis is about my exploration of the use of qualitative methodologies in hospital ergonomics. It is intentionally written in the first person to emphasize the use of a qualitative (or interpretative) approach throughout the thesis and the integral role I have had with both the data in the case studies and the ideas being developed from the literature review. Establishing one's position by writing in the first person is supported by a tradition in the social sciences and education (Wolcott, 1990:19, Webb, 1992). I will start by giving the background for my motivation, and then go on to outline the structure and content of the thesis.

I see ergonomics as a socially situated practice and, in order to be effective as a practitioner, I feel that I need to understand why people make choices or carry out tasks in particular ways. I also believe that practice needs to be underpinned by theory and this will mostly be generated from the academic environment.

My concern was that I had been using qualitative methodologies for ergonomic projects at the hospital without having a clear understanding of either the background philosophy (theory) or operational methods (practice). To compound this I felt that the ergonomics journals seemed to have a large number of theoretical (rather than practical) papers using quantitative methods to look at subcomponents of human activity rather than the whole person.

How did this help me as a practitioner? Where were the social elements of the individual person, group or even organisation?

I started this thesis to address some of my own concerns and rapidly became aware that the academic/practitioner relationship in ergonomics had been commented on by others in the same vein, but that few then seemed to take the next step of looking for a way forward.

This thesis draws from, and aims to contribute to, ergonomics theory and practice in all domains and contexts by creating the foundation for the expansion of the ergonomic tool box to use methods supported by qualitative methodologies. For the health care industry, I feel this is particularly important. Clinicians aim to treat patients holistically. This means looking at the whole person, their hopes, fears, life goals, social setting etc. Surely the same principles should apply within hospital ergonomics?

1.1 Setting the scene

I am a hospital ergonomist. I have worked in the health care industry for over 18 years, firstly as a medical laboratory scientific officer in an haematology laboratory, secondly as a physiotherapist, and for the last six years as an ergonomist. My educational and scientific background has been almost entirely quantitative, with a first degree in biochemistry. Just over eight years ago I started work on a research project looking at the application of ergonomics to address manual handling risks for nursing staff. When working on the design of the protocol I felt quite strongly that a quantitative based approach would result in a very limited picture. It would not generate any new ideas or result in any new creative solutions. I started to read about qualitative methodology and realised that I had been working for many years within a particular world-view, based almost exclusively on a positivist-oriented education. Once I started questioning this I was pleased to find that many people

had gone before me, but unfortunately also found that with more information the picture became more clouded. It might have seemed easy at this point to have used a particular qualitative methodology, but this would have required feeling comfortable with the epistemology (and ontology) of a particular school of sociological and philosophical thought, e.g. symbolic interactionism, discourse analysis etc. However the range of methodologies available confused me and I found it difficult to understand how one could build on theories when there could be fundamental philosophical differences. So I reached the point of having carried out two projects under a qualitative umbrella (Hignett and Richardson, 1995; Hignett, 1996a) and still feeling that my own perspective, or world view (ontology), was unclear.

My second area of confusion was about ergonomics. The definition and scope of practice seems to be a perennial debate within ergonomics. At each international conference there are papers from an ever-widening range of academic disciplines. I certainly suffer from the ergonomists dilemma of how to describe what you do in one sentence! There have been a number of models of ergonomics over the years but I could not find one relating to health care. There are models to look at the ageing worker or the use of ergonomics in rehabilitation, but there seemed to be little available looking at the hospital worker and, in particular, the interactions with the patient. Even in the sociology literature most of the research seemed to be from the perspective of the patient rather than the worker.

1.2 Aims

These two areas of confusion have been brought together in this thesis as the following aims:

1. The exploration for, and development of, a theoretical base for the use of qualitative methodology in ergonomics.
2. To explore whether the practice of ergonomics in hospitals is different to other areas of ergonomics, through the identification of generic characteristics and a specific case study.

Specific objectives were then defined, as follows, for parts one and two.

1.2.1 Qualitative methodology in ergonomics (part one)

- To produce a clear picture of the qualitative-quantitative debate which has relevance for ergonomics theory and practice.
- To develop a model of ergonomics, including social factors, from the literature.
- To explore the use of qualitative methodologies in ergonomics.
- To develop a representation model of the relationship between ergonomics theory and practice.

1.2.2 Hospital Ergonomics (part two)

- To try and identify the characteristics of the health care industry and how these might impact on the practice of ergonomics in hospitals.
- To discuss these characteristics in the context of the literature and data from the ergonomists case study.
- To use a practical problem (manual handling risks in occupational therapy) as a case study to show the value of using a qualitative approach to identify new ideas and creative solutions in a complex situation.

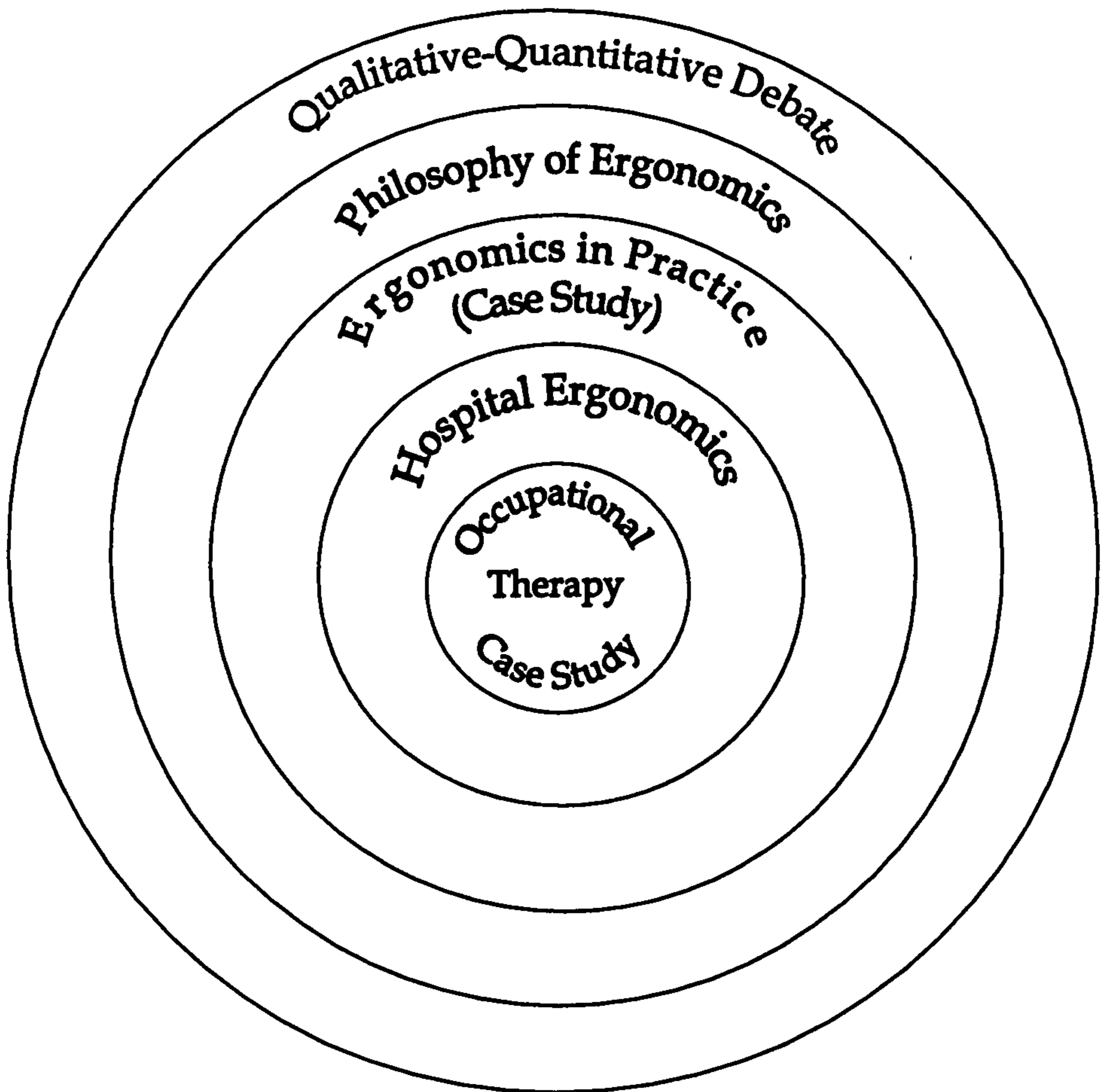
1.3 Outline of thesis

I am presenting this thesis as an 'onion' model (figure 1.1), working inwards, where I gradually focus in on the area of interest, hospital ergonomics.

The purpose of this design is to set the scene in part one by creating an argument for the use of qualitative methodologies in ergonomics. Part two goes on to make an industry-specific case for the use of qualitative methodology in hospital ergonomics both theoretically and practically.

Both parts one and two of the thesis draw on the first case study (chapter four) which was carried out with ergonomists to explore the above issues. Part one uses the data on qualitative methodology and ergonomics. Part two uses the data on hospital ergonomics, and is presented with the second case study on occupational therapists.

Figure 1.1 Structure of Ph.D.



Parts one and two are intentionally structured differently to each other for the following reason. One of the key differences between quantitative and qualitative methodology is the iterative process in qualitative analysis with respect to the existing literature, data and interpretation of the findings. So the literature is used within the analysis to test, and to give directions (sometime obscure) to the collection, analysis and interpretation of the data. For this reason part one has a more traditional structure using the 'analytic story' (Silverman, 2000:242) of literature review, method, findings/discussion and conclusion, whereas part two intends to give a contrasting alternative structure. The literature on hospital ergonomics is intertwined with the analysis (Wolcott, 1990:17), rather than as a stand-alone chapter. The same structure is used with the second case study on occupational therapists.

1.4 Part One

Chapter Two.

Literature review: (1) Qualitative Methodologies

This chapter reviews some of the literature on qualitative methodologies. It starts by setting out a brief and superficial historical context for the philosophical debate on quantitative and qualitative approaches. The outcome of the review is a model to represent my understanding of qualitative methodologies and how they interface with quantitative methodology. This sets the scene for the selection of the methods used in both case studies.

Chapter Three.

Literature review: (2) Qualitative Methodologies in Ergonomics

A review of models used to both explain and drive the practice of ergonomics is given, and I put forward a three-dimensional model which I have used to represent my own interpretation of the scope and practice of ergonomics.

The literature review is in sub-sections to look at the use of qualitative methodologies in the feeder disciplines, in particular engineering, psychology and product design. An argument is developed to look at the changes in organisational theory over the years and how this has been reflected in ergonomics theory. In each section the literature is presented in the context of a methodological continuum, with my categorisation of the methodologies used in the different disciplines.

The philosophy of psychology is reviewed to show clear evidence of the qualitative-quantitative debate. Four approaches in ergonomics are reviewed: macro ergonomics; participatory ergonomics; exploratory sequential data analysis; and francophone ergonomics (ergonomics in French speaking areas, e.g. France, Belgium, Quebec). It is suggested that francophone ergonomics has already experienced a paradigm shift and is now working within an interactionist organisational theory (actor networks).

Chapter Four.

Case Study of Ergonomists

(1) Theoretical exploration of using qualitative methodology in ergonomics

Twenty-one academics and practitioners were interviewed over a two year period to explore their use of qualitative methodology. A middle ground philosophical position is taken based on chapter two. This means that the interpretation recognises

that there is both an external structural world but that interactions will be individual and personally constructed.

A generic qualitative process is used with the three steps of data reduction, data display and conclusion drawing. The four hierarchical trees are summarised in a checklist matrix to show the continuity throughout the process. The interpretation uses a model to show how the theory, methodologies (qualitative and quantitative) and methods in practice in ergonomics interface with the internal (academic) and external (professional practice) environments of ergonomics. The conclusion is that there is a very clear role for the use of qualitative methodology in ergonomics, and there is evidence of use, though with a real problem identified with respect to the supporting knowledge (education) as well as a lack of rigour in the process.

1.5 Part Two

Chapter Five.

Case study of Ergonomists

(2) Identification of the characteristics of hospital ergonomics

The basis for this chapter is the exploration (findings and analysis) of hospital ergonomics using the interview data from chapter four. Only seventeen of the interviewees had experience of the health care industry (academic or practical), some having been National Health Service (NHS) employees (as ergonomists and in other professions), others had worked on specific projects as consultant ergonomists, and yet others just had experience of hospitals as a user of the service.

The findings indicate that hospitals present a particularly complex setting in which to practice ergonomics. This is partly due to the organisational structure (with multiple professional and managerial lines) and also to the core business. The whole population of the UK are potential users of the NHS so the definition of the user group is difficult for many areas. As a service industry the clients (patients) are not paying at the point of contact (unlike banking or transport services) and they do not have to be there (unlike education or the prison service). The work is often intimate, dirty and is characteristically carried out by female workers. The chapter summarises by saying that qualitative methodologies are increasingly being used for research into clinical practice and this would seem to be a trend which is appropriate for hospital ergonomists to follow.

Chapter Six.

Occupational Therapy case study

The purpose of this chapter is both to address the specific aims within the case study and to present an example of a project in hospital ergonomics using qualitative methodology.

The case study looks at the management of manual handling risks in occupational therapy (OT). The OT department generated 63 risk assessments in 1994. By 1996 it was evident that there were problems in managing the assessments which was resulting in a lack of management of the risks. To assist the department a two-year qualitative study was set up with the aims of:

- Rationalising the large number of manual handling risk assessments into generic themes.
- Using the generic themes to identify and plan the management of any outstanding risks.

There was a three-stage data collection process starting with a preliminary focus group to brainstorm the risks, resulting in two groups of generic risks. The second stage used individual observation and interview sessions with 12 occupational therapists to look at these generic risks. The analysis process is described in detail showing how the interpretation was developed through six hierarchical trees, a thematic conceptual matrix and finally explanatory displays in the form of segmented causal networks. For the third stage of data collection the latter two were presented iteratively at four group interviews until theoretical saturation was achieved.

The residual risks are grouped into four segments (treatment handling, internal and external inter-agency communication, and non-hospital property) to show the patient pathway and causal relationships. The first three have been acted upon with the development of local standards, and two multi-professional workshops. The fourth area, non-hospital property, is more complex and is being addressed through local negotiations and inter-agency contracts.

Chapter Seven.

General Discussion and Conclusions

This chapter sums up the findings and discussions from the previous chapters. It revisits the aims and objectives and shows the links and contrasts between parts one and two.

A final dynamic model for ergonomics is proposed to incorporate the findings from chapters three and four. More recent literature is presented to substantiate this model and establish the timely relevance of this thesis.

Chapters five and six are retrospectively linked to show the commonalities of the emergent themes. These are grouped into the three characteristic areas of organisational, staff and patient issues.

Finally the limitations of this thesis are outlined and recommendations for future work identified.

Chapter Two Literature review:

(1) Qualitative Methodologies

The Arts I expected nothing from.

Good company when they're sober

but totally unreliable. But

Science, I expected more from you.

A bit dull perhaps, but steady.

Plodding, but getting there in the end.

Now the end limps into view

and where are you? Cultivating

cosmic pastures new? Biting off

more space than you can chew?

Science you're needed here, come down

and stay. I've got this funny pain

and it won't go awa

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Extract from 'Science, where are you?'

(McGough, 1991:62)

2.0 Introduction

I plan to use the literature review in this chapter and the following chapter to look at three areas relevant to the aim of developing a theoretical base for the use of qualitative methodologies in ergonomics:

1. Qualitative methodologies.
2. Models of ergonomics.
3. Examples of where qualitative methodologies have been used in ergonomics.

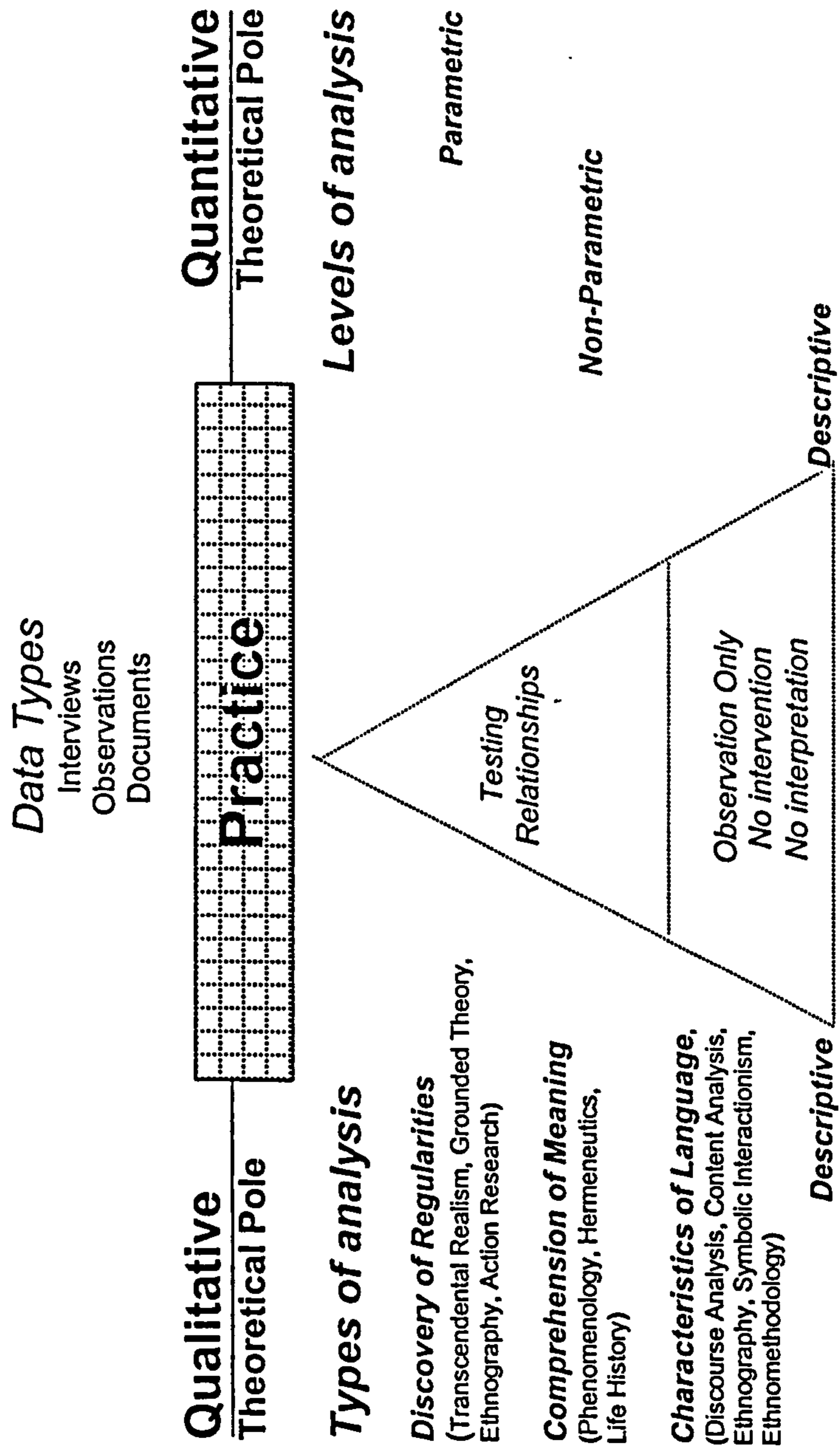
The chapter starts with an historical review of the philosophical qualitative/quantitative dichotomy and goes on to present a summary taxonomy of qualitative methodologies. It finishes with a discussion about the emerging middle ground philosophy, which seems to offer possibilities for ergonomics.

Qualitative methodologies represent the philosophical position of a broadly interpretivist explanation of the social world (Mason, 1996:4). They are often described negatively or by exclusion, for example as being 'non-positivist'. I describe this as being description by omission rather than commission and it introduces a danger of qualitative methodologies being used as a catch-all, or as Walker (1985:18) suggested 'qualitative research reaches those parts that other techniques don't'. There has been a tendency for quantitative studies with qualitative data (e.g. open question at the end of a questionnaire) to carry out a level of analysis which is called 'qualitative' rather than descriptive. There is an argument for mixing methodologies but as a planned, designed process rather than an afterthought.

The pluralism of qualitative methodologies initially confused me, so I offer the following model (figure 2.1) to give a representation of my current understanding.

This model will be used as a recurring theme to discuss the epistemological poles, methodologies, methods and finally, the middle ground, mixing methods. At this stage in the chapter I will only point out the list of methodologies under the qualitative theoretical pole, in comparison with the graded levels of analysis (to reflect the data type) under the quantitative theoretical pole. Titchen and McIntyre (1992) discussed the level of analysis at the qualitative epistemological pole. They identified the lowest level as purely descriptive, as for quantitative methodology, and the highest level of analysis as aiming for a general social theory, or the drawing out

Figure 2.1 The methodological continuum of qualitative and quantitative research



of theoretical models within a body of philosophical thought. These methodologies will be returned to later in this chapter to locate them within their academic disciplines.

The first question often asked is what is the difference between qualitative and quantitative methodology? This is not a simple question and although one-line answers can be given, for example words versus numbers, this does not do justice to the mature debate.

I have found it helpful to follow Bryman's example (1988:102) of discussing the differences at two levels: philosophical and operational. Figure 2.1 is used to show my representation of the research spectrum, suggesting that academic research tends to be located at the epistemological poles of both qualitative and quantitative methodologies using the most philosophically extreme, or most formal academic positions, and in practice the level of analysis is more often somewhere in the middle. This chapter will then go on to set out a generic process for using qualitative approaches, and finish by considering whether qualitative and quantitative methodologies can be combined or if the philosophical differences are too great.

2.0.1 Terminology

Before starting this section I need to give my working definitions of some the terms used in qualitative research. In particular ontology, epistemology, methodology, paradigm, objectivity, validity and reliability (section 2.3.3.1).

Ontology is the fundamental study of being (Hollis, 1996:8). It has also been defined as the study of reality and, as a branch of metaphysics which provides a certain view of the social world, is concerned with beliefs and understanding the kinds of things that constitute the world (Schwandt, 1997:90). I tend to use ontology to mean a world view, the fundamental way in which a person or society sees the world. This could, for example, be simply exemplified using the concept of religion, setting out a defined structure to a world view. This would include how the world came into being (creationist theory rather than evolution) and how societies function with respect to codes of behaviour (morals and ethics) as well as justice (legal systems).

Once one has established the world view, the next level is epistemology. Grayling (1996:38) gave the definition as the theory of knowledge. So how can things be known? Do we learn things or do we innately know them? This is a fascinating level

with a rich debate which can broadly be split between the rationalists and the empiricists, and can be traced from Ancient Greek history as described in the next section. This debate will be historically sited in the next section to lead into the defining characteristics of qualitative and quantitative methodology. More recently, in feminist philosophy, Harding (1987:3) used epistemology to address questions about who could be a knower, how legitimate knowledge was developed from beliefs, and what kinds of things could be known – is there a truth out there?

Methodology will be used as an umbrella term to indicate the theory and account of how research is, or should be, carried out in contrast to method, which is used to describe a technique for gathering evidence (Harding, 1987). The theory relates to the ontology and epistemology, relevant for that social context, to set the scene for the analysis and interpretation within that philosophical position. So all philosophical positions and their attendant methodologies explicitly or implicitly hold a view about reality (Williams and May, 1996:69). An example of methodology is discourse analysis which sets out the underlying philosophy and also the context in which the research analysis and interpretation is carried out. Silverman (2000:300) used methodology to mean a general approach to studying research topics which relates theories to methods. So for his definition, the theory would be the Foucaultian discourse analytic approach, the world viewed as discourses (forms of knowledge which work like languages; Jones, 1993:103) and the method would be the analysis of language to identify the discourses being used.

The word **paradigm** is often used to describe what I would call a school of thought. Kuhn (1962) popularised the word paradigm when he used it to describe the changes in fashions in scientific knowledge as paradigm shifts. His thesis was based on the notion that all scientific knowledge was produced from within a particular tradition or paradigm which then determined what research was done and how it was carried out (Jones, 1993:156). This applies equally to qualitative and quantitative methodologies. So a new paradigm is a new way of seeing the same things in a different way (Hughes and Sharrock, 1997:82) and depending on how polar one's ontological position then the paradigms may be mutually exclusive. It may not be possible to believe in both the creation and the evolution of humans from the same genetic line as chimpanzees.

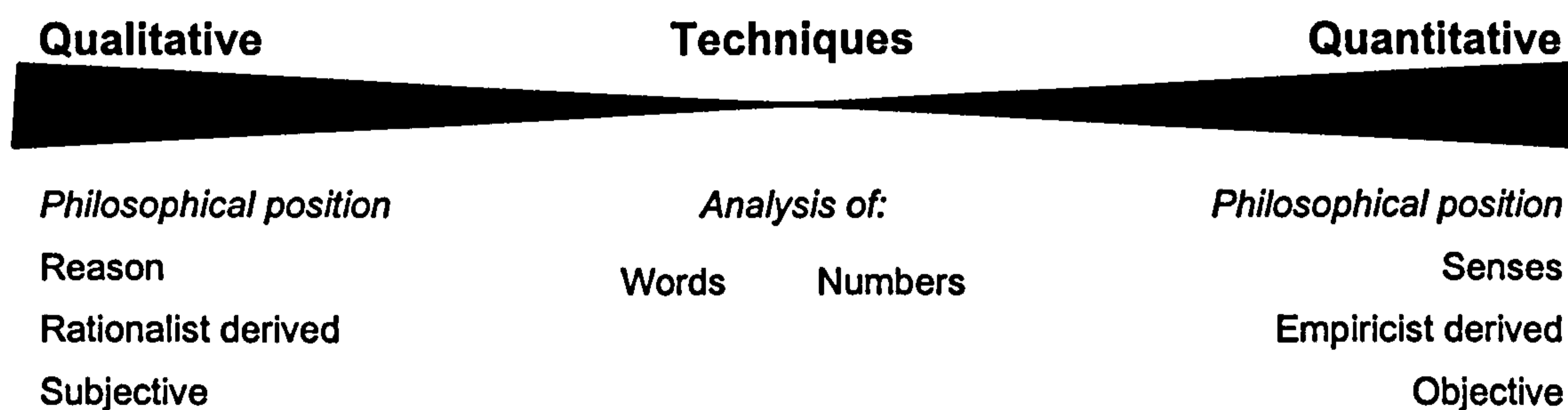
Qualitative data types have tended to be classified as subjective rather than objective. This takes us into another philosophical debate with respect to whether it is possible for any research to be objective if a human has been involved in choosing the area of research/question/equipment etc. Objectivity in qualitative research is generally not an issue as the goal is not usually to seek neutrality, but to recognise the researcher's effect on the research, making explicit how this may affect the interpretation and findings. Silverman (2000:11) summed up his position by saying that 'ultimately, objectivity should be the common aim of all social science ... if we wish to establish criteria for distinguishing qualitative research, we will need to understand the similar issues faced by any systematic attempt at description and explanation, whether quantitative or qualitative'.

2.1 Philosophy

Within philosophy there are two extreme positions (rationalism and empiricism) with respect to ontology, epistemology and methodology. The equivalent polar positions for methodology can be called qualitative and quantitative, and there are supporting frameworks for epistemology and ontology for both.

This tradition of a dichotomy can be traced back to ancient Greek philosophy (Murphy et al, 1998:15) between mind and matter or reason versus senses. The two philosophical positions are shown with respect to qualitative and quantitative methodologies in the following diagram (figure 2.2)

*Figure 2.2 The simple qualitative – quantitative continuum
(Hignett, 2000a)*



A rationalist has the belief that reason is the primary source of knowledge, with certain innate ideas that exist in the mind prior to all experience. The rationalists are roughly grouped as taking a world view, or ontology, with human reason as the

central tenet. In contrast an empiricist believes that there is absolutely nothing in the mind that is not experienced through the senses. The tradition started with Aristotle (Wardy, 1996) taking the position that the highest sense of reality is what we perceive with our senses not what we think with our reason. The following 'Cooks Tour' through the history of the philosophy of science and the social sciences was drawn from a number of authors (Bond and Bond, 1994; Bunnin and Tsui-James, 1996; Chalmers, 1982; Gaardner, 1995; Hughes and Sharrock, 1997; Jones, 1993; Marshall, 1994; Richards, 1983; Williams and May, 1996). Even within this limited number of texts there were differences of opinion so I have tried to stay with only one classification, of reason versus senses, rather than getting into alternative classifications, for example conflict, consensus and action theory (Jones, 1993:15), or structuralism versus functionalism (Bond and Bond, 1994:18). Inevitably the short descriptions given for the individual philosophers do not do justice to their greater body of thought and work. However it is my intention simply to use this overview to develop a context for the range of qualitative methodologies.

*Table 2.1 Historical perspective on reason versus senses.
Part one, Ancient Greece.*

Reason	Senses
<p>Parmenides (540-480 BC). Senses give an inaccurate picture of the world, human reason is our primary source of knowledge. RATIONALIST</p>	
<p>Socrates (470-399 BC). There needs to be a solid foundation for knowledge based in human reason. Set the foundations for the dialectic process where an initial proposition (thesis) is inadequate and generates a counter proposition (anti-thesis) and the rational content of both are taken up into the synthesis. RATIONALIST</p>	<p>Democritus (460-370 BC). Believed in nothing but material things. MATERIALIST</p>
<p>Plato (428-347 BC). Proposed a second reality (world of ideas) to represent complete knowledge which was incompletely known in the first reality (world of senses). The creation of a good state depends on everything being governed by reason RATIONALIST</p>	<p>Aristotle (384-322 BC). Nature is the real world. Biologist/scientist - started the classification of natural phenomena based on characteristics. Used logic to demonstrate a number of laws governing valid conclusions or proofs, started the tradition of cause-effect relationships. EMPIRICIST</p>

Having established the philosophical dichotomy, I will move forward to the era of medieval philosophy, where religion (or mysticism) emerged as a strong influence with the integration of faith, reason, theology and philosophy. This mostly came under the reason tradition, with St Augustine (354-430) finding no contradiction between Christian and Platonic teachings. However in believing that all knowledge was derived from faith, a hierarchy emerged with God's wisdom being greater than human wisdom, so reason had to be subordinated to faith, with the corresponding subordination of philosophy to theology. Towards the end of this era (eleventh century) there was a rediscovery of the work and logic of Aristotle. St Thomas Aquinas (1225-1274) is credited as one of the first philosophers to integrate the two strands. This integration is seen again in later periods and will be further considered in the context of mixing methods at the end of the chapter. He developed the Aristotle school of thought to integrate Christianity and physical science.

In the fifteenth and sixteenth centuries philosophy and science started to break away from theology. This era of Renaissance philosophy saw the development of the Scientific Method, based in empiricism, using systematic experiments and observations to investigate many natural phenomena. This led to, and included, the scientific discoveries of the compass, telescope, fire arms and the printing press.

*Table 2.2 Historical perspective on reason versus senses.
Part two, Renaissance Philosophy.*

Reason	Senses
<p>Descartes (1596-1650), a mathematician and epistemologist, had two concerns (1) what we can know, and (2) the relationship between body and mind (dualism). He continued in the Platonic rationalist tradition and is regarded as the originator of the phenomenological and existentialist traditions. This developed the rationalist position to integrate the mathematical view point of reason. RATIONALIST</p>	<p>The great growth in scientific knowledge is exemplified by: Copernicus (1473-1543) - heliocentric world picture replaced Ptolemaic earth-centred picture. Kepler (1571-1630) - elliptical orbit Galileo (1564-1642) - law of inertia Bacon (1561-1626) continued the Aristotelian legacy of empiricism as the account for the foundations of human knowledge Newton (1642-1727) - mechanistic world picture, law of universal gravitation EMPIRICISTS</p>

<p>Spinoza (1632-1677) saw reason as the source of knowledge. He included religion by putting forward the notion that all material things and events were an expression of God and nature. Man has certain innate ideas that exist in the mind prior to all experiences.</p>	<p>Thomas Hobbes (1588-1679) postulated that all phenomena (including humans) and psychological attributes (thought, speech etc.) consisted exclusively of particles of matter. MATERIALIST</p>
	<p>Locke (1632-1704) combined the leading doctrines of the empiricist theory of knowledge with a commitment to the prevailing mechanical view of the nature of reality and our perception of it. If we have a conception or idea that cannot be related to experienced facts then it will be false. EMPIRICIST</p>
	<p>Hume (1711-1776). No philosopher will ever be able to take us behind the daily experiences or give us rules of conduct that are different from those we get through reflections on every day life. Cause and effect between pairs of events cannot be proved by reason. EMPIRICIST</p>

The next era, the Enlightenment period, produced philosophers who laid the direct foundations for some of the qualitative methodologies. Before looking at the dichotomy for this period there is another philosopher who took a cross-boundary view, Immanuel Kant (1724-1804). He believed that knowledge of the world came from our senses but in our reason there were also decisive factors that contributed to our conception of the world. Taking a metaphysical or epistemological perspective, he proposed that there were two elements contributing to knowledge of the world:

1. External conditions. The material of knowledge, which we cannot know of before we have perceived them (empirical knowledge).
2. Internal conditions. Form of knowledge, perceptions of events, as happening in time and space (interactions).

This brings the two strands together in using the senses and reason to know the world.

**Table 2.3 Historical perspective on reason versus senses.
Part three, Enlightenment Period.**

Reason	Senses
<p>Kierkegaard (1813-1855) believed that it was more important to find the kind of truths that are meaningful to the individual's life than a universal truth. He drew his entire existence into his philosophical reflection.</p> <p>EXISTENTIALIST</p>	<p>Comte (1789-1857) proposed a three-stage doctrine which replace religion by metaphysical philosophy, and then metaphysics by empirical sciences, lead by sociology. He believed that sociology was about adapting and applying the methods of physical sciences to social life.</p> <p>POSITIVIST</p>
<p>Hegel (1770-1831) was concerned with rationality, freedom and self-consciousness as historical phenomena which develop through an intelligible succession of forms, moved by spirit and structured by dialectic. Recognised that the whole was more important than the sum of the parts.</p>	<p>John Stuart Mill (1806-1873) traced regularities in human behaviour to their source in human nature. Knowledge of the world was confined to beliefs which observation can justify.</p> <p>POSITIVIST</p>
<p>Nietzsche (1844-1900) put forward the view that metaphysicians, religious believers and scientists were all guilty of misunderstanding the nature of language when they made their claims about substance, God, gravity or whatever, as stating how things objectively are. He was emphasising the lack of reflection. Even the propositions of logic and mathematics are not 'truths' but only extremely useful tools for coping with life.</p>	<p>Marx (1818-1883). Historical materialist, economist, sociologist. He wanted to show that material changes affect history: spiritual relations do not create material change. Emphasised that it was the economic forces in society that created change and drove history forward.</p>
<p>Dilthey (1833-1911) put forward the notion that life doesn't mean anything other than itself (hermeneutic circle). 'There is nothing in it which points to a meaning beyond it'.</p>	<p>Darwin (1809-1882). Sense of reality that accepts no other reality than nature and the sensory world. Evolution is the result of natural selection.</p>
<p>Weber (1864-1920). The world is as it is because of social action. He acknowledged that existing action-created social circumstances would exercise constraints as structural forces, but maintained that action was still mental in origin, chosen in the light of the person's perception of the structural constraints. So sociological theories are not theories of social systems, but of the meanings behind the actions which can be accessed through a process of 'verstehen' or understanding.</p> <p>There is a sense of combination between reason and senses for his ideas, although he mostly belongs under the 'reason' classification.</p>	

From around this time it becomes harder to follow such a simple dichotomy. The philosophy of science is further discussed by philosophers such as Popper (1902-1994) developing his theory of falsification for a hypothesis rather than the previously accepted justification. More recently Kuhn, Lakatos, and Feyerabend have all added to the discussion. Kuhn was mentioned earlier in the definition of paradigm. Lakatos has similarly given much thought to the structure of scientific knowledge, suggesting a model for the epistemology of physical science as a hard core of basic assumptions (e.g. the earth moves around the sun), which must not be rejected or modified and is protected from falsification by a belt of auxiliary hypotheses, initial conditions etc. Feyerabend is the post-modernist of the philosophy of science. He presents an anarchistic theory of knowledge, by saying that the methodologies of science had failed to provide rules adequate for guiding the activities of science. The physical sciences, and scientific approach, are now being critically appraised more than they have been for many years. An extreme example of this is the critique of the randomised controlled trial (RCT) which has been held up as the gold standard within medicine. The limitations of applying this extreme methodological approach within human sciences has been reviewed by Britton et al (1998:iv) who concluded that well designed non-randomised study was preferable to a small, poorly designed and exclusive RCT. Campbell (1994:x) described randomisation as 'purporting to control an infinite number of 'rival hypotheses' *without specifying what any of them are [authors italics]*. Randomised assignment never completely controls these rivals but renders them 'implausible' to a degree estimated by the statistical model.'

At this point, rather than continue to trace the historical philosophy of social science in the twentieth century I will move on to looking at a taxonomy of qualitative methodologies.

2.2 Taxonomy of qualitative methodologies

Before creating a taxonomy to represent my own understanding, I will finish the dichotomy of qualitative versus quantitative by summarising the divergence in philosophical thought in table 2.4 (Hignett, 1999). This draws on, and attempts to summarise, contributions from the following authors: Burrell and Morgan (1979), Crabtree and Miller (1992), Evered and Louis (1981), Guba and Lincoln (1981), Hammersley (1992), Leininger (1985), Lincoln and Guba (1985), Marshall (1994),

Miles and Huberman (1984, 1994), Patton (1990), Perry (1996), Robson (1993) and Webb (1992).

Table 2.4 Dimensions of qualitative and quantitative methodologies

Qualitative Dimensions	Quantitative Dimensions
Words, understanding	Numbers, explanation
Purposive sampling, inductive reasoning	Statistical sampling, deductive reasoning
Social sciences, soft, subjective	Physical sciences, hard, objective
Practitioner as a human instrument to gather data, prescriptive, personal	Researcher, descriptive, impersonal
Inquiry from the inside	Inquiry from the outside
Data collection and analysis intertwined	Data collection before analysis
Creative, acknowledgement of extraneous variables as contributing to the phenomenon	Predefined, operationalised concepts stated as hypotheses, empirical measurement and control of variables
Meanings of behaviours, broad and inclusive focus	Cause and effect relationship
Discovery, gaining knowledge, understanding actions.	Theory/explanation testing and development.
Micro-sociology	Macro-sociology

Overall I found that there was a consistency in representing the world in terms of words or pictures, rather than numbers. There were generally differences in scale, with qualitative studies focussing on a few cases, but with many variables, and the opposite in quantitative studies (many cases, few variables). For me the three defining dimensions of qualitative methodology are:

1. The sampling strategy: pre-assigned for projects using quantitative methodology, whereas the sampling strategy for qualitative research develops during the study (section 2.3.3).
2. The iterative nature of data collection and analysis, which also drives the sampling strategy
3. The emphasis on identifying the influence of the researcher. This is achieved by the researcher reflecting on their interaction before and during the project.

I think that, for both research and practice, a project will be underpinned by the project manager's beliefs and interests whether they are implicit or explicit. Hence the design of any project should acknowledge both the researcher's philosophical

perspective and also their reasons for choosing a particular methodology to investigate the question. Hammersley (1996) took a very pragmatic view citing limitations created by practical considerations, including the resources available and constraints, which would then impact on goals of the research. However, although I can understand his point of view, I think it is particularly important in the multi-disciplinary nature of ergonomics that a clear methodological decision is taken and made explicit.

It is at this stage that many qualitative researchers appear to have had problems. Until relatively recently it seemed to be necessary to belong to a particular school of thought in order to undertake qualitative research. This contrasted with quantitative research where the focus was on the process: what type of data to collect and then how to collect, analyse and present them. This has produced the very structured approach shown in figure 2.1 with the two extreme methodological positions for qualitative and quantitative research (Campbell, 1994:x).

To produce my summary taxonomy I have used the framework from Tesch (1990) for listing the methodologies in figure 2.1. She used three broad families of research purpose:

1. Discovery of regularities.
2. Comprehension of meaning.
3. Characteristics of language.

The location of the individual methodologies is not static, for example life history has evolved from focussing on the biographical account into focussing on the interpretive process of developing the biographical account. I think this reflects a general trend within qualitative research and I will discuss this in the next section on process.

As I did not take the historical review of the philosophy of social science into the twentieth century I am summarising the methodologies listed in figure 2.1 in table 2.5. This shows the disciplines in which the methodology originated and is mostly used. It also gives an outline of the philosophers contributing to the development of the methodology, and a simplified summary question to indicate the fundamental area of concern.

Table 2.5. Twentieth Century Qualitative Methodologies (Chenitz and Swanson, 1986; Cresswell, 1998; Miles and Huberman, 1994; Patton, 1990; Schwandt, 1997; Strauss and Corbin, 1990)

Methodology and Central Questions (Q)	Disciplinary Roots	Development
<p>Transcendental realism Q = Is there both a causal explanation and the evidence to show that each entity or event is an instance of that explanation?</p>	<p>Sociology Philosophy</p>	<p>Harré and Secord (1972). Social phenomena exist not only in the mind but also in the objective world and that some lawful and reasonably stable relationships are to be found among them. Human relationships and societies have peculiarities that make a realistic approach to understanding them more complex but not impossible. Calls for both a causal explanation and for evidence to show that each entity or event is an instance of that explanation (explanatory structure and care descriptive account).</p>
<p>Grounded Theory Generate and develop propositions, processes and substantive theory.</p>	<p>Sociology</p>	<p>Highly systematic research approach for the collection and analysis of qualitative data for the purpose of generating explanatory theory that furthers the understanding of social and psychological phenomena. Developed by Glaser and Strauss (1967). Closely linked to symbolic interactionism.</p>
<p>Ethnography Q = What is the culture of this group of people?</p>	<p>Anthropology Sociology</p>	<p>An ethnograph is a description and interpretation of a cultural or social group or system. There is disagreement in the meaning of 'culture' between the two disciplines.</p>
<p>Action Research Process with the researcher as change agent</p>	<p>Social Psychology</p>	<p>Derived from the work of Kurt Lewin (1890-1947) to describe the uniting of the experimental approach to social science with programmes of social actions to address social problems.</p>
<p>Phenomenology Q = What is the structure and essence of the experience of this phenomenon for these people?</p>	<p>Philosophy Sociology Psychology</p>	<p>Description of the experience of every day life as it is internalised in the subjective consciousness of the individual. This has a multiple philosophical derivation, including the transcendental phenomenology of Husserl (1859-1938), the existential views of Merleau-Ponty (1980-1961) and Sartre (1905-1980) and the hermeneutic phenomenology of Heidegger (1889-1976). Schultz (1899-1955) popularised existential phenomenology and influenced the development of ethnomethodology.</p>

<p>Hermeneutics Q = What are the conditions under which a human act took place or a product was produced that makes it possible to interpret its meanings?</p>	<p>Theology Philosophy Literary Criticism</p>	<p>Refers to the art, theory and philosophy of the interpretation of meaning of an object (text, work of art, human action etc.). Draws mostly on the work of Dilthey (1833-1911) and Heidegger (1889-1976) leading to a split between the theory of interpretation as a methodology (Dilthey) and an ontological position of existentialism (Heidegger). The hermeneutic circle refers to an ontological position of understanding as an inescapable condition of what it means to be human. The interpretation of each part depends on the interpretation of the whole and vice versa.</p>
<p>Life History Variety of approaches that focus on the generation, analysis and presentation of the data of a life history.</p>	<p>Sociology</p>	<p>Developed by the Chicago school, initially a biographical account, more recently developed into an interpretive process of developing the biographical account. Assumes that human action can best be understood from the accounts and perspectives of the people involved.</p>
<p>Discourse Analysis Concerned with the analysis of the process of communication.</p>	<p>Sociology Psychology Communication Studies</p>	<p>Study of language, structure, function and patterns. De Saussure (1857-1913), Foucault (1926-1984). The linguistic categories into which people or things are sorted do not reflect any natural, objective order in reality.</p>
<p>Content Analysis</p>	<p>Sociology Psychology</p>	<p>Textual analysis to compare, contrast and categorise data. Originally using word counts and semantic concepts, it has developed further by exploring stylistic characteristics and themes.</p>
<p>Symbolic Interactionism Q = What common set of symbols and understandings have emerged to give meanings to people's interactions?</p>	<p>Social Psychology</p>	<p>Developed by George Herbert Mead (1863-1931) and Herbert Blumer (1900-1987), but also derived from Weber's (1864-1920) ideas that sociologists should proceed to understand those they have studied. Introduces the concept that human action is different to human behaviour, where action depends on an individual's ability to plan their actions and reflect on surrounding objects and past experience. So it is appropriate to study social life as it occurs in its natural social setting.</p>
<p>Ethnomethodology Q = How do people make sense of their everyday activities so as to behave in socially acceptable ways?</p>	<p>Sociology</p>	<p>The study of everyday practical reasoning, and the study of the processes whereby rules that cover interactional settings are constructed. Originated principally from Garfinkel (1917-), drawing on phenomenology and the work by Schultz and Husserl.</p>
<p>Conversation Analysis</p>	<p>Sociology Communication Studies</p>	<p>Detailed analysis of audio and audio-visual recordings of naturally occurring social interaction to identify the interactional practices used by speakers to produce their own conduct and to interpret and deal with the conduct of others.</p>

2.3 Process of doing qualitative research

Silverman (2000:xiii) introduced his text 'Doing Qualitative Research' by saying that 'research students still lack a singly authored, hands-on, practical guide to the business of doing qualitative research, writing it up and making use of it'. For the most part I feel he is right. Previous texts have tended to be multiple-authored with individual chapters rather than collaborative authorship (Bryman and Burgess, 1994; Denzin and Lincoln, 1994; Silverman, 1993). This has resulted in an interesting, but inconsistent, description of how each individual author used qualitative methodologies in their work. The multiple options for sampling, data collection, data management and data analysis reinforce this lack of a pre-packaged design in qualitative research (Crabtree and Miller, 1992). I plan to look at each of these steps and show that, in fact, there has been coalescence for sampling, data collection and data management, with common processes being used. Data analysis is the exception, remaining within the philosophical sphere with each school applying their own body of literature to their research. A parallel can be drawn with quantitative research, where different versions of the same statistical tests (e.g. Chi-squared, ANOVA) are preferred within individual disciplines.

The main text I have used to look at the process of qualitative research is by Miles and Huberman (1984, 1994). They were unusual in describing their philosophical position as non-exclusive and used both qualitative and quantitative approaches, as applicable to the research question. They are also extensively referenced by more recent texts addressing the question of the qualitative process (Grbich, 1999; Silverman, 2000; Whalley Hammell et al, 2000).

2.3.1 Design Decisions

Janesick (1998) suggested a number of design decisions to be made at the start of a qualitative research project which I have summarised in table 2.6.

Points one to four are generally applicable to quantitative research, but point five is rarely found. Miles and Huberman (1994:11) strongly recommended the use of a conceptual framework for both variable-oriented research (looking at the relations among well-defined concepts, predominantly quantitative) or process-oriented research (following the events in a specific case context over time, predominantly qualitative).

Table 2.6 Design Decisions

1. What is studied?	Intellectual question, site, participants (data sources)
2. Under what circumstances?	Access and entry to site and participants. Ethics.
3. For what duration?	Time frame.
4. Research strategy?	Methodology? Methods?
5. Framework?	Personal position, viewpoint with respect to the research question, site and participants.

They suggested that a framework was useful for starting to identify both implicit and explicit theories. I have found keeping a diary, memoing and mind-maps helpful for both developing the conceptual framework at the start of the research project and for reflection during the project. Miles and Huberman (1994:17) stressed the importance of making the researcher's position clear for both the implicit theory, which is likely to be influenced by preconceptions and biases, and the explicit theory, which will be more directly derived from the research. This may result in a set of concepts in a list form, hierarchy, or a network of prepositional statements.

2.3.2 Data Sources

Although qualitative data sources are many and varied, there are three basic types as listed in table 2.7, with a summary ontology and epistemology for each (Mason, 1996:39). All three are also used as sources for quantitative research so they are not uniquely qualitative.

Table 2.7. Qualitative Data Types

		Mason (1996)	
Miles and Huberman (1994:9)	Interviews	Wolcott (1992)	Dingwall (1997)
		Asking	Asking questions Researcher: researched relationship
Observation		Watching	'Hanging out' Transactions between members
Documents		Examining	Reading the papers
			<p>Ontology = people's knowledge, views, understandings, interpretations, experiences and interactions are meaningful properties of the social reality which the research questions are designed to explore. Epistemology = a legitimate way to generate data on these ontological properties is to interact with people, to talk to them, to listen to them, and to gain access to their accounts and articulations. Knowledge and evidence are contextual, situational and interactional so each interview will be different, reflexive and responsive to the situation, context and interaction.</p> <p>Ontology = a data collection method which sees interactions, action and behaviours, and the way people interpret these and act on them, as central. Epistemology = the knowledge, or evidence or the social world can be generated by observing, participating in, or experiencing natural or real life settings, interaction situations and so on, based on the premise that these kinds of settings, situations and interactions reveal data, and that it is possible for the researcher to be an interpreter, or knower of such data as well as an experienter, observer or participant observer.</p> <p>Ontology = (1) the written word, texts, documents, records, visual or spatial phenomena or aspects of social organisation are meaningful constituents of the social world themselves, (2) interest in the processes by which they are produced or consumed; (3) belief that they act as some form of expression or representation of relevant elements of the social world; or (4) that aspect of the social world can be traced or read through them. Epistemology=Words, texts, visual documents, visual records, visual artefacts and phenomena can provide or count as evidence of these ontological properties.</p>

I will look at each data type in a little more detail to see if the literature offers any defining characteristics which would help to differentiate these data types towards the qualitative pole, or if, as I suspect, they are just 'types of data' which can be used within both qualitative and quantitative research.

Within ergonomics Sinclair (1995) suggested that three data types were used: observational (including experimental methods), data base (document searching), and subjective methods. For subjective methods he included questionnaires, interviews, ranking/rating, and critical incident techniques. He identified a common thread for these as containing 'any method that draws its data from the psychological contents of people's heads' (p70). He recommended collecting data with at least two different, independent methods to enhance validity. This is similar to the concept of triangulation and will be returned to in the section on data analysis. An argument against subjective methods includes the inherent human biases but, as I mentioned earlier, this criticism could be levelled at objective data as well as subjective data.

2.3.2.1 Interviews

The continuum for interview types goes from very structured (directed) through to completely unstructured (non-directed). Examples of a structured interview might include a market research questionnaire, with fixed choice responses, or repertory grids and pile sorting where paired comparisons are used for the subjects to order their responses (Crabtree and Miller, 1992). At the unstructured end of the continuum, every day conversation has been used as a data type. Dingwall (1997:58) disagrees with this use, saying that unstructured interview should be something more than just a conversation as it is a deliberately created opportunity to talk about something that the researcher is interested in. He suggests that it could be described as a 'turn-taking system that requires that the interviewer proposes topics and that the respondent seeks to produce locally acceptable answers'. My view is that, as a data type, interviews are not exclusively within the domain of qualitative research: they lie in the middle of the qualitative-quantitative continuum. The selection of subjects to be interviewed (sampling strategy) gives a better indication of the underlying philosophy. If interviewing is used within a quantitative methodology then probability sampling will be used to meet the criteria for statistical analysis. This will be further considered when I look at the range of sampling strategies which have been proposed for qualitative research.

Interviews are not only a one-to-one interaction. Groups are also used to discuss the research questions. Table 2.8 gives a summary of some of the advantages and disadvantages identified by Walker (1985) and Patton (1990:335).

Table 2.8 Group Interviewing

Advantages	Disadvantages
Member checks to eliminate extreme views during the group interview.	Social pressures may condition responses in an artificial way.
When social context is important.	Less suitable for handling sensitive issues, controversial or private topics.
Where new ideas are to be generated.	Limited questions which can be asked in specified time period due to the increased number of respondents.

Focus groups have become increasingly popular, but they are often used as political tools to explore, brainstorm or confirm a question or area of interest without locating their relevance in a wider context.

2.3.2.2 Observation

Observation consists of gathering impressions of the surrounding world through all relevant human senses. The data can be recorded either directly by field notes or indirectly using visual and audio equipment.

A number of authors have categorised observation, as a data collection method, into levels. Adler and Adler (1998:84) modified Gold's (1958) four observation roles in terms of group membership as follows:

Gold (1958)	Adler and Adler (1998)
• Complete participant (going native)	• Complete-member-researcher
• Participant as observer, overt, mutual awareness of research	• Active-member-researcher
• Observer as participant, one-shot interview	• Peripheral-member-researcher
• Complete observer, experiment, no participants	

Patton (1990:217) enlarged on this single continuum, the role of the researcher as an observer, to include an additional four continua with respect to the visibility and explanation of the research to the subjects (overt-covert), the duration (single-multiple observations) and focus (single issue-all elements).

2.3.2.3 Documents

Written text and artefacts are also known as 'mute evidence' (Hodder, 1998:110). Unlike the spoken word these endure physically but, as with group interviews, the text should always be understood in the context of its production, i.e. was it a first-hand account or a commentary, edited or unedited, anonymous or acknowledged.

Material artefacts can include buildings as well as cultural products, visual images, maps, media products, official records, correspondence, diaries etc (Hodder, 1998: 113; Mason, 1996:5; Patton, 1990:10).

2.3.3 Sampling

Sampling is one of the dimensions which, I believe, shows a fundamental difference between qualitative and quantitative approaches. Qualitative methodologies use inductive reasoning during the analysis to interact with the data and drive the sampling, whereas quantitative methodology uses deductive reasoning to test (or falsify) a pre-existing theory (Mason, 1996:99).

The sampling strategy for any research project should be defensible with respect to the appropriate relationship (or logic) of the sample and the intellectual question. The representativeness of the sample against a wider population is generally based on characteristics (e.g. sex, age, occupation) as classifications on a scale. For quantitative research this reduces to just three categories: simple random, stratified random and cluster sampling.

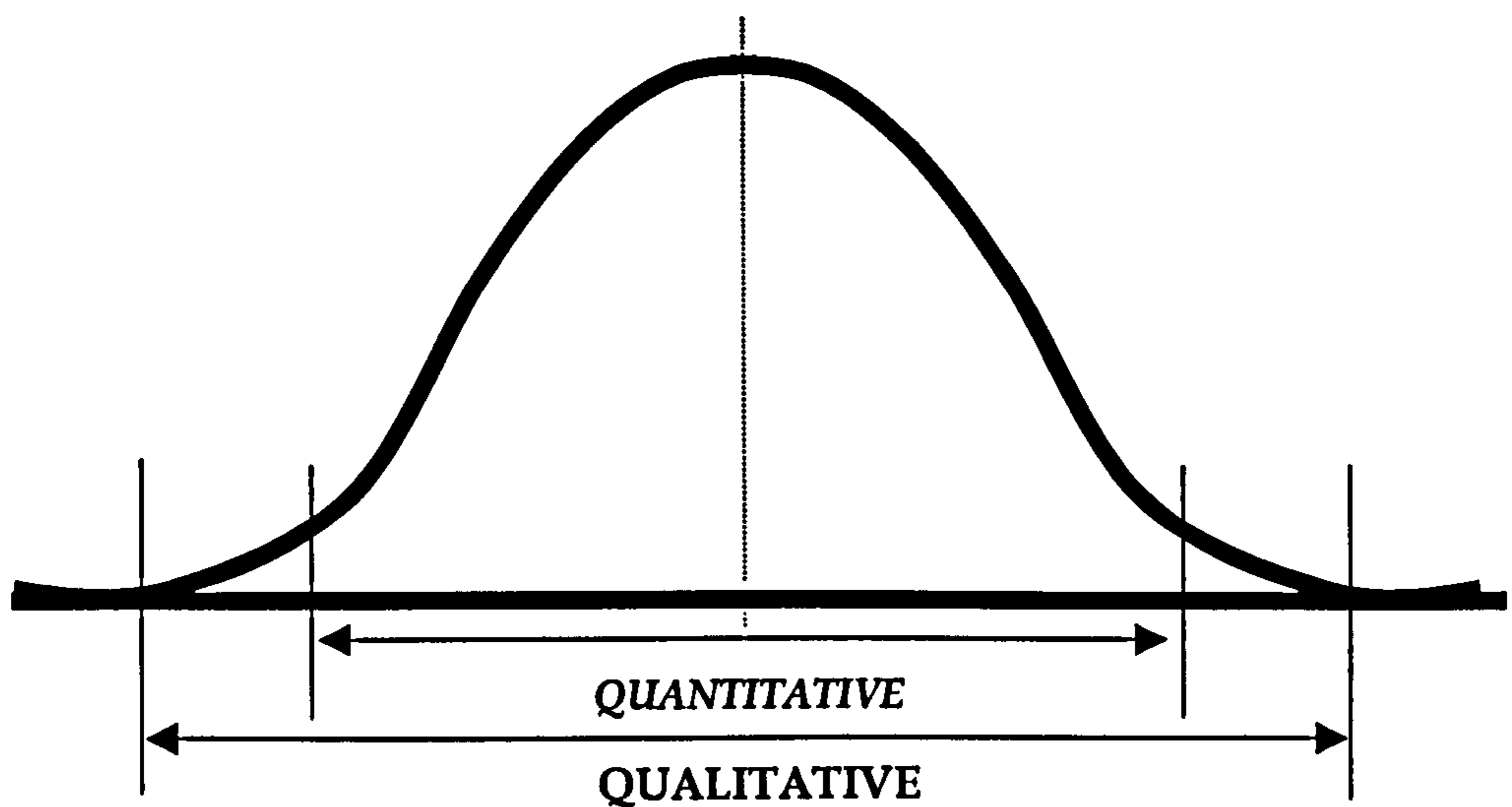
The range of sampling strategies seems symptomatic of the range of qualitative methodologies. I have used a table from Patton (1990:182) with additional contributions from other authors (Miles and Huberman, 1994; Kuzel, 1992; Coyne, 1997; Strauss and Corbin, 1990, Glaser, 1978; and Yin, 1991), and attempted to group the named strategies into similar logics of spreading the net, following up leads, focusing and analysis sampling.

Table 2.9 Sampling Strategies

Type	Purpose
Spreading the net	
Purposive sampling	Maximum variation/open sampling. Picking a wide range of variation on dimensions of interest (time, location, events, people) to provide the greatest opportunity to gather the most relevant data about the phenomenon under study.
Mixed purposeful sampling	Triangulation, flexibility, meets multiple interests and needs.
Convenience sampling	Save time, money, effort. Poorest rationale, lowest credibility. Yields information-poor cases.
Following up leads	
Theoretical sampling	Analyst jointly collects, codes and analyses the data and then decides which data to collect next and where to find them in order to develop the theory as it emerges. Central tenet of Grounded Theory (secondary or analysis sampling strategy).
Snowball or chain sampling	Identifies cases of interest from people who know people, who know what cases are information-rich, i.e. good examples for study.
Opportunistic sampling	Following new leads during field work, taking advantage of the unexpected flexibility.
Focusing	
Homogenous sampling	Focuses, reduces variation, simplifies analysis.
Typical case sampling	Illustrates what is typical, normal, average, trying to find more than one case.
Intensity sampling	Information-rich cases that manifest the phenomenon intensively but not extremely such as above/below average.
Stratified purposeful sampling	Illustrates characteristics of a particular subgroup of interest, facilitates comparisons.
Analysis sampling (inductive analysis)	
Extreme or deviant case sampling	Learning from highly unusual manifestations of the phenomenon of interest. Qualify findings and specify variations or contingencies in the main patterns observed.
Confirming and disconfirming cases	Elaborating and deepening initial analysis, seeking exceptions, looking for variations. Disconfirming cases limit conclusions and indicate points of greatest variation.
Criterion sampling	Picking cases that need some criterion, such as children abused in a treatment facility. Quality Assurance.
Multiple case sampling	Grounding a finding using replication strategy.
Indiscriminate sampling	Choosing sites, persons and documents that will maximise opportunities for verifying the storyline, relationships between categories and for filling in poorly developed categories.

These groupings concur with the ideas of Sandelowski et al (1992) and recognise that it is necessary to use more than one sampling logic during the course of a qualitative research project. This highlights one of the differences in sampling between qualitative and quantitative research. In a quantitative study the sampling decisions are made prior to the collection of data. In contrast, in a qualitative study the sampling strategy will develop during the project. For example, in qualitative research, one would probably start by spreading the net, and then, possibly, by either following up leads or focussing on a specific characteristic. Finally, some form of analysis sampling should be evident in all qualitative studies and I have represented this diagrammatically as a distinguishing feature between qualitative and quantitative research in figure 2.3.

Figure 2.3 Inclusivity of qualitative research



The normal distribution curve shows all the results from a study. When applying statistical analysis in quantitative research one would seek to describe the results in terms of exclusivity, by looking for a central tendency and excluding data lying beyond the standard deviation limits. The tests for a normal distribution (skewness, kurtosis) require the curve to lie within ± 2 standard deviations. If this is not found then it is inappropriate to use parametric statistics on the sample. In contrast, a qualitative analysis should be actively seeking those examples lying in the extreme limits of the curve and providing an inclusive interpretation. I feel that the latter has a lot in common with some areas of ergonomics, e.g. safety critical work and human error, where it is important to identify the unusual, or extreme occurrences.

2.3.3.1 Validity and Reliability

The words validity and reliability are taken from the quantitative approach and need interpretation within a qualitative context. Silverman (1993:vii) commented there was 'a need to reject the assumption that, in qualitative research, anything goes'. Again this is part of the systematic rigour which needs to be seen within qualitative research.

As has been found for other areas there have been a variety of terms used for the two concepts of validity and reliability. Table 2.10 pulls together some of the terms from Guba and Lincoln (1981), Lincoln and Guba (1985), Miles and Huberman (1994) and Robson (1993).

Table 2.10 Alternative terms for validity and reliability

Internal Validity	External Validity	Reliability
Credibility	Fittingness	Auditability
Truth Value	Applicability	Consistency
Trustworthiness	Transferability	Dependability
Authenticity	Generalisability	

The concept of validity applies to both qualitative and quantitative research. For quantitative methodology validity requires proof, evidence and statistical significance such that the study is replicable. For qualitative methodology validity requires completeness, plausibility, illustrativeness, understanding and responsiveness to the readers' or subjects' experiences (Leininger, 1985:323).

Dingwall (1997:62) gave three tests for general validity, which will be used within both case studies:

1. Distinguish clearly between data and analysis.
2. See how the study has looked for contradictory or negative evidence and set out to test statements proposed on theoretical grounds or reported from previous studies.
3. See how it reflects the interactive character of social life and deals even-handedly with the people being studied.

The tests should screen out writings which simply 'explore the emotional or intuitive response of the investigator and fail to contribute to a cumulative science of society or are exposé journalism masquerading as scholarship' (Dingwall, 1997:62). This

again stresses the importance of a systematic, rigorous approach which can be audited.

Walker (1989) looked at the question of validity throughout the qualitative process, starting at the design stage, but particularly focussed on data collection. His view was that the process of respondent validation added to the trustworthiness of the data. Respondent validation is also known as member checking whereby the interpretation of the researcher is presented back to the subjects as part of the conclusion drawing and verification. This is a different process to accuracy checking of data by returning an interview transcript to the interviewee. Mays and Pope (1995) suggested that member checking could be used to add to both the internal (authenticity check) and external validity (transferability of findings).

Table 2.10 showed validity as internal or external. Internal validity addresses issues of credibility and authenticity in the research. At an operational level this is established through the audit trail and the analytic induction process of testing theory. External validity looks at issues of generalisability and transferability. The detail given with respect to the context, researcher bias, sampling strategy and history of the research question can all help to establish the conditions whereby the findings could be transferred to another setting. Webb (1992) added to the discussion with a definition of credibility as 'faithful descriptions or interpretations of a human experience that people having that experience would immediately recognise it' (p750).

Reliability addresses the issues of auditability or quality control. This could be the consistency by which instances are assigned to the same code in analysis, or on a broader level to the process itself. The transparency that Miles and Huberman (1994) sought should reinforce reliability if decision making is explicit with appropriate justification. However there is a problem with replicability for both qualitative and quantitative research. For any study looking at human actions within a social context there will be change, whether in the people involved or in the social situation. Marshall and Rossman (1989:147) suggested that the nature of a qualitative study might be 'characterised by change'.

At a fundamental level the aim of all research should be to convince the reader. Whether this is achieved using large sample sizes and statistical tests, or by detailed descriptions of a situation or point of view, depends on the design of the

investigation or exploration. If the reader is able to use the research by incorporating the findings in their own work then boundaries have been extended and knowledge has been generated, and robust scientific research has been done.

2.3.3.2 Triangulation

Triangulation is another method which has been used to establish validity, both internal and external. Triangulation refers to the use of more than one data source, method, or investigator and the convergence of these to add credibility to a study. Denzin (1970) was one of the first clear advocates of triangulation, but expressed caution with respect to the selection of complementary components. His concern has been echoed by other authors with respect to the underpinning logic such that combining methods may imply a 'view of the social world which says that there is one objective and knowable social reality, and all that social researchers have to do is work out which are the most appropriate triangulation points to measure it' (Mason, 1996:149). As shown in the first two sections of this chapter, different methods involve different ontological positions, so it is better to use triangulation within-case rather than between cases (Silverman, 1993:158). Bloor (1997) took the within-case concerns further with respect to the use of different within-case data collection methods. He suggested that if the best method for the study was chosen (e.g. interviews) and less preferred method was also used (e.g. observation) in order to triangulate, then the comparison will be between optimal and inferior methods and data.

As a final point on triangulation, Coffey and Atkinson (1996) are quite forceful in their general agreement with Bloor's point. They said that the combination of different analyses could not be stuck 'together like children's building blocks in order to create a single edifice' (p14). Different analytic strategies should be used, based on a logic given within the methodology, in order to explore different research questions.

2.3.4 Data Management, Display and Analysis

In any research project the management of the data is important but, perhaps due to the iteration of data collection and analysis in qualitative research, it is particularly important to have a good audit trail showing how data were collected and then managed with respect to the analysis. Huberman and Miles (1998:179) addressed

data management and analysis in detail, expressing concern with the apparent lack of detail in qualitative studies, saying that it was 'unlikely that a researcher could write a case study from a colleague's field notes that would be plausibly similar to the original'. They were keen to encourage transparency in the process of data management for the systematic processes of data collection, storage and retrieval. Data analysis for Miles and Huberman (1994:10) consisted of the three concurrent steps of data reduction, display and conclusion drawing/verification. Their approach has been named 'Qualitative Classification' (Sanderson and Fisher, 1997:1475) and it seems to offer a middle ground, based on realism, which can include both quantitative and qualitative approaches.

Table 2.11 uses their three stage process for data management and compares it with the process recommended by two other authors (Dey, 1993; Marshall and Rossman, 1989). All start by organising, reducing or describing the data. Step two starts the analysis by classifying, either visually or as text. Step three mostly involves interpretation or conclusion drawing. As the qualitative process is iterative these steps are intertwined cyclically, rather than in a linear relationship. Although Tesch (1990) suggested that analysis was not about adhering to one correct approach or set of right techniques, I will give two examples using the case studies in this thesis of the process of data management and analysis.

2.3.4.1 Data Reduction

Initial tools for reducing data can include the use of:

- Contact summary sheets. This method pulls together the data in the researcher's mind and makes them available for further reflection and analysis. It acts as a quality assurance or reflective mechanism to review data collected, any key points raised, and any areas which need further exploration. An example is shown in appendix one from the ergonomists case study.
- Vignettes are pockets of rich, meaningful data which are used to develop interim understanding. They give a focussed description of a series of events which are taken to be representative or typical in the case. They provide a narrative (short story) that preserves chronological flow, but is bounded by the context.
- Memoing during coding. This is a continuation of reflection which started when formulating the conceptual framework. Memos are the ideas about codes and their relationships as they strike the researcher during coding (Glaser, 1978). I

have found that memoing can help in the move from the empirical data to a conceptual level where relationships are explored.

Primary analysis starts by trying out coding categories before moving to identifying themes and trends. The data is condensed, clustered, sorted and linked over time. Codes are labels for assigning units of meaning to 'chunks' of varying size (words, phrases, sentences or paragraphs). Codes drive the retrieval and organisation of data for analysis. The use of CADQAS (Computer Assisted Qualitative Data Analysis Software) supports this process and will be covered later in this chapter.

Coding at this first stage can be considered as just data reduction or simplification. However I also use it as an analytical strategy by noticing relevant phenomena; collecting examples of those phenomena; and analysing the phenomena in order to find commonalities, differences, patterns and structures. Coding is the technical operation of a more subtle process of having ideas and using concepts to describe the data.

Pattern coding is the second level, where coding is used to expand, transform and reconceptualise the data (Coffey and Atkinson, 1996). Miles and Huberman (1994) suggested ways of using pattern coding:

- To map the codes by network displays to show how components interact.
- To check out the codes in the next wave of data collection.

Table 2.11. Data Management Steps

Author	Step One	Step Two	Step Three
Miles and Huberman (1994)	<p>Data Reduction</p> <p>Managing field notes, transcripts etc. Data are reduced in anticipatory ways as conceptual frameworks are chosen and cases and questions are refined. Data are summarised, coded and broken down into themes, clusters or categories.</p>	<p>Data Display</p> <p>E.g. matrices, charts, graphs, networks. Data display describes diagrammatically pictorial or visual forms in order to show what those data imply to give an organised compressed assembly of information that permits conclusion drawing and/or action taking.</p>	<p>Conclusion Drawing/Verification</p> <p>Regularities, patterns, explanations, causal flows. Conclusion drawing and verification using different tactics, e.g. analytic induction.</p>
Marshall and Rossman (1989)	<p>Summarising and packaging the data</p> <p>Organising the data.</p>	<p>Repackaging and aggregating the data</p> <p>Generalising categories, themes and patterns.</p>	<p>Developing and testing propositions to construct an explanatory framework</p> <p>Testing emergent hypotheses against the data, looking for contradictions. Searching for explanations for the data. Writing the report.</p>
Dey (1993)	<p>Describing, including context of action, intentions and process of social action.</p>	<p>Classifying, as themes and codes, to give meanings.</p>	<p>Connecting concepts.</p>

2.3.4.2 Data Display

Step two in table 2.11 is data display. Miles and Huberman (1994) give a number of suggestions for data display including:

1. Context chart, where the inter-relationships between roles and groups is mapped in graphic form.
2. Checklist matrix to tabulate the data in terms of a specific question (table 4.4).
3. Time ordered display to show the flow and sequence of events. This is similar to an activity record or critical incident chart.
4. Conceptually ordered display to show well-defined themes and their interactions. This approach was used for two previous studies looking at manual handling risks for (a) midwives (Hignett, 1996a), and (b) nurses on care of the elderly wards (Hignett and Richardson, 1995).

I use data display as part of the analysis, to try and find relationships and then test them against the data. This creates the framework for the next process of analytic induction as part of the conclusion drawing.

2.3.4.3 Conclusion Drawing

Conclusion drawing is listed as step three whereas, in fact, there is a fuzzy boundary between it and step two. Analytic induction is the process whereby negative or extreme cases are sought to (1) test, (2) extend the scope, and (3) determine the limits of the proposed theory. Basically the theory is revised until all the exceptions are eliminated by inclusion (Silverman, 1993:160; Mason, 1996:94; Fielding and Fielding, 1986:89).

At this stage it is important to bring all the reflective strands together. Testing the interpretation will include checking against one's own biases as acknowledged at the start of the project in the conceptual framework, as well as the influences of the epistemology of the methodology if one has chosen to carry out the study within a particular school of thought.

2.3.5 CADQAS

(Computer Assisted Qualitative Data Analysis Software)

There are a number of data management software packages available to assist with the handling of qualitative data. I am only familiar with two, TextBase Alpha (Tesch,

1993) and NUD*IST, version 3 (QSR, 1994), N₄ (QSR, 1997) and to a lesser extent, Nvivo (Richards, 1999). Computers offer considerable advantages in handling large amounts of text and initially became popular for basic content analysis (counting) in the 1960's (Seale, 2000:154). TextBase Alpha is basically a data retrieval package and is now mostly obsolete, having been surpassed by more sophisticated packages. It allows on-screen coding, but only off-screen search and retrieval and theorising. In contrast NUD*IST N₄ is a code-based theory building programme with two paths, data management and theory-building management. This allows on-screen coding, searching and retrieval through either route. The coding can be displayed as an hierarchical tree with the nesting of codes shown as branches.

It is important to reinforce the point which is often made when discussing the use of computers in analysis: the computer cannot do the thinking, interpreting or relationship exploring, this must come from the researcher. The use of CADQAS is growing for qualitative research, Fielding and Lee (1998:16) suggested that about two fifths of qualitative social researchers in the UK could be described as being CADQAS aware. I would expect this figure to grow as, in my experience, CADQAS takes the grind out of managing a large amount of data using a paper cut and paste/filing cabinet method.

2.4 Mixing Methodologies

Mixing methodologies is a different issue to mixing methods. Mixing methods is a form of triangulation (2.3.3.2). As discussed earlier there are benefits and drawbacks to consider in triangulating methods. The choice of the methods should be part of the initial project design, and therefore appropriate to both the intellectual question and context. An example might be the use of interviews after collecting data by observation. It could be argued that the two data types should be analysed separately and the findings brought together at a second stage analysis. Nonetheless as long as the carry-over, or influence, of each method is identified then this can only add to the richness of the study, rather than introduce a weakness. So the data types indicated in figure 2.1 are placed in the middle of the continuum, to be used across the spectrum of methodologies.

Mixing methodologies is potentially a much more complex issue. Figure 2.1 attempts to show different levels within both qualitative and quantitative methodologies. For

quantitative methodology levels of analysis are given, as defined by the strength of statistical analysis, going from parametric (interval/ratio) down to non-parametric and descriptive. In contrast I have not given levels of analysis for the qualitative methodologies but types, again trying to differentiate between testing relationships and observation-only. The grouping for the qualitative methodologies is from Tesch (1990), whereas the categorisation into testing relationships and observation-only is my attempt to draw a parallel with quantitative methodology. The methodologies that mostly provide a description of the situation or language characteristics have been placed in the observation-only tier. Whereas those seeking comprehension of meaning or looking for regularities have been categorised as testing relationships. Some of the methodologies appear in more than one group and, as indicated in the description of life history, are changing in use.

So whilst methods, at a technical level, can be mixed, methodologies reflect their underlying philosophy. Rather than mix different methodologies I would be more comfortable finding a methodology which supports a middle ground ontology (Patton, 1990), with at least some of the epistemological dimensions as shown in table 2.4.

2.5 Discussion: The Middle Ground

From an historical perspective a central ontology would seem to be possible from Kant's ideal of practical reason (Murphy et al, 1998) to unite 'the judgements of fact and value'. This underpins his emphasis on the 'interaction between theory and practice or ideas and objects' (p28). Weber likewise closed the gap by rejecting the idea that the 'only valid way of doing science was by quantification and measurement' (p30).

The philosophical position I find myself drawn to is transcendental realism, developed by Bhaskar (1989) from the historical tradition of realism. Williams and May (1996:81) summed up this philosophy with one phrase 'the world has an existence independent of our perception of it ... a common sense position'. With my background in positivist science it is not surprising that I am attracted to this school of thought as it could be historically categorised into the empiricist (or positivist) dichotomy (tables 2.1, 2.2, 2.3). So concepts such as causality, explanation and prediction are just as appropriate in the social sciences as physical sciences (Williams

and May, 1996:82). Bhaskar (1975:250) took this further and unpicked the idea of cause-and-effect into not just what you look at, but also how you look at it. So although things exist and act independent of our descriptions, we can only know them under particular descriptions. Descriptions belong to the world of society and of humans, whereas objects belong to the world of nature. He described science as the 'systematic attempt to express in thought the structures and ways of acting of things that exist and act independently of thought'. Bhaskar therefore created the possibility of an ontological realism in which the dichotomy of qualitative and quantitative methodologies could co-exist. This ontological realism requires the 'recognition of the existence of a real, independent world which operates according to natural necessity with a corresponding position of epistemological relativism'. So there is a difference between our descriptions of reality and the reality itself. This means that the kinds of descriptions given in science are themselves historically and socially formed products, the result of the work by previous researchers. I think this offers a very pragmatic viewpoint with the possibility of multiple realities such that the description of a thing in one way, rather than another, does not change the nature of the thing.

Williams and May (1996) and Murphy et al (1998) differentiated between three types of realists, the two epistemologically polar positions (quantitative and qualitative) and the middle position of transcendental (or subtle) realism. Murphy et al (1998:65) used Hammersley's term of subtle realism to define the middle ground. This means that phenomena exist independently of the researcher's descriptions or claims about them. So the aim of social research, according to subtle realists, is to represent reality rather than reproduce it, allowing for multiple, non-competing valid descriptions and explanations for the same phenomena.

What is particular interesting to me is that these two defined positions, transcendental realism and subtle realism, have effectively come from the two opposing poles (Bhaskar from the empiricist pole and Hammersley from the rationalist pole) and found such a similar middle ground. Unfortunately I have been unable to find any comparison of transcendental and subtle realism to add to this discussion.

Williams and May (1996:85) went on to say that social systems are more open than physical ones. This phrase was also used by one of the interviewees when describing

a hospital as an organisation (chapter five). I think this is similar to the description by Murphy et al (1998) of non-competing multiple realities. A different combination or sequence of events can result in the same outcome (e.g. different route choices when driving to a destination or different medical treatment regimes resulting in recovery). Williams and May (1996:83) developed Bhaskar's differences between social and physical science with respect to their comparative complexity, so the research challenge is to identify all the conditions, or causes, that result in an outcome or effect. The relationship is rarely linear.

On a final note Miles and Huberman (1994:4) took a pragmatic approach to this middle ground, describing themselves as transcendental realists, and saying that 'social phenomena exist not only in the mind but also in the objective world - and that some lawful and reasonably stable relationships are to be found among them'. They gave their ontological position as needing an 'explanatory structure [*physical description or framework*] but also a grasp [*through interaction or interpretation*] of the particular configuration at hand'. Although I still only have a very peripheral grasp on the philosophical issues outlined in this chapter, I feel that this middle ground must offer considerable scope for ergonomics. This will be considered again at the end of the next chapter, the literature review of the use of qualitative methodologies in ergonomics, and as part of the analysis for the case study on ergonomists (chapter four).

Chapter Three

Literature Review

(2) Qualitative Methodology in Ergonomics

'The success of scientists in the late 19th and early 20th centuries looking at the physical work and physical process on the organic world lead to an acceptance of 'science'.

This was envied by ... psychologists, in their strivings to gain acceptance with other scientists, [they] did not pause long on issues raised by the difference between studying a rock or chemical compound or an animal on one hand and a human individual on the other.

Instead methods that had been successful in the physical and biological sciences were embraced as models for psychology. ...

Turning to the humanities for an understanding of what is basic in being a human being was considered absurd'.

Wood Sherif (in Harding, 1987: 43)

3.0 Introduction

Over the last 50 years the practice of ergonomics has changed and with it the models of practice. Some of these models will be reviewed, but I will start this chapter by saying that I see ergonomics as a socially situated practice (Hignett, 2001a:62) and have developed my own model to represent this position (figure 3.6). I shall expand this by looking at some dimensions in ergonomics, and then look at how the scope of ergonomics has changed and extended over the years into new areas of practice.

The next section will look at organisational theories from both an historical perspective but also in terms of the qualitative-quantitative continuum. This sets the

scene for considering where the education and practice of ergonomics sit with respect to current and previous theories of organisations.

Design is one of the feeder disciplines for ergonomics, principally from and to engineering design but also from and to product design. The two disciplines are contrasted with respect to the positioning of ergonomics and the use of qualitative and quantitative methodologies.

The philosophy of psychology is reviewed, with three sub-sections on environmental psychology, cognitive engineering and naturalistic decision making. There is a feeling coming from some practitioners and academics that quantitative methodology is not suitable for all intellectual and research questions. To compensate for this it seems to me that new approaches or methodologies have been invented rather than drawing on methodologies used by other academic (qualitative) disciplines.

In the review of ergonomics I will look at specific areas in ergonomics which seem to have an affinity with the use of qualitative methodologies: macro-ergonomics, participatory ergonomics, exploratory sequential data analysis and francophone ergonomics.

This leads me onto considering a new paradigm or model for ergonomics, and to review figure 3.6 to see if it provides a suitable representation of the various schools of thought.

3.1 Scope of Ergonomics

3.1.1 Dimensions in Ergonomics

Table 3.1 shows my representation of dimensions in ergonomics, putting the age of the profession at about 50 years, coming to prominence during World War Two (Sanders and McCormick, 1993:7). The three background disciplines are engineering, psychology, and life sciences with more recent disciplines of organisational management and computer science having been added at a later stage. The education is mostly post-graduate, with a first degree in one of the background disciplines. Ergonomics departments are usually located within one of the background (or feeder) academic disciplines. This has resulted in a diverse profession where some ergonomists may consider themselves to firstly belong to

another profession (engineer/psychologist), with ergonomics being performed under the auspices of that background (or first) profession (Noy, 1999).

*Table 3.1 Dimensions in Ergonomics
(modified from Hignett, 2000a)*

Ergonomics	
<i>Age</i>	Traces route from Ramazzini (1633-1714) Came to prominence during WW2
<i>Background</i>	Engineering Psychology Life Sciences Organisational Management Computer Science
<i>Education</i>	Mostly post-graduate
<i>Major Applications</i>	Military Manufacturing Product Design Human Computer Interaction (HCI) Process and transport control (human reliability and error analysis) Health and Safety
<i>Major Client Population</i>	18-65 years [paid employment]
<i>Involvement via</i>	Organisational change programmes Design projects
<i>Focus</i>	<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; margin-right: 10px;"> <p>+++</p> <p>↓</p> <p>+</p> </div> <div style="text-align: left;"> <p>General Population</p> <p>Organisation</p> <p>Small Group</p> <p>Individual</p> </div> </div>
<i>Process</i>	Task Analysis Design Test and evaluation

The areas of application are drawn from Shackel (1996) and Lee (2000). The initial application in the 1950's was in the military, moving onto industrial applications in

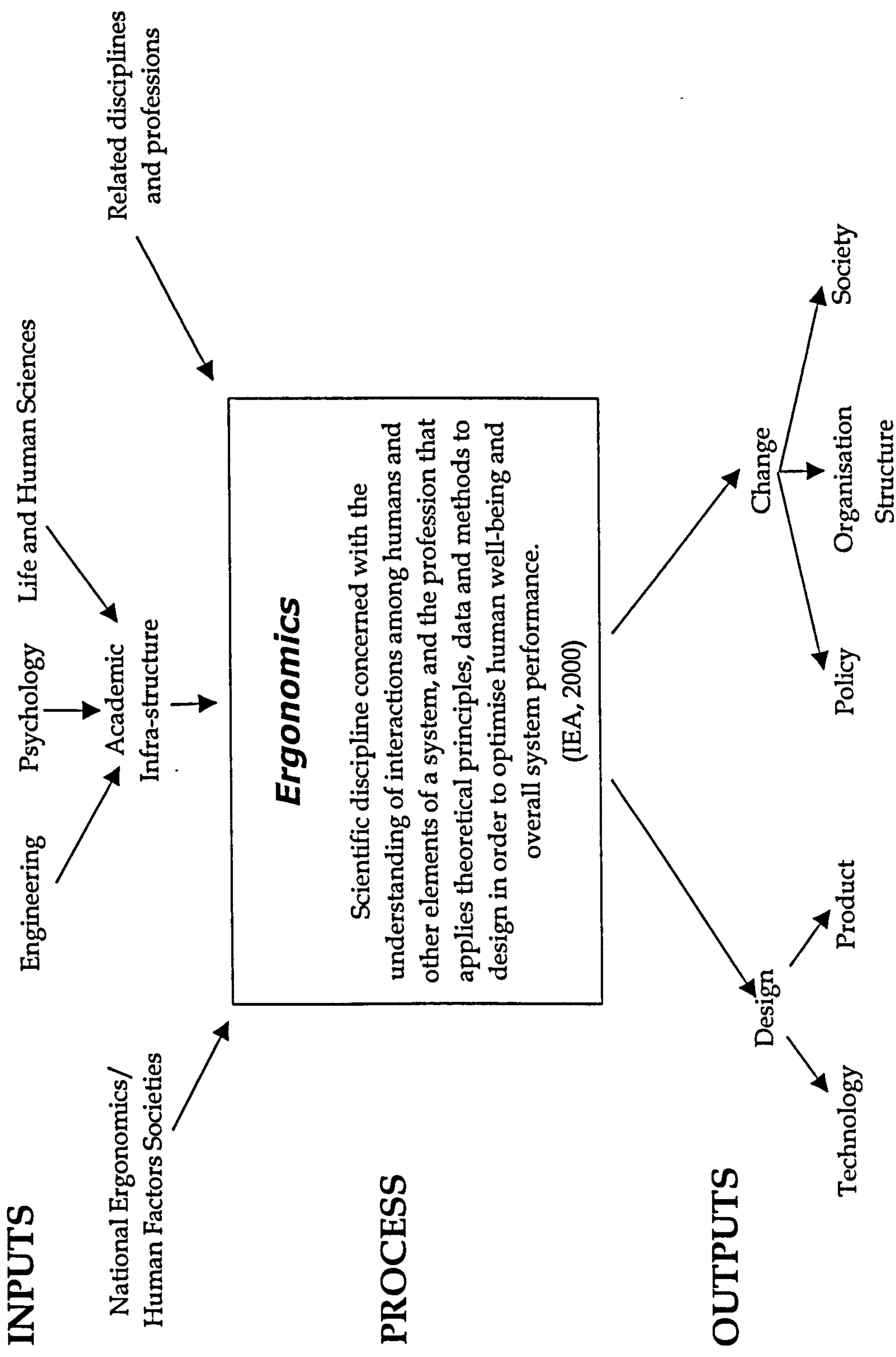
the 1960s (manufacturing) and then consumer product design in the 1970s. The 1980s saw a growth in information technology, computers and space research which was followed by human error analysis (information and cognitive ergonomics) in both the 1980s and 1990s. Shackel speculated that future areas of application for ergonomics would include: advanced transportation; co-operative working; telework/home working; health services, elderly and disabled; pollution and waste management; leisure; and virtual reality. Some of these are areas of application or specific industries, whereas others are client groups, for example the elderly and disabled. Traditionally the major client group for ergonomics has been the working population (18-65 years) with other professions leading the service provision to other populations. For example occupational therapists provide ergonomic services at an individual level to the younger and older age groups (Hignett, 2000b).

Involvement has been either proactive, when a design project is being tackled, or reactive, when a problem has been identified which requires analysis and change in the organisation or product. Ergonomics has traditionally focussed on large employee populations, designing solutions at an organisational level, or for large consumer populations in product design. However there are some smaller scale applications, though again these tend to cross over to other professions e.g. clinical ergonomics (Abdel-Moty et al, 1988, Khalil et al, 1991) and occupational therapy (Hignett, 2000b). Finally, the process by which ergonomics is delivered has been task-centred. A new definition of ergonomics (IEA, 2000) changes the process into the interactions between humans and other elements in a system. This will be reviewed both later in this chapter and again in the next chapter as part of the case study.

3.1.2 Definition of Ergonomics

Noy (1999) identified input and output factors influencing the development of ergonomics in the global, social, economic and political contexts. I have represented these diagrammatically in figure 3.1. The inputs include the professional contribution via the national societies, but the strongest input is the academic infrastructure, with engineering, psychology and life sciences still being the main feeder disciplines. Moray (1994) suggested that there needed to be a much closer relationship with other related disciplines, for example: industrial psychology, social psychology, anthropology, and sociology.

Figure 3.1 Definition of Ergonomics



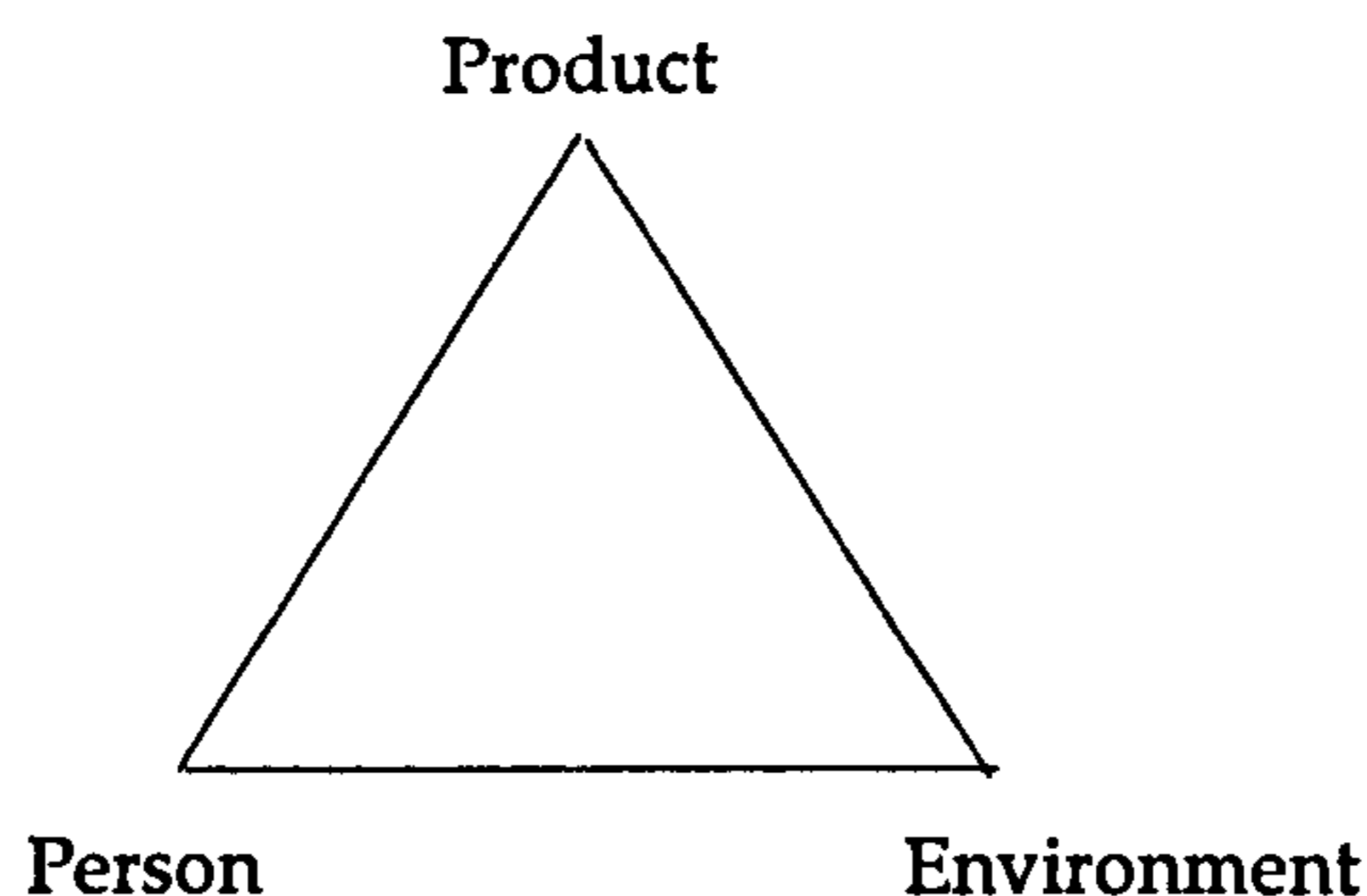
Noy listed outputs as influencing technology, policy and society. I have put these into two groups of design and change to introduce my perspective on the practice of ergonomics. Helander (1997) suggested that the main purpose of ergonomics was design whereas Caccamise (1995) described human factors engineers as process facilitators or change agents. This encapsulates what I think are the two key areas of practice for ergonomics.

In the 1990s there were a lot of introspective and soul-searching articles published about the definition of ergonomics, its status as a science, art (Moray, 1994) or craft, and its utility (Wilson, 1999). Defining ergonomics as the science of interactions draws heavily on systems theory, and will be considered in the context of organisational theories (3.3).

3.2 Models of Ergonomics

The following models of ergonomics reflect the era in which they were used.

Figure 3.2 1960s – 1970s



The model in figure 3.2 was mostly used in manufacturing and consumer product design. Perrow (1983) called this the 'predominantly physiological perspective'. This model was expanded (figure 3.3) to include organisational factors, and is still used as a broad categorisation (IEA, 2000:5).

Figure 3.3 1980s onwards

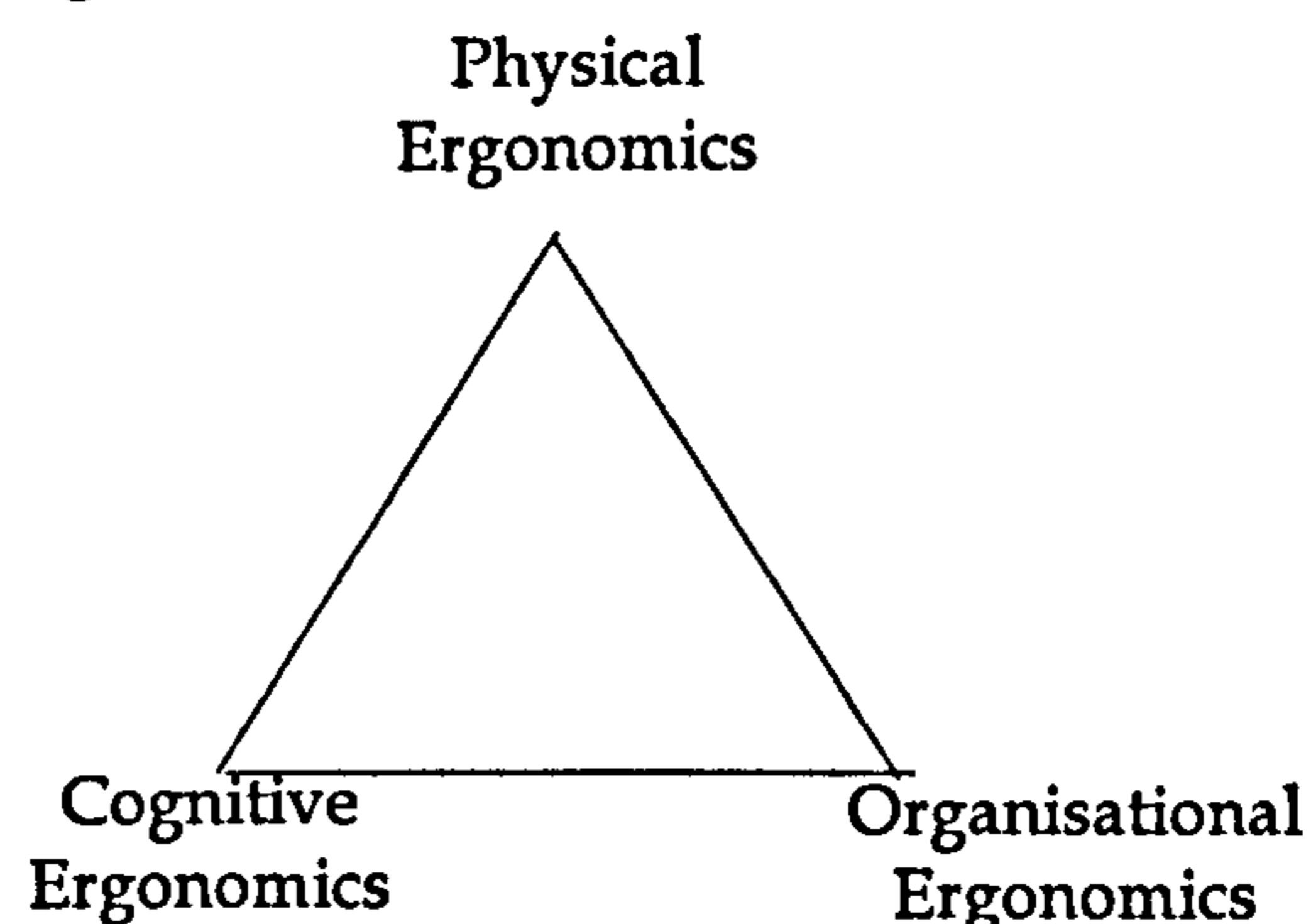


Figure 3.4 Work ability (Ilmarinen, 1997)

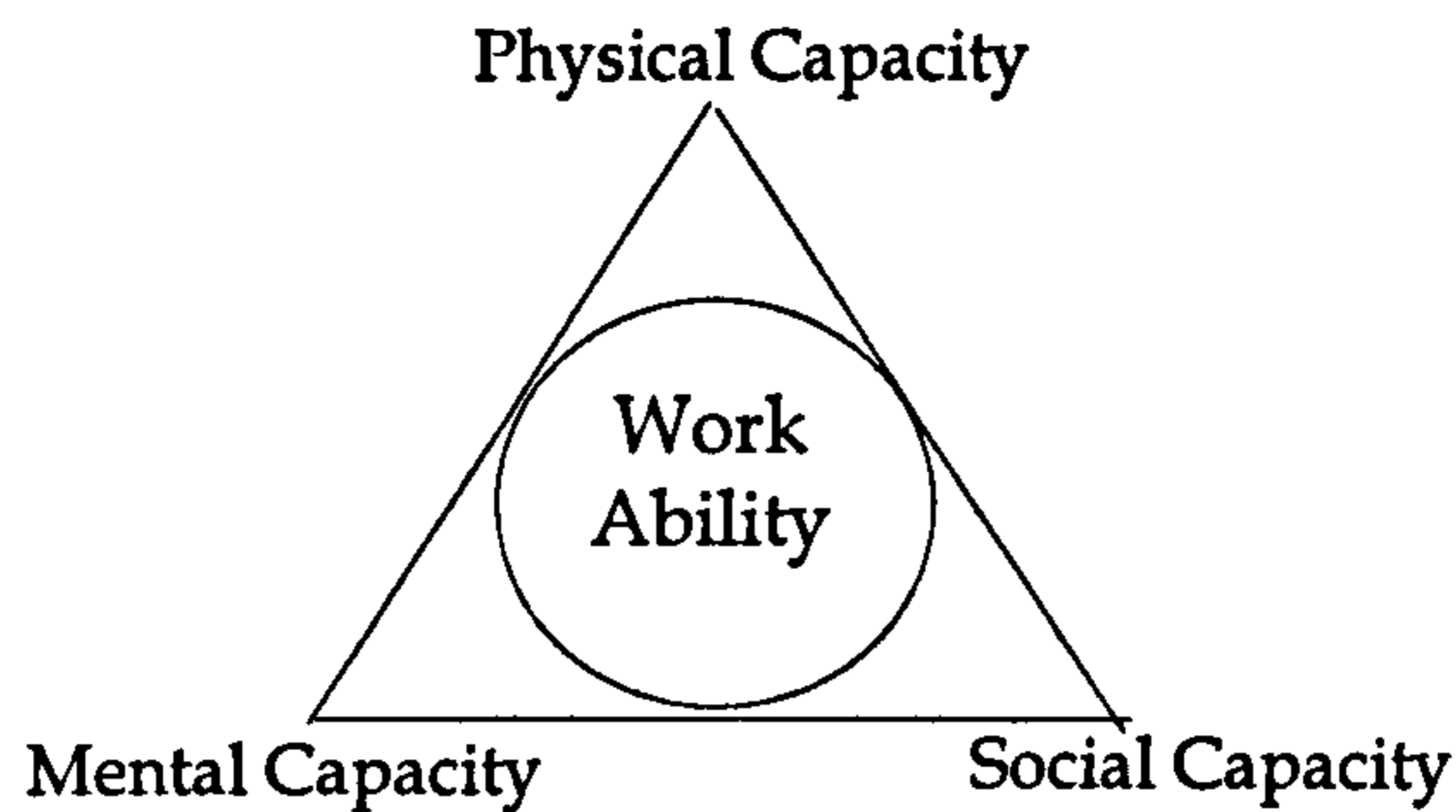
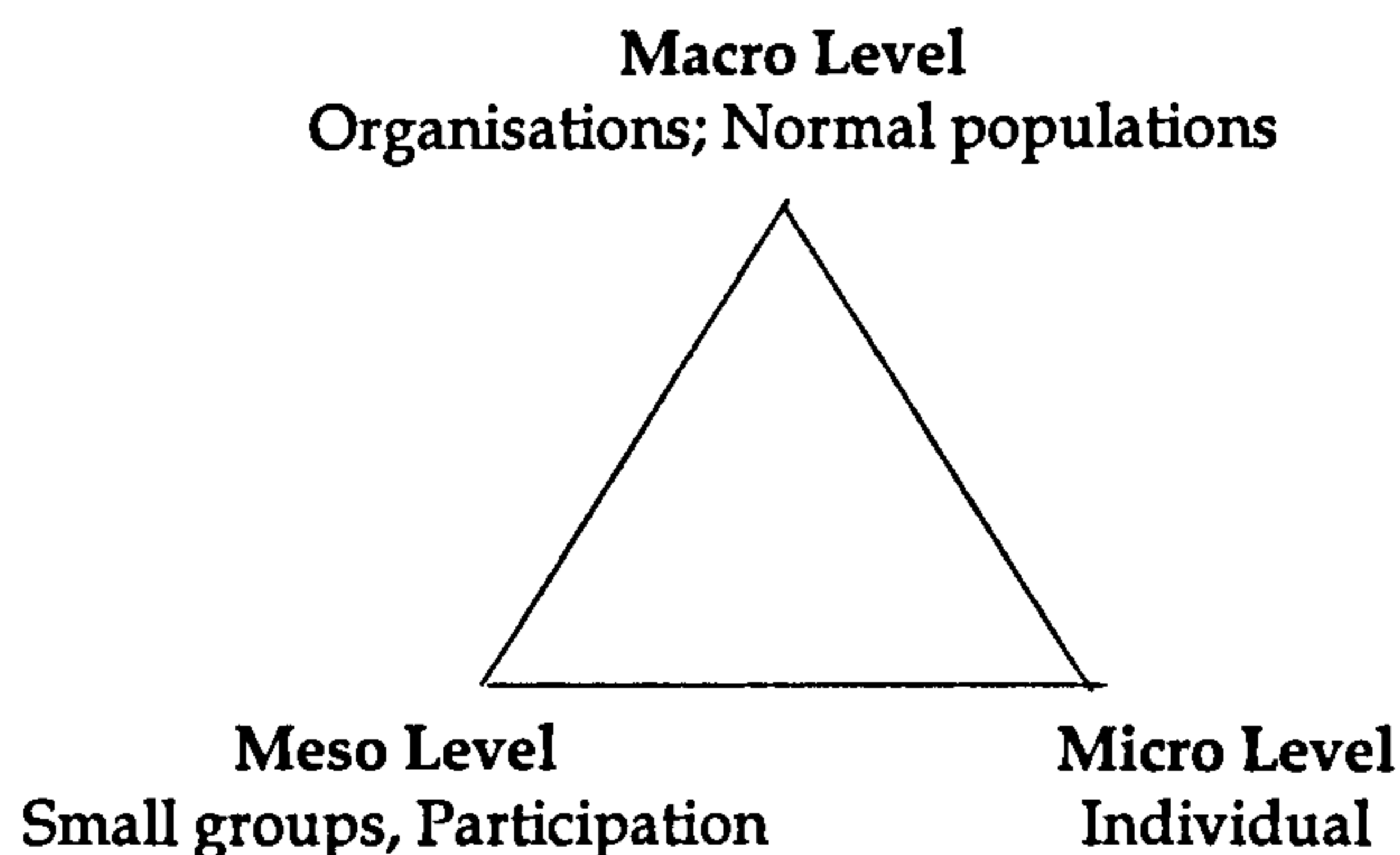


Figure 3.4 (Ilmarinen, 1997) again uses a triangular model to describe the human ability to work, placing work ability in the centre, and leaving reserves, in all the triangle corners, of physical, mental and social capabilities. To develop figure 3.6, I incorporated aspects of the above models and also used an earlier triangular model (figure 3.5, Hignett, 1999) to try and represent the levels of ergonomic focus.

Figure 3.5 Levels of ergonomic intervention (Hignett, 1999)

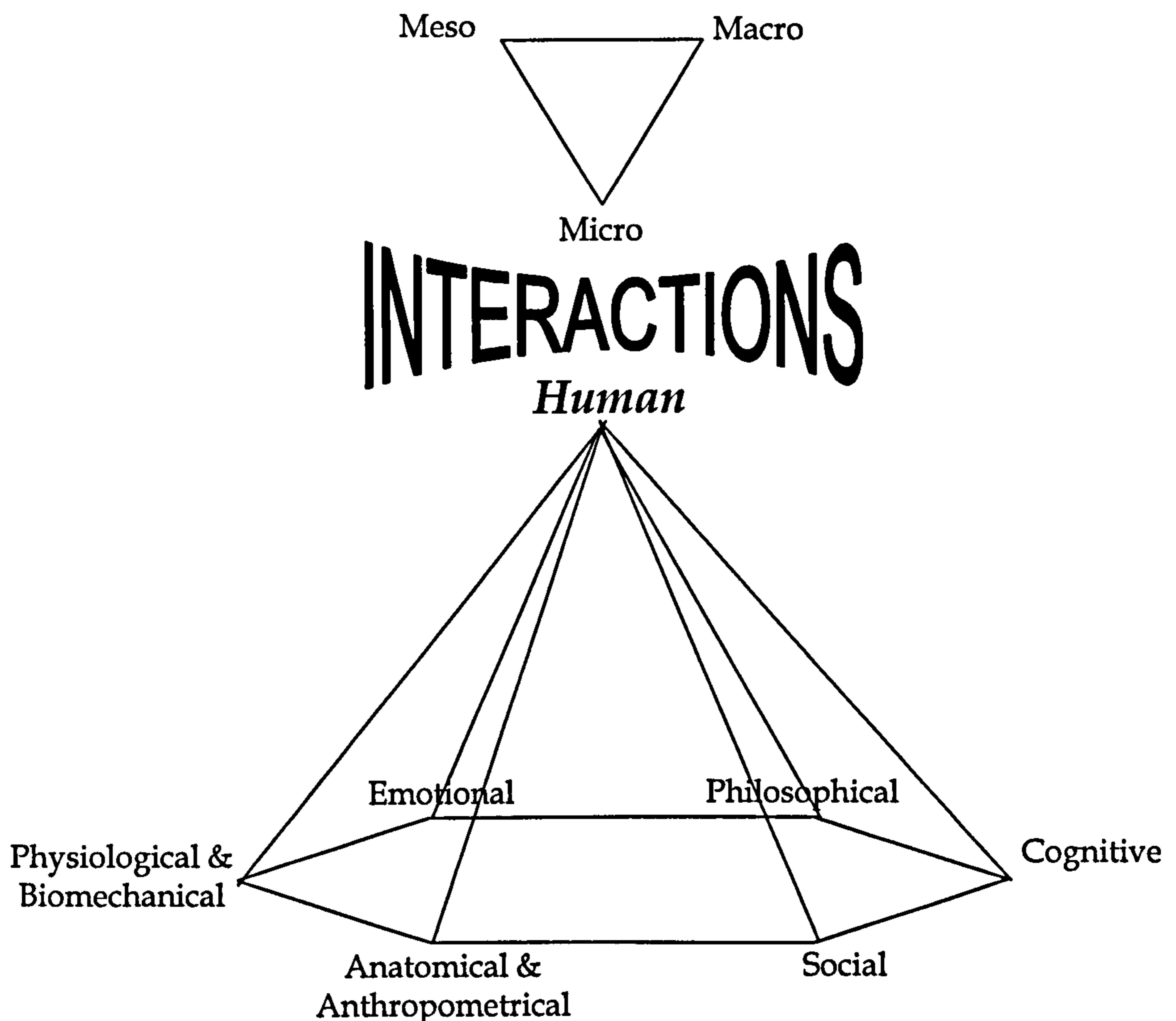


This illustrates ergonomic involvement-through-interactions, from the macro (organisational or population level), through the meso (small group, often used for participatory projects), to the micro or individual level. The levels triangle (figure 3.5) was derived from Klein (1976), Bronfenbrenner (1979) and Shipley (1998). Klein described issues of human welfare as a continuum from the most internal level (which is similar to the micro or individual level) through to an intermediate level (similar to meso) and finally to a wider society (or macro level). Bronfenbrenner described micro-meso-macro as nested systems. The micro setting described the immediate setting in which the person is situated and experiencing. The meso system has the relationships and interactions between two or more micro systems and finally the macro system is the exo-system. This is the highest level and consists of the broader social and cultural values which impact all the other systems.

Shiple's three levels are described with respect to ergonomics and ethics in section 3.2.6.

The three levels are illustrated as follows for office design. The micro level intervention might be recommending modifications to a single physical work station or working pattern for one person to address an individual problem. At the meso level all the employees in the office would be involved in a group intervention. This might include looking at the work flow and interactions between individuals as well as other groups of workers (physical work movements in the office). At the macro level the systems of the organisation impinging on the office design might be considered. This could include working patterns (hot desking, flexible working) as well as communication channels for introducing change. At the organisational level there might also be limitations with respect to both product design (specifying products from preferred or single suppliers) and resources. These three levels have been used in figure 3.6 as a three-tiered levels triangle (macro-meso-micro).

Figure 3.6 Human interactions model



This triangle is supported by the hexagon through an interaction, with the micro point providing the direct interface to emphasise the individual nature of each interaction. The hexagon is used to show the simplistic dimensions of a human (expanded from a tripartite to a sexpartite model). The points on the hexagon are used to represent aspects of people which have either previously been used in ergonomics models or, I am suggesting, should be. It takes two corners of the earlier triangle (figure 3.3), physical and cognitive, into the human hexagon and moves the organisational dimension into the levels triangle. The physical dimension is split into physiological and biomechanical, and anatomical and anthropometrical. The cognitive dimension stands alone and there are three additional dimensions for social, emotional and philosophical factors. This uses the person-centred view of Osborne et al (1993:6; 1995:10) to identify the attributes that the person brings to the system as a separate entity rather than a system or task-centred approach.

The original dimensions (physiological and biomechanical, anatomical and anthropometrical and cognitive) will be briefly described using the definitions in the IEA Triennial Report (IEA, 2000:5). The new dimensions (social, emotional and philosophical) will be discussed in more detail.

3.2.1 *Physiological and Biomechanical dimensions*

The physiology and biomechanics of the body give information about function with respect to dynamic physical capabilities and limitations (Osborne, 1995:7). This includes how much can be lifted or moved, the physical pressures that can be endured, as well as the physiological responses to various external environmental stimuli (heat, light, humidity etc.). Relevant topics include working postures, materials handling, repetitive movements, environmental conditions and work-related musculoskeletal disorders.

3.2.2 *Anatomical and Anthropometrical dimensions*

These sciences give information about the body's structure with respect to the static bodily dimensions (Osborne, 1995:7). Anthropometry deals with body measurements: size, shape, strength and working capacity (Pheasant, 1996:6). Relevant topics include work place and product design as well as work-related musculoskeletal disorders.

3.2.3 Cognitive dimension

The IEA (2000:5) define cognitive ergonomics as being concerned with 'mental processes such as perception, memory, reasoning and motor response as they affect interactions among humans and other elements of a system'. Relevant topics include mental workload, decision-making, skilled performance, human-computer interaction, human reliability, work stress and training.

3.2.4 Social dimension

Welford (1966) reported a meeting in 1953, where a Mr Leslie Farrer-Brown made 'an impassioned plea that ergonomists should concern themselves with social problems, by considering social behaviour as an aspect of human biology'. He suggested that there was a close analogy between human-machine systems and the social groups in which individuals were in communication with one another. Welford gave an insight into perhaps why he felt that this plea had never been taken up, suggesting that it could be due to the concepts and terms (and I would suggest the philosophy) used by sociologists, social psychologists and psychiatrists being different to those being used by experimental and physiological psychologists, resulting in social and ergonomic studies almost always being pursued independently. He returned to this topic in 1987, looking at similarities of human-machine and human-human interactions as a means of understanding human behaviour. The approach he discussed considered human interaction as a feedback system in which each action influences another in a continuous series, identifying that social contacts are a powerful source of stimulation.

Another model for the social dimension was proposed by Klein (1976:5). She used an onion model to describe the layers of a person's social attitudes. She went on to say that in any specific situation the history, traditions, needs and values of the people in the situation must be explored. She linked the influence of the organisation of work with how people saw and experienced their surroundings. These individual and group experiences then, she suggested, led to strong and well-rooted cultures. So the details of each unique and specific situation is one of the reasons that conflicting evidence is thrown up by different research findings.

This is a theme which is repeated by others (Moray, 1994) and will be further considered in the section on francophone ergonomics (3.6.4).

3.2.5 Emotional dimension

This dimension has been added to bring in the perspective of designers. Jordan (1997a), from the field of product design, said that ergonomics should take a 'more holistic approach in order to optimise users' experience with products'. He asked for users to be considered as 'complex, rational and emotional beings'. He was concerned that engineering design had the tendency to dehumanise people, with the result that minimal attention was paid to peoples' emotions, values, hopes and fears. This gives a very strong argument for the inclusion of an emotional dimension for all aspects of design in ergonomics.

Jordan and Macdonald (1998) took the emotional aspect of design further, looking at the concept of products giving pleasure rather than just the absence of discomfort. Their thesis was that ergonomics had tended to focus on pain rather than considering the positive benefits and experiences which could result from the use of some products. This is similar to Herzberg's model in human relations theory (section 3.3.1.2) where hygiene factors (causes of dissatisfaction) are one level of addressing motivation but parallel to this the motivation factors (causes of satisfaction) as the positive strand, which Jordan and Macdonald suggested, were missing in ergonomics research.

The perspective of product designers is reviewed and contrasted with that of design engineers in section 3.4.2.

3.2.6 Philosophical dimension

I will look at two issues in the philosophical dimension. Firstly the position of ergonomics with respect to the philosophy of science and, secondly, the personal philosophy of the individual practitioner.

Shipley (1998) used the three levels of macro, middle (meso) and micro to discuss ethics and ergonomics, suggesting that ethics were hardly ever talked about in modern organisational life. She looked at the epistemological base for ergonomics, placing it in the empiricist (positivist) camp with the physical sciences and then suggested the possibility of using a different paradigm (interpretivist) to look at social relationships within an organisation. Shipley's discussion was mostly at the macro level, looking at organisational structures and drawing on the functionalist aspects of Weber's work with respect to the bureaucratic organisational structure. At

the practitioner level she talked about the role of the researcher (or ergonomist) and their own influence on the organisational interactions. This is interesting as it sits firmly within the qualitative methodologies camp but, as she specifically suggested the use of symbolic interactionism as a methodology to facilitate the understanding of change in an organisation, she left little scope for the middle ground philosophical position of subtle or transcendental realism.

Branton (in Osborne et al, 1993) believed that an individual person's philosophy should be considered with respect to the situation under consideration to incorporate an understanding of their perceptions and views. His work drew on Kant's transcendental argument that human beings cannot 'know the real truth with absolute certainty' (Osborne et al, 1993). This has been called Branton's humanistic view of ergonomics, whereby an individual person's philosophy was considered with respect to the situation in order to incorporate an understanding of their perceptions and views that extend beyond the limits of the situation. Branton sought to understand the purposes rather than the causes of actions, so looked prospectively for anticipation and decision-making rather than retrospectively to determine the cause of an event that had already happened. He placed his views within an historical context saying 'when we understand the person's variability we will be in a better position to adapt the system to accommodate and make better use of them' (Osborne et al, 1993:17). He was remarkably far-sighted in looking for a future discipline which could mediate between metaphysics and the social sciences (p60), being ever more inclusive and interactionist rather than reductionist, but at the same time placed his discussion with a historical context. He identified that psychologists and philosophers had been trying to come to terms with this inclusionist problem for many hundreds of years, as was shown in chapter two.

Looking at the philosophical strand for an individual practitioner, it is tempting to suggest that most people will have little interest in philosophy and are likely not to have a defined philosophical position which could be said to be influencing their lives. Warnock (1998:109) challenged this with her assertion that even people who were hesitant to declare a theoretical attachment to a scientific or philosophical point of view would probably still have practical views drawn from unexamined assumptions which were based on philosophical or scientific theories. So even if a practitioner does not have an explicitly declared philosophical stance there will still be influences, for example religion, moral codes etc.

Woolgar (1996:16) gave a similar argument in psychology with respect to the selection of methods. He identified the epistemological commitments underpinning methods as a series of choices and perspectives. This challenged the supposed neutral or objective position to which psychology, as a discipline, had made claim. He went on to say that the mechanism of choosing a particular method drew on, and was shaped, by previous decisions and interventions in the work of preceding social scientists.

This line of argument has also been used within engineering (Vesilund and Gunn, 1998:xi) discussing environmental issues. They suggested that engineering was meant to serve the public, but they identified a conflict. They felt that engineers ignored intangibles because they looked at the overall and aggregate net benefit. They labelled engineers as positivists, saying that 'they tend to ignore or dismiss considerations for which reasons of a certain type cannot be given ...[with] quantifiable or at least empirical data' (p30). In this sentence they are very clearly identifying the philosophical position of the generic profession of engineering as coming from the positivist or empiricist school. As engineering is one of the three main feeder disciplines for ergonomics I explore this issue further in the case study with respect to the personal philosophy of the interviewed ergonomists (chapter four).

Vesilund and Gunn summarised their position by saying that engineering was for the benefit of people, and thus could be thought of as an applied social science as well as an applied physical science (p30). Their definition of engineering saw it as taking the knowledge created by the physical sciences and applying it for the benefit of the people in order to create a higher standard of health, comfort and living (p34). This fits very well with Shipley's point about looking at social relationships and relates closely to the social dimension in section 3.2.4.

Whichever aspect is considered of the philosophical dimension, it seems clear to me that the discipline and practice of ergonomics is engaged in the qualitative-quantitative debate.

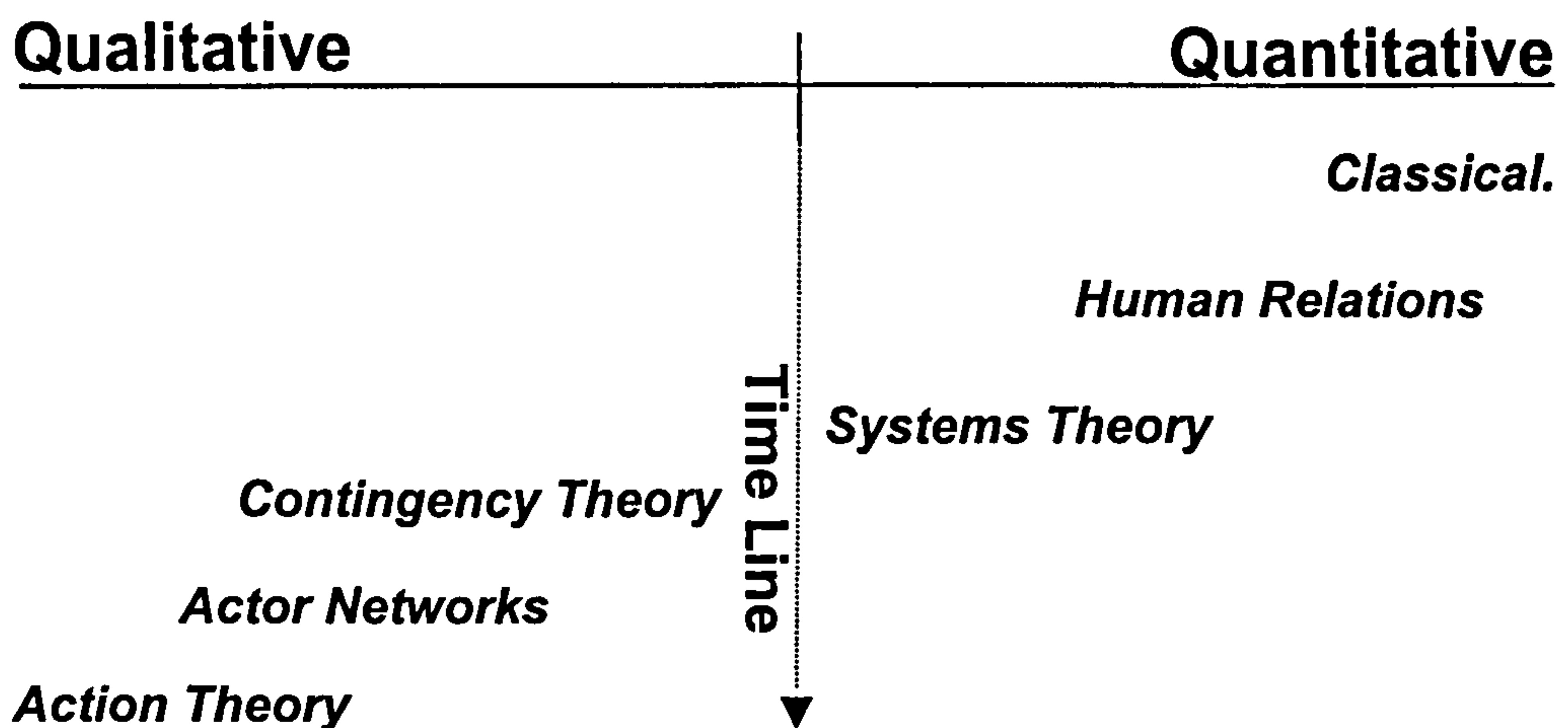
3.3 Organisational theories

In this section I will review six models of organisational theories and discuss them with respect to the philosophical positions described by Grint (1998:114). As one of

the main outputs from ergonomics is change, organisational theory has the potential to be very influential on models of ergonomics.

The field of organisational behaviour and management (including job design) draws from a variety of disciplines including psychology, sociology, anthropology, political sciences, engineering, ergonomics and economics (Blackler and Brown, 1975:1353; Mullins, 1993:5), and includes aspects of culture, the social systems and individual psychology.

Figure 3.7 Organisational theories



The qualitative-quantitative (interpretivist-determinist) continuum (figure 3.7) has the same polar range used in the previous chapter. Grint (1998:114) used this framework to locate these, and other, organisational and management theories. An additional time line has been added to give an historical perspective. At the quantitative pole there are approaches based on the positivist and objective way in which organisations can be described, often relating specifically to underlying structural conditions and requirements. At the opposite pole there are the approaches which focus on the indeterminate and contingent nature of reality, the significance of human interaction. This continuum gives an opportunity to look at where ergonomics research has predominantly taken place and why, perhaps, there has been little use of qualitative methodologies (section 3.6).

Figure 3.7 however, is not a real dichotomy. Mullins (1993:58) suggested that the various theories and approaches show a progression of ideas, with each building on the previous ones, saying that the different approaches are 'not in competition with

each other and no one approach should be viewed as if it were the only approach, replacing or superseding earlier contributions’.

3.3.1 Models of organisational theories

The following sections are drawn from Mullins (1993), Grint (1998) and Wall and Martin (1987), using literature about work organisation, motivation, job design and organisational cultures.

3.3.1.1 Classical model

The classical model includes the scientific management (Taylorism) and bureaucratic approaches, with an emphasis on vertical division of labour and a well-defined hierarchy with respect to the distribution of power (Wall and Martin, 1987). There was a rational allocation of work into specialised units with the supporting authority to maintain control and co-ordination. The background influences include the military, engineering, psychology and classical economics.

Scientific management was developed by Taylor (1856-1917) who believed that all work processes could be analysed into discrete tasks, with an optimum procedure (Mullins, 1993:36). His approach was used by Henry Ford (Fordism) to set up a system for mass production of a car on a moving assembly line (Giddens, 1993:494). Criticism of this approach includes the boredom factor with repetitive low-skilled tasks.

The bureaucracy approach is derived from Weber (1864-1920), who pointed out that ‘the definition of tasks and responsibilities with the structure of management gave rise to a permanent administration and standardisation of work procedures’ (Mullins, 1993:40). His analysis of bureaucracy put the focus on the formal relations within an organisation, looking at the detail of proscribed tasks (Giddens, 1993:289). Again this is a hierarchical structure relying on specialisation, authority, rules and impersonality. The hierarchy was maintained either by coercion, the ‘whip’, with fines, beatings or dismissals, or paternalism, the ‘carrot’, managing people through persuasion.

Traditionally public sector organisations have tended to be organised in the classical style to deliver ‘uniformity of treatment, regularity of procedures and accountability of their operations’ (Mullins, 1993:43). This will be reviewed in chapter five when looking at the question of whether hospitals differ from other organisations.

3.3.1.2 Human Relations

In the 1920s greater attention started to be placed on social factors at work, including groups, leadership, the informal organisational and the behaviour of people. This theory looked for arrangements that evoked co-operation using the participation of workers in decisions that affected them. It drew on inputs from social psychology and sociology. There seem to be features in this theory which reappear in the descriptions of participatory ergonomics (3.6.2).

One of the most well known examples is the Hawthorne experiment (Parsons, 1974) looking at the changes in production in four conditions. The analysis of the results suggested that the intervention itself could have influenced the outcome. The interpretations have been controversial but on a positive note it did encourage research into work groups, communication and job design.

This also created a foundation for research on motivation and the development of the content and process theories. Maslow proposed a hierarchy of needs and Herzberg developed a model using two sets of factors: hygiene/maintenance with respect to the job environment; and motivator/growth for the job content (Mullins, 1993:451/456). A more complex process theory model of motivation and job design was developed by Hackman and Lawler (1979) as the Job Characteristics Model. Adams' Equity theory perhaps exemplifies the human relations approach by focussing on peoples' feelings of how fairly they have been treated in comparison with the treatment received by others.

One branch developed into the socio-technical system theory: this is included in the next section.

3.3.1.3 Systems theory

Systems theory integrates the classical (technical) and human relations (social) approaches, high-lighting the importance of both the social and technical aspects as well as the external environment and drawing on inputs from mathematics, economics, operational research and system engineering. As an approach, it has been used since the 1950s, and was generally associated with philosophers such as Hegel, who recognised that the whole was more important than the sum of the parts (Czaja, 1997:18). It involved breaking up the whole into discrete elements to look at the relationships and interactions between them and then using this to explain the behaviour of the whole. There are two extremes of systems design: closed systems

which are virtually self-regulating with all the elements mutually dependent; and open systems which are necessarily dependent upon the wider environment with which they interact and which are less stable than closed systems.

Grint (1998:131) located systems theory close to the centre of his continuum, because he saw traditional systems theorists as having tended to 'mirror the conservative emphasis of evolutionary theories which highlight the significance of organisations and individuals reacting to, rather than actively constructing, their environment'. However he went on to give the opposite position (p134) for some organisational sociologists who use a contingency model, rather than the deterministic engineering model, located closer to the qualitative pole. Czaja (1997) also moved systems theory away from the quantitative pole by looking at each element of a system in terms of its interaction with other elements of the system.

Grint (1998:132) provided a critique of systems theory which included a lack of consideration of historical factors. He pointed out that organisations had no existence beyond their human members, a view which moved the approach more towards the qualitative end of the continuum and led onto actor networks theory (3.3.1.5).

Systems theory includes the work of Trist and Bamforth (1951) in the development of the sociotechnical systems theory, basically seeing organisations as open systems. Although the theory has been widely written about, Grint (1998:278) suggested that the actual impact of the theory has been limited, with no large industrial organisation in the UK adopting it. He went on to suggest that it had, however, formed the basis for the development of the Quality of Working Life (QWL) movement in Scandinavia and Canada. QWL models developed from a conservative interpretation (quality circles) through to semi-autonomous work groups and the redesign of technology in line with the social aspects of production (p281). The implementation of sociotechnical systems theory has perhaps been used more in the micro-electronic-based technologies (Blackler and Brown, 1986:288).

Eason (1988:ix) looked at the practical use of sociotechnical systems theory, where it was needed in order to recognise social subsystems in the organisation. He described (p62) the split between technical and social aspects in terms of the implementation of change, using systems design as both a technical problem solving exercise and a political process such that the technical processes were used as the rational logical

methods to search for the optimal solution and the political processes were used by people with different goals and values who sought a commonly acceptable solution. At this point it seems appropriate to introduce the term soft systems methodology.

Soft systems methodology recognises the more complex and chaotic nature of organisational life where a variety of goals are being pursued and there may be many views of reality with which workers have to deal (Eason, 1988:87). Clegg and Walsh (1998:212) defined soft systems thinking as an 'overarching meta-theory for examining and understanding the behaviour of complex entities. A central assumption is that people see and interpret the world differently'. The concept of soft systems thinking was developed by Checkland (1981) based on the argument that thinking about systems using an engineering model (quantitative/deterministic) reflected the values and prevailing epistemologies (positivist) within education and training. Clegg and Walsh (1998:213) located soft systems analysis within an interpretive (qualitative) perspective, based on the assumption that there was 'an ontological commitment to order and an epistemological concern for the subjective nature of reality'. This reinforces the position of systems theory close to the middle of the continuum.

3.3.1.4 Contingency theory

Contingency theory takes a middle ground position as shown in figure 3.7. It offers no one best design of organisation, and takes the approach that the structure, management and success of the organisation depend on a range of situational variables and that there is no one optimum state. It extends the earlier systems model to incorporate aspects of technology, the social system, a formal organisational structure as well as relations with the environmental factors outside the organisation, and so is very similar to the open systems definition in particular that used for the soft systems thinking of Checkland (1981).

Grint (1998:133) suggested that contingency theory rested upon the assumption that organisational characteristics had to be altered to meet situational circumstances. He placed it very close to the centre line saying that it was vulnerable to criticism in its construction of independent variables (independent from the organisation). So this could result in the environmental factors shaping the nature of the organisation and the people in the organisation having less influence. He went on to say that

contingency theory was perhaps the one which was most used for organisational theories (Grint, 1998: 134).

3.3.1.5 Actor Networks

Actor Networks seems similar to contingency theory in being responsive to situational variables, but shifts the emphasis from organisational level (macro) to a group level (meso). It is located more towards the qualitative pole in the continuum (figure 3.7). In this theory the power depends on the construction and maintenance of a network of actors (group), where the networks involve both human and non-human elements.

Grint (1998:141) defined the basis of the approach with respect to the organisation in terms of the interpretive practices (interactions) of humans (e.g. workers in an organisation) in association with non-human (e.g. technology and buildings) elements. It allowed for the existence of multiple networks, so included a person's interactions at home as well as in their working environment or driving the car to work. He went on to emphasise that networks were fragile and transient (p143), so would have to be regularly reproduced unless a design feature of the technology or building maintained the interaction, e.g. a maintenance panel with a difficult access which resulted in a consistent complex interaction (including working posture) for an electrician.

3.3.1.6 Action theory

Action theorists see the major, or only, object for sociological study as human action. They are interested in the meaning and interpretation of an action as well as its nature. The defining quality of the action is that it has subjective meaning for the individual performing it. Marshall (1994:3) defined this group as including phenomenological and hermeneutic sociology as well as symbolic interactionism and ethnomethodology. This type of theory has tended to stay in the domain of sociologists as it concentrates on the micro or individual level of social life (Jones, 1993:16), so has been positioned towards the end of the qualitative pole.

To locate action theory, Grint (1998:272) outlined the philosophical positions in industrial sociology with respect to social and technological determinism. This gave another continuum in which the extreme position of technological determinism saw technology as an autonomous development which coerced and determined social and economic organisations and relationships, whereas social determinism assumed

that technological changes were themselves socially engineered and that work relationships were derived from, and ultimately determined, by cultural and social aspects rather than technological aspects. He did however go on to say that most industrial sociologists did not engage in the extreme positions, but that the action theorists would be located towards the social determinism end of this continuum, although not at the pole.

3.3.2 *Qualitative methodologies in organisational research*

Cassell and Symon (1994; Symon and Cassell, 1998) have edited two books looking at the use of qualitative methods in organisational research. They felt that the use of qualitative methods was more appropriate to the type of question being explored in organisational management, to look at processes as well as outcomes, and to try and understand both individual and group experiences.

One of the factors which they identified as making qualitative research particularly appropriate for organisational research was flexibility, the ability to respond within the design of the research to the changing nature of the context. They suggested that only qualitative methods were sensitive enough to allow the detailed analysis of change as a quantitative method would only allow an assessment of the fact that change has occurred over time but would give no information about the processes or individuals involved.

This position is in common with Crozier (1990) and Cossette (1998) in describing firstly a philosophical perspective and secondly the use of symbolic interactionism in organisational research. At a general level Crozier (1990:298) discussed the functionalist (interactionist) and structuralist approaches in organisational theory in the context of an organisation as a series of games played according to some informal rules that cannot be easily predicted from the prescribed roles of the formal structure. The games can only be understood as depending on the individual and collective capacities (partly cultural and partly organisational) thus striking a mid-point between structuralist and interactionist perspectives and providing the basis for the use of both qualitative and quantitative methodologies.

Cossette (1998) discussed the symbolic interactionist approach to study language in organisations, contrasting objective and subjective research. The main difference was the relativity in subjective research which allowed words and language practices to

have different meanings for different people. Cossette finished by saying that, for interactionist (subjective) research, language could only be understood in the context of the interactive situation in which it was produced.

3.4 Design

Ergonomics has always been linked with design, and as I said in section 3.1.2 (definition of ergonomics), I see the two main outputs of ergonomics as design and change. So, having looked at organisational management (the change strand), I will now look at design philosophy and practice.

3.4.1 Models of design

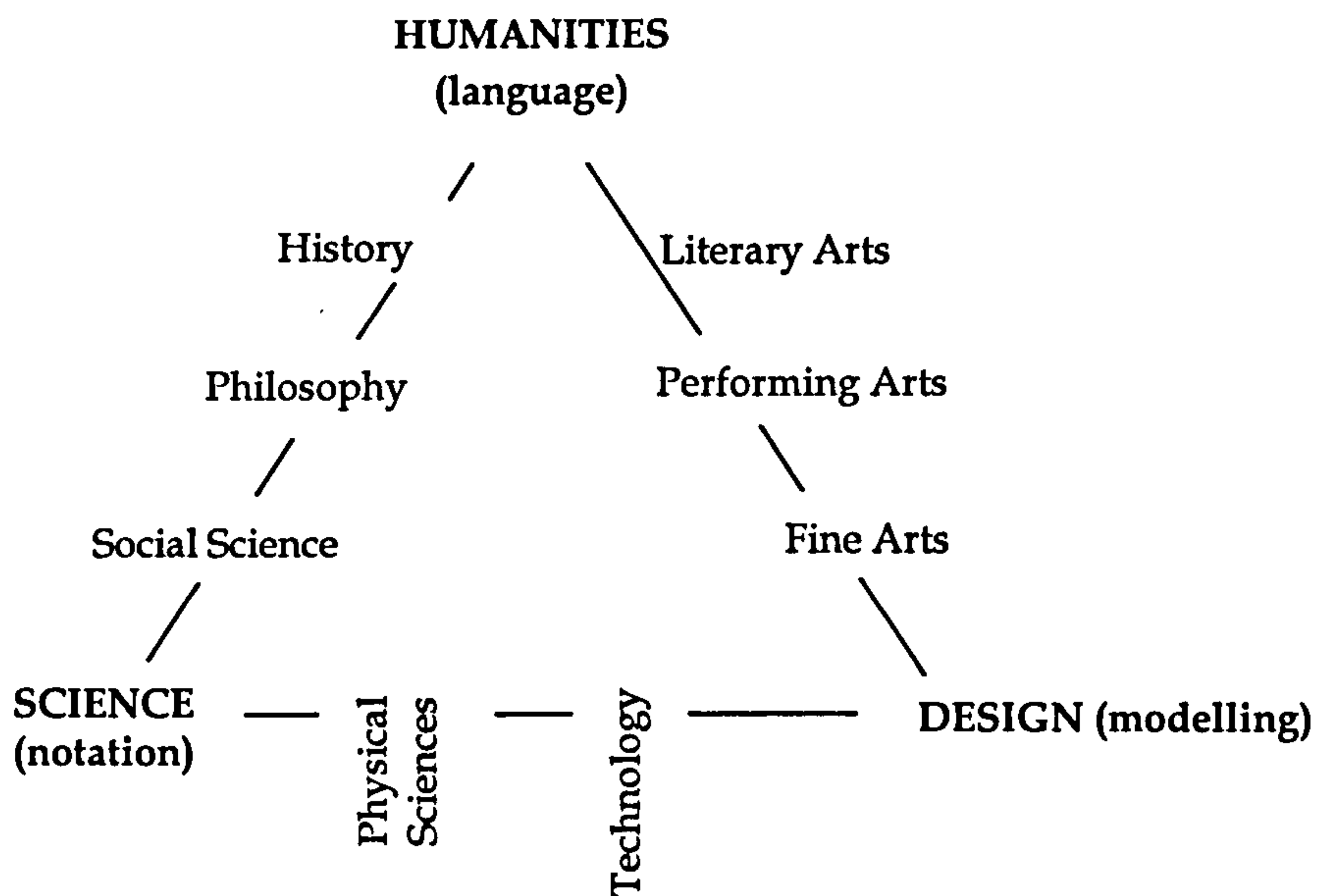
The development of models for design methodology parallels that in ergonomics. In around the 1950's (when ergonomics was becoming established) design thinking was reported by Gregory (1980) to have been without form. At this time it developed two functions: design task pattern and design methods which he called contingency models (in line with the thinking in management studies) to reflect the macro and micro interactions in process. In the late 1970s the journal 'Design Studies' was launched and with it debates about whether design could be a discipline in its own right (Archer, 1979). This included discussions about the distinguishing features and methodology. Generally a spectrum was proposed with arts (or Humanities) at one end and science (physical sciences) at the other. However Archer (1979) proposed a triangular model (figure 3.8) to draw a distinction between language at each pole as written language (Humanities), mathematical notation (Science) and modelling or representation (Design).

This gives an interesting perspective on the qualitative-quantitative continuum that I have been using by taking modelling, or visual data, out as a separate epistemological position. Cross (1982) commented on Archer's three cultures giving a definition for the values of the cultures. I have put these onto the linear qualitative-quantitative continuum as shown in figure 3.9.

The contrast, Cross suggested, was that scientists solved problems by analysis, whereas designers solved problem by synthesis. I have described this elsewhere (Hignett, 2001a) in terms fitting a square peg into a round hole. The designer will produce the square peg and then modify it until it fits the round hole, whereas the

ergonomist will spend their time finding out that the hole is round before coming up with a proposed solution. In terms of the phenomena, appropriate methods and values shown in figure 3.9, design fits in the practical, or middle ground, of the continuum. The middle ground position seems to be exemplified by a confusion in the definition of purpose and process. Cross (1982) said that what designers know about their own problem solving processes remains largely tacit knowledge. For a process he suggested that 'designerly ways of knowing rest upon the manipulation of non-verbal codes in the material culture. These codes translate messages either way between concrete objects and abstract requirements'. Rather than seeking a middle ground philosophy, Cross relied on designers having innate abilities in solving real-world ill-defined problems.

Figure 3.8 *Triangular Continuum. (Archer, 1979)*



I suggest that the middle ground philosophy (section 2.5), which supports using a range of methods, could be appropriate for designers. The phenomena and values suggested by Cross (figure 3.9) could be used for ergonomics as the human-made world applied not only to the design of artefacts and products, but also to engineering systems and organisations. Helander (1997) has provided support for this idea by identifying two main activities in design work as synthesis and analysis, thus combining the design and science methods from figure 3.9. Goel and Pirolli (1992) investigated engineering design decisions for new products and found that only 2% of the decisions were logical (B follows A, analysis), whereas the remaining 98% were based on associations and experiences (synthesis). Bucciarelli (1984)

described design as a social process where the task was to get different people to share a common perspective.

Figure 3.9 Linear continuum for design

	Qualitative		Quantitative
	Humanities	Design	Science
PHENOMENA	Human Experience	Human-made World	The Natural World
APPROPRIATE METHODS	Analogy, metaphor, criticism, evaluation	Modelling, pattern formation, synthesis	Controlled experiment, classification, analysis
VALUES	Subjectivity, imagination, commitment, concern for justice	Practicality, ingenuity, empathy, a concern for appropriateness	Objectivity, rationality, neutrality, concern for truth

These two strands of design are discussed in the following sections although there seem to be very different perspectives between product and engineering designers with respect to the input of ergonomics information.

3.4.2 Product design

Jordan (1997b) criticised the ergonomics profession as only looking at users, products and tasks (the 1960s model, figure 3.2) and proposed a more holistic approach to include relationships. In his discussion about the difficulty of using ergonomics information in product design, he felt that the information needed to move away from the quantitative perspective. He described a design need to look at the wider role products play in people's lives, rather than just the usability based approaches which looked at products as tools to achieve tasks efficiently, effectively and within certain limits of comfort and acceptability. This feels as if the product design philosophy is making a leap over four decades of evolving models of ergonomics, from the 1960s to the current day discussion of qualitative methodology.

Macdonald and Jordan's (1998) comparison of ergonomics and product design is shown in table 3.2. They suggested that product design and ergonomics had a shared focus but differed greatly with respect to philosophy and scope.

Table 3.2 Dimensions in Product Design

	Product Design	Ergonomics
<i>Focus</i>	User Centred How products, tasks and environments 'fit' people	
<i>Philosophy</i>	Visually-oriented Artistic	Science
<i>Scope</i>	Generalist Creative, combining aesthetic, ergonomic and technological elements to produce an improved or innovative product	Specialist Narrow focus, specialist in one field only e.g. anthropometry

Their suggestion was that designers provide the generalist role of taking an overview and bringing together specialists, one of which was the ergonomist. They included anthropologists, linguists and sociologists in their design teams and, not surprisingly, suggested that ergonomists would have to embrace a more visually-oriented approach to communication, and needed training in qualitative value judgement. This is a view of ergonomics that many ergonomists would not recognise. The ergonomist is usually seen as being the generalist, bringing together information from a range of disciplines, however the suggestion that ergonomists should broaden their education to include the approaches and knowledge available from sociology, linguistics and anthropology fits with the theme of this thesis.

The next section looks at engineering design, comparing the difference from product design in the relative position of ergonomics.

3.4.3 Engineering design

Engineering design was defined by Hubka and Eder (1987) as a 'purposeful activity directed towards the goal of fulfilling human needs, particularly those which can be met by the technology factors of our culture'. They gave a good description of the early days of engineering design methodology, moving away from the traditional procedures of design (creativity and intuition). They suggested that the current

engineering design is based on the use of scientific principles to define a device, a process or system so that it can be created.

Ratcliffe and Holt (1984) continued the historical story of engineering design as it moved away from creativity and intuition, but then succumbed to the pressure of the positivist movement. This led to engineering design moving towards a more problem solving and mathematical model. They criticised this saying that 'no matter how attractive such methods may be to academics, real world needs do not come neatly packaged as a set of objectives to be achieved'. They suggested that the engineering education system had become closed and that systems thinking did not provide a sufficient philosophical base for creative design, calling for the recognition of the human factors. So engineering design seemed, to them, to have fallen between not being an art and not being a science. Lewin (1979) had earlier also raised the same point of view describing it as the unhappy state of affairs in engineering design. He contrasted scientists and engineers as working with closed and open systems respectively. The open systems in engineering required dynamic interaction with the environment as well as responding to external stimuli.

Wulff et al (1999a and b) looked at engineering design by contrasting the information that designers said they wanted and what they thought ergonomists were providing. This is presented in the form of the qualitative-quantitative dichotomy (table 3.3) with the description of engineering design from Holt et al (1985).

Table 3.3 Dimensions in Engineering Design

	Personal Expression Ergonomics format NOT preferred by designers	Systematic Ergonomics format preferred by designers
<i>Wulff et al, (1999a & b)</i>	Qualitative Long, woolly, not specific	Quantitative Concise, precise, concrete
<i>Holt et al, (1985)</i>	Creative design approach Analytic and Human Factors Visual imagery	Problem solver Hard Systems thinking Convergent thinking

The position of ergonomics contrasts to that given by Macdonald and Jordan (1998). Holt et al (1985) placed human factors under the qualitative column rather than the systematic approach preferred by engineering designers. Wulff et al agreed with this position, recommending the inclusion of ergonomics in order to gain the human or

social perspective, 'an alternative view to engineering as an orderly, rational process is that it should not be looked upon as a cognitive or mechanical process, but as a social process involving a wide range of participants and different perspectives, interests and expertise'. This is similar to the position of Vesilund and Gunn (1998) describing engineering as both an applied physical and social science (section 3.2.6).

3.5 Psychology

Wood Sherif (1987:37) gave a personal perspective of the methodology bias in psychology between 1943 and 1987. She put forward her opinion that each of the fields and specialities in psychology had sought to improve its status by adopting the perspectives, theories and methodologies as high on a given hierarchy (table 3.4) as possible.

Table 3.4 Hierarchy in psychology

Experimentalists	Top of the hierarchy. Based on the philosophy of science of the logical positivists (most extreme quantitative position).
Differential psychologists	Mental testers and statistical buffs. Developed a different tradition to experimentalists but high on the hierarchy for their ability to analyse data.
Developmental psychologists	Looking at pre-school children.
Applied, social and clinical psychologists	Lowest position on the hierarchy. By 1987 the clinical psychologists had increased considerably in number so achieved a higher status by critical mass. Social psychologists had mostly become experimentalists.

The position of psychology within the positivist tradition has also been commented on by other authors, a few of them are summarised below.

Suchman (1987) suggested that the move into such a strongly positivist position happened around the beginning of the 20th century. Before then the recognised method of studying human mental life had been introspection (armchair psychology).

Ratner (1997) gave another viewpoint, this time from Vygotsky (1991), which was about cultural psychology but could be applied to ergonomics: 'methodology is currently in a state of deep crisis ... if this crisis goes unresolved then radical

development in the field ... will encounter the greatest obstacle of all, that is, its practical insignificance, the limited utility of its results. But if a way out of the crisis is to be found, then the methodology ... must confront the enormous historical meaning of its tasks'. Ratner suggested that positivist psychologists stopped linking psychological functions to a broad social systems theory and instead linked them to discrete factors like income and occupation. He agreed with the time frame in table 3.4, saying that the 'replacement of qualitative descriptions by quantitative measurement was not complete until the 1950s'.

The changing perspective and its accompanying methodologies was commented on by Durkheim (quoted in Ratner, 1997:97) with respect to the collective quality of social life: 'society is not a mere sum of individuals, but a system formed by their association representing a specific reality which has its own proper characteristics. Without a doubt, collective life cannot be produced if the individual consciousnesses are not given ... The group thinks, feels and acts quite differently from the manner in which its members would act, were they isolated. If then one start from the latter, he cannot understand of what transpires in the group. In a work, there is in the case of psychology and sociology, the same break in continuity as between biology and the physico-chemical sciences. Accordingly, whenever a social phenomenon is directly explained by a psychological phenomenon one may be sure that the explanation is false'. Durkheim wrote this in 1895 and we now seem to be coming full circle in the debate about psychological methodologies.

Within the last ten years the debate has gained momentum. Woolgar (1996:11) reflected that the qualitative and quantitative methodology debate in psychology was in line with the way it had 'raged within sociology and anthropology some years ago'.

Authors who have engaged in this debate include Bannister et al (1994), Henwood and Nicholson (1995), Richardson (1996), Hayes (1997), Cooper and Stevenson (1998), Morgan (1998), and Burt and Oaksford (1999). They are all advocating the use of qualitative methodologies in psychology, though Morgan is perhaps the most reticent and critical.

A middle ground position was proposed by Bannister et al in 1994. They suggested that the qualitative and quantitative traditions were not necessarily diametrically opposed to each other. I agree with this and feel that a continuum gives a better

representation of the range of thought and methodologies. Cooper and Stevenson (1998:484) also saw a coexistence of 'both humanistic and mechanistic understandings' as an underlying characteristic of psychology whatever 'concepts and modes of analysis' are in fashion.

The philosophical position underlying the use of qualitative methodologies has been discussed. Woolgar (1996:23) looked at the definition of the unit of analysis for psychological research, suggesting a move from the 'cognisizing individual' to 'investigations into how conceptions of agency [*actions*] are generated and sustained'. Ratner (1997:54) gave a detailed description of his philosophical position with respect to the nature of psychological phenomena in terms of ontological and epistemological principles as follows:

- 'Ontological principles are based on the nature of psychological phenomena as forms of mental activity or consciousness - intentions, values, ways of thinking or perceiving, feelings. This results in the conception of psychological phenomena as complex configuration of (mental) components. When these are permeated by related phenomena this will be expressed in a configuration of related responses. Thus a given perception is a configuration of related perceptual images, motivation, memory, cognitive schemata, emotions and reasoning that unfolds over a network of statements and behaviours across numerous situations and time periods'.
- 'Epistemological principles must be comprehended as complex mental phenomena that are internally related to other phenomena, so reflecting the ontological position. This results in multi-faceted qualities from this inter-penetration and they are deciphered from numerous inter-related, extended expressions'.

This resulted in the unit of analysis being 'the awareness of the gap between the object of study (and the way we represent it) and the interpretation necessary to fill that gap'.

Suchman (1987:50) joined in with a critical look at the use of language in psychology, in particular for verbal protocol analysis (VPA). She saw language as a central resource for achieving objectivity of situations, saying that 'it stands in a generally indexical relationship to the circumstances that it presupposes, produces and describes'. She used indexical to mean that there is no such thing as a clear, extensive

definition of any word or concept in language since meaning comes from reference to other words, and to the context in which the words are spoken. So, as a consequence of the indexicality, mutual understanding is achieved on each occasion of interaction with reference to that particular situation, rather than 'being discharged once and for all by a stable body of shared meaning'.

There are some specific methodologies which have been developed, and are used predominantly, in psychology. Henwood (1996) grouped them into three broad strands for their emerging use in psychology (table 3.5).

When the definitions of these methodologies are compared with those in table 2.5 (chapter two), which were derived from predominantly sociological sources, there is a difference in the detail for discourse analysis, with the second and fourth themes of Gill's definitions (1996:141) having a structuralist feel. The second theme used pre-existing linguistic resources, so Suchman's critique of the use of language (1987:50) could be applied. The fourth theme sought to establish one version of the world against competing versions. This seems to take on an empiricist stance and does not allow for the middle ground of subtle realism with multiple non-competing realities (section 2.5).

Suchman (1987) looked at the use of VPA from the perspective of human-computer interaction (HCI) and offered two alternative views of action as follows:

1. The organisation and significance of human action is located in underlying plans, such that the plans are prerequisite to, and prescribe, action at every level of detail. Plans are seen both as a conceptual framework for the analysis and simulation of action, and a psychological mechanism for its action production. Suchman (p61) defined plans as 'any hierarchical process in the organism that can control the order in which a sequence of operations is to be performed. A plan is for an organism essentially the same as a program for a computer'.
2. The alternative view is that action is contingent on circumstances which cannot be anticipated in advance. These are called situated actions, which are tied to local interactions contingent on the actor's particular circumstance. This is more of an interactionist approach as the situated nature of actions means that communication must include both a sensitivity to local circumstances and the resources for action.

She looked at these forms of action and classified them to include cultural variation and the nature of the activity e.g. following procedures or creative, expressive activities (expert or artistic behaviour). She proposed an alternative representational form, abstract structural accounts, which aim to explore the relation of knowledge and action to the particular circumstances in which the knowing and action occur (p178). This is a middle ground between plans and situated actions, where an action is not presupposed but is contingent on a complex world of objects, artefacts and other actors located in space and time.

She finished by saying that verbal protocols may provide access to action, however the act of producing the protocol sets up a structure which will constrain the action, so she proposed a move away from the hierarchical outputs of VPA towards an understanding or interaction model supported by qualitative methodological approach.

Table 3.5. *Qualitative methodologies in psychology*

Broad Strand appraising research by:	Methodology	Description
<i>Reliability and validity. Standard analogies</i>	Content analysis	An approach to the study of communication and symbolic media, including verbal dialogues, films, advertisements, theatre and political speeches. Make inferences from these sources about other phenomena (Henwood, 1996:33).
	Protocol analysis	This provides detailed records of behaviour during a task. Verbal protocol analyses (VPA) are transcriptions derived from recordings of the participants' speech under thinking-aloud instructions but not explaining or justifying actions (Henwood, 1996:44; Bainbridge and Sanderson, 1995). The social element is played down. There is a presumption in VPA that once the task protocol has been established it can be generalised.
	Thematic analysis	A coherent way of organising or reading interview material under thematic headings in ways that attempt to do justice to both the elements of the research question and to the preoccupations of the interviewees (Bannister et al, 1994:57).
<i>Generating how theory is at the same time firmly grounded in participants own accounts</i>	Grounded Theory	Henwood and Pidgeon (1992:21) and Henwood (1996:78) discussed the use of grounded theory in psychology saying that it was very different to traditional content analysis with respect to the counting of instances into a predefined set of mutually exclusive and exhaustive categories, whereas the goal of grounded theory was to generate theory using constant comparison and theoretical sampling.
<i>Focusing analytically on the reflexive functions of language</i>	Discourse analysis	Treats the social world as text, or a system of texts that can be systematically 'read' lay open the psychological processes that lie within them (Bannister et al, 1994:92). Four main themes were identified by Gill (1996:141) as follows: <ol style="list-style-type: none"> 1. Taking discourse itself as a topic, so all forms of talk, text, conversations etc. are seen as a means of getting at some reality that is assumed to lie behind the discourse. 2. Language is constructive, so the discourse is manufactured out of pre-existing linguistic resources. 3. Concerned with action or function orientation, so people use discourse to do things (not a social vacuum). 4. Analysis of both the discourse and the interpretative context. <p>Treat talk and text as being organised rhetorically, so discourse is involved with establishing one version of the world in the face of competing versions.</p>
	Narrative analysis	Discussed in the developmental psychology and psychotherapy. Concerned with the means of generating data in the form of stories, the means of interpreting that data and the representation of it in a narrative or storied form (Schwandt, 1997:98).

There are many sub-disciplines and approaches in psychology. The following three sections have literature which either draws on the qualitative-quantitative debate or have developed a parallel debate with many common themes.

3.5.1 Environmental Psychology

Environmental psychology (Cassidy, 1997) is a diverse area. It draws on social psychology and seems to have a common ground with ecological psychology. It takes an interactional perspective and has relationships with behavioural geography and architectural psychology. It seems to be defined in terms of the interaction of 'the physical environment and human behaviour' (Burroughs, 1989) and to have multiple levels of analysis, from macro to micro. Cassidy (1997:5) also suggested that it was a multi-method approach, using both qualitative and quantitative methods and then went on to quote Vetch and Arkkelin (in Cassidy; p36) giving reasons for why 'no grand theory exists in environmental psychology'. These included a lack of data and inconsistent use of methods which is cited again as a problem by Endsley et al (1995) in section 3.5.3.

It is a development in psychology which is looking for a more qualitative approach, and in doing so creating a new area of research/work. This limited use of philosophical and historical discussion is also seen in the following two sections.

3.5.2 Cognitive Engineering

Dowell and Long (1998) described the emergence of the discipline of cognitive engineering (Hollnagel and Woods, 1983) to reflect the innovative, or artistic, nature of design in contrast to the application of scientific theory. They suggested that its aim should be to 'understand the fundamental principles behind human action and performance that are relevant for the development of engineering principles of design'. They sought to locate the discipline by defining its ontological position not philosophically but with respect to its scope of practice as 'users interaction with computers to perform effective work', and in doing so have remained entrenched within a positivist paradigm. They took a hierarchical, linear perspective to design, looking at goal definition within specified work systems (domains) and shifted rapidly from a macro level of design (for normal populations) to a micro level, placing individual human behaviour in structural boundaries.

Two commentaries were published about this paper by Benyon (1998) and Flach (1998). Benyon commented on their blinkered focus in excluding social factors, suggesting that if cognitive engineering 'is used for the creation of information spaces' it would 'enable designers to move away from a utilitarian view of engineering towards a recognition of the social, cultural and political environment that people inhabit'. Flach also questioned the classical assumptions about linearity and reductionism. His view was that cognitive engineering should place high value on 'ecological validity and naturalistic observations where cognition is studied in rich semantic contexts'.

When considered in the context of section 3.4.3 (engineering design), cognitive engineering is positioned much closer to psychology than engineering with respect to the location of ergonomics towards the quantitative end of the continuum.

3.5.3 *Naturalistic Decision Making*

Another example of branching out in psychology with respect to the use of different methodologies is Naturalistic Decision Making (NDM). Klein (1995) defined it as studying 'the way people use experience to make decisions, solve problems and gain situation awareness'. At a panel discussion in 1995 Endsley et al described NDM as rejecting 'previous work on decision theory as being largely normative instead of descriptive'. They discussed both cognitive engineering and NDM saying that they had 'largely developed over dissatisfaction with the status quo - the tools, concepts and methods of previous engineering psychology and decision making and the sterility and inadequacy of the psychology laboratory'. But they went onto to say that both approaches needed 'methods for analysis, design and evaluation that provide the human factors practitioner with positive guidance for improving human performance in these complex domains' [aviation, medicine, nuclear power; Mosier and Orasanu, 1995]. At that time they reported that research under the auspices of cognitive engineering and NDM had 'employed different approaches and used different terminology'. This is not dissimilar to the level of use of qualitative methodologies in psychology in general and is an example of the increasing debate in psychology.

3.6 Ergonomics

This section will look at how qualitative or interactionist issues have been incorporated into some models of ergonomics. It starts with macro ergonomics and goes on to look at participatory ergonomics (meso level) before looking at exploratory sequential data analysis (ESDA) and francophone ergonomics, which both seem to be using either qualitative methodologies (ESDA) or espousing an interactionist philosophical position.

3.6.1 Macro Ergonomics

Macro-ergonomics (Hendrick, 1993) was proposed as a new concept to take into account the differences in organisational contexts. Hendrick suggested that the organisational aspect of ergonomics had not been developed. This perhaps reflects the development of human factors in North America with a more mechanistic perspective. In contrast in Europe the sociotechnical systems theory had been developed in the 1950s and was incorporated into models of ergonomics from the 1980s onwards (figure 3.3). The initial scope of ergonomics practice in North America was predominantly limited to the military (with a fairly static organisational structure). In 1995 Hendrick defined macro-ergonomics as a 'top-down sociotechnical systems approach to organisational and work system design, and the design of related human-modelling user-system and human-environment' (p1620). By 1997 he had moved on to define it as 'employee involvement via the methods of participatory ergonomics'. This appears to be a move from a systems theory model to a human relations model, so towards the quantitative pole in figure 3.7 rather than the qualitative pole with respect to social context and interactions.

So although macro-ergonomics puts the spotlight on organisational issues it offers very little that is new in comparison with Eason (1988), or Checkland (1981) and Clegg and Walsh (1998) with respect to a change in the philosophy of ergonomics.

Markus and Robey (1988:593) suggested that the approach later taken by Drury et al (1999) offered an increase in the scope of ergonomics practice. Drury et al used macro-ergonomics in terms of the level of intervention, as in figure 3.5, putting it alongside micro-ergonomics (which they defined as technical rather than individual). Markus and Robey suggested that the use of macro or micro theories reflected the ideological biases of the different disciplinary groups and hence the disciplinary

boundaries. As indicated in table 2.4 (section 2.2) macro level sociological analysis tends to explain phenomena by macro level concepts (e.g. populations) in contrast to micro level concepts such as individual attitudes, motivation etc. They went on to look at a mixed level which preserved the macro level concepts and put them in the context of micro level concepts. I would suggest that the levels triangle (figure 3.6) should not be broken down into its components, but that all levels should be used. To break it down and work at only one level places the ergonomic practitioner very strongly at the quantitative end of the philosophical continuum. It does not reflect the whole person or the interactions at all the levels.

3.6.2 Participatory Ergonomics

At a meso level there has been considerable growth in the concept of participatory ergonomics, as well as considerable discussion about what this means and what is carried out in its name. In 1991 Wilson published a review paper in which he brought together definitions of participatory ergonomics from the preceding few years. He suggested that there was considerable interest in user participation as a philosophy and a process amongst ergonomics, however he failed to locate the philosophy in a broader context with respect to social models and the qualitative-quantitative debate. He gave some historical context with respect to organisational theories, in referring to an antipathy from some ergonomists towards the Taylorist approach to work design, saying that this had attracted them towards a participatory approach. The definition he provided was 'participation is seen as providing the opportunity for real, early and full involvement of the people involved in the making of decisions about their jobs, systems, workplace and organisations. Such involvement will include the ability to influence, or to control, such decisions or the relevant decision makers' (Wilson, 1991:74; 1995a:1071). This is very similar to the human relations model of organisational theory (3.3.1.2) looking for arrangements to encourage co-operation, and using the participation of workers in decisions that affected them.

The models he described included Fuchs-Kittowski and Wenzlaff (1987), using a three-tier model (or continuum) from consultation, but led by management, through to full staff involvement. Reuter (1987) took a broader interactionist perspective to look at the value systems, and personal perspectives of the actors, as providing a basis for decisions within a participative process. Imada (1991) provided an

interesting discussion of participation in ergonomic strategies revealing his linear perception of ergonomics, and expressed the difficulty of including the social aspect of humans within his linear model. Like Hendrick (1993, macro ergonomics) and Karwowski (1999, symvatology), he invented a new concept, the fractal, rather than reviewing the philosophy of ergonomics with respect to social factors. The fractal was described as a multi-dimensional concept within chaos theory. It had patterns which appeared at random, creating a chaotic system, and relied on many parts of that system to generate unusual solutions.

Vink and Kompier (1997) took a step-wise participative process to describe the practice of field-oriented ergonomics using reciprocal communication flows among managers and employees. This was an iterative process, so has similarities to the qualitative process although the philosophy remains unclear.

An overview of participatory ergonomics was presented by Richardson and Hignett (1994) with respect to risk management of musculoskeletal problems. They summarised by saying that 'participatory ergonomics currently falls short in that it is based predominantly on a scientific approach where the research discovers, describes, measures and predicts the behaviour of others. It shows promise as an approach which could be used to evaluate changes in understanding and behaviour of people at work as far as risk management is concerned, but it does not include a methodology which supports real world evaluation or concern for how the message of risk is generated, understood or acted upon by the recipient within the workplace'.

3.6.3 *Exploratory Sequential Data Analysis*

Exploratory Sequential Data Analysis (ESDA) was described by Sanderson and Fisher (1997:1472) as 'any empirical undertaking seeking to analyse systems, environmental and/or behavioural data (usually recorded) in which the sequential integrity of events has been preserved'. It was been used as an umbrella term to group established observational and analysis techniques rather than proposing new techniques. They are unusual in the ergonomics literature in that they set out their epistemological position, as looking for 'the meaning of the data in relation to a research or design question'. This suggests that they decided that observational data would enable knowledge to be generated or represented with respect to the question. The interesting aspect of ESDA is the recommendation that the analysis could be guided methodologically by one or more traditions of practice, giving the

possibilities of mixing methods. I disagree with them on this and feel it is better to use a middle ground methodology which supports the mixing of methods, rather than working with a combination of methodologies.

Many methods were identified under the umbrella of ESDA (Sanderson and Fisher, 1997:1474/5) with uses for the different techniques within ergonomics. These are summarised and categorised onto the continuum in figure 3.10.

Their overall umbrella process (p1467) had four steps: defining the research question ('what's the issue at hand?'); data collection ('what should be observed?'); analysis ('what operations should be done?'); and findings ('what's an acceptable type of answer?'). This fits with the steps proposed for qualitative data management (table 2.11, chapter 2), and the traditional scientific method proforma of method/analysis/results. The eight fundamental operations proposed (p1479) can be classified in the same way as table 2.11 as follows:

1. Data Reduction: Commenting, chunking and coding
2. Data Display: Connecting, converting
3. Conclusion Drawing: Comparing, constraining, computing.

They proposed that the reason ergonomists had not explicitly used the range of methodologies across the continuum was because 'many descriptions of observations and sequential data analysis techniques are strongly rooted in one theoretical tradition, presenting the methodology associated with that tradition as self-evident rather than simply as one methodological option among many' (p1477). They suggested that when choosing an ESDA technique the ergonomist 'should understand the pervasive influence of theoretical tradition at all stages of analysis and should be keenly aware of the wide range of options that exist', emphasising that imposing a linear sequence on data (trying to use statistics to analyse data) would fail. It is important to remember that their discussion of ESDA is only applicable to observational data so other data types were not included.

Sanderson and Fisher gave an historical perspective to their discussion by listing three traditions for ESDA in ergonomics. They started with the behavioural tradition, suggesting that this was the oldest, with a commitment to the scientific method and directly observable laboratory-based experimentation. They then placed the cognitive tradition next in chronological order, drawing on the behavioural tradition, but being further developed to model indirectly observed behaviour

Figure 3.10 Methods used in ESDA

Qualitative	Quantitative
<p>Social (qualitative classification, constant comparison, interaction analysis) Identifying crucial incidents, identifying causes of error, identifying social or organisational factors shaping professional decision making, identifying effects of information technology on collaborative work.</p> <p>Visualisation Techniques (tree structures, timeline displays, link diagrams) Analysing task structure, exploring reasoning processes, evaluating behavioural consistency and strength of tactics, seeing temporal co-ordination, inter-agent communication patterns, evaluation display and control layouts, describing human activity within space or with equipment.</p> <p>Cognitive (protocol analysis) Assessing mental work load, effects of design or training, decision making process.</p>	<p>Statistical sequential data analysis Analysing motion sequences, eye movements allocation of attention, finding causes for actions patterns if multi-agent interactions</p> <p>Grammatical Techniques Identifying rules underlying motor sequences, identifying and evaluating pivotal events that organise behaviour, finding key stroke patterns in HCI.</p> <p>Comparison Techniques Assessing match of behaviour to formal operating procedures or model predictions, assessing inter- or intra- observer coding reliability.</p>

(symbolic behaviour), for example in human computer interaction. Finally they located the social or naturalistic tradition of social sciences as a more recent development with respect to the techniques listed in figure 3.10. I agree with their historical analysis but feel that the techniques should be reviewed to include additional data types, in particular interview data.

3.6.4 Francophone Ergonomics

Francophone ergonomics refers to ergonomics practised in the French speaking countries and areas, in particular, France, Belgium and Quebec. There has been an interesting debate on the philosophy of ergonomics from the 1970s starting with Wisner (1972) and reported by other authors (De Keyser, 1991; Carballeda and Daniellou, 1997; and Falzon, 1999). They made a case to differentiate francophone ergonomics from anglophone ergonomics based both on the underlying philosophy and the process of practice.

Historically Wisner (1972:611) reported the on-going discussions about the best methods to approach and solve real ergonomic problems including the limitations of the experimental method. His background was as an ergonomics practitioner for eight years in the car industry where he found that the complexity of trying to solve real problems was not always supported by academic teaching, saying that students would comment 'you have taught us the scientific laws, shown us the measuring techniques and some criteria for evaluation, but we have learnt nothing about how to tackle the problems in their reality and complexity' (p602). In his paper he described his thoughts about ergonomics methodology taking examples from, and drawing contrasts between, an open loop (field) situation through to a closed loop (laboratory) environment. I found it very interesting that his position was very similar to mine, as a practitioner facing complex situations but lacking a robust methodology to do justice to the complexity. He described the difficulty of implementing change due to organisational constraints saying that the ergonomist should be 'conscious of these phenomena which limit and locate his action' (p611) but should maintain their focus on the problem and include all the aspects of technical, economic and social structures which impinge on it. He finished by saying that 'in spite of our scientific knowledge and our measuring techniques, ergonomics practice still remains an art like that of engineering or medicine' (p618).

De Keyser (1991) gave a detailed description of the basis for the process of francophone work analysis as choosing the specific and descriptive level of work and limiting it, in agreement with Wisner, to describing and comprehending what the worker was doing in a given situation rather than just looking at an externally observable component of the task. The important aspect here is the comprehension of the actions from the perspective of the worker. These descriptions enabled analysis of the observed differences between:

- Informal (worker action) and prescribed work (procedures and systems)
- Tasks (what they were supposed to do) and activities (what they actually did) using activity analysis (Jackson et al, 1997)

She discussed the rejection of systematisation describing it as 'a grand formalisation of approach', using 'flow diagrams to represent the engineer's model of the system rather than the workers and by the use of work station profile analysis to look at physical and cognitive aspects', and called it an empiricist approach. It has, she suggested, contributed to the separation of analysis from the behaviours of workers and led to problems with reproducibility as soon as individual subjective differences are introduced. So francophone ergonomics rejected systematisation in favour of a 'conviction that pertinent elements bring out in a work situation (influencing the operators behaviour) vary to extremes from one situation to another'. This portrays the interactionist (or qualitative) perspective underlying the francophone approach, with a phenomenological vein.

Historically De Keyser (1991:660) identified a suspicion of interview-based data as contributing to the 'quest for scientific status by psychologists and ergonomists' (as discussed in section 3.5). She believed this 'led them to distrust anything resembling introspection'. Daniellou (1999) returned to introspection by advocating the inclusion of reflective practice (Schön, 1983) as part of the core competencies guidelines produced by the IEA (Core Competencies, 1999).

However francophone ergonomics overcame this suspicion of interview data and 'verbalisation has penetrated into francophone work analysis to a considerable degree'. De Keyser (1991) described the process of analysis as very similar to qualitative analysis with the segmentation of data into units of varying size as part of a conceptual framework. The meanings of the units were explored and themes developed which were used to look at both the dialogue (process) and the task under

investigation. This contrasts with ESDA which only used observational data and so offers a much wider scope of application.

De Keyser (1991:666) finished by saying that 'gradually, over the years, questions of meaning and of the operator as a subject, and not as an object of analysis, have taken on a greater importance: the operator fashions the environment in his or her own manner; the operator creates common referents with the team. These constructs show through in the idea of a semantic of situation, of operative language, or integration of the historical dimensions of events. Subsequent behaviours are tendencies that researchers assemble patiently, like the pieces of a jigsaw puzzle'. She suggested that francophone ergonomics had achieved the position of a middle ground ontology saying that 'out of this very particular mix between a phenomenological vein and a scientific experimental procedure comes francophone work analysis: an original and singular approach.' This sounds similar to the middle ground for ergonomics of subtle or transcendental realism, section 2.5.

Daniellou (1999) took this philosophical reflection further, he believed that the first target of the ergonomist's action was peoples' minds, 'like therapists, teachers or trainers, the ergonomist contributes to a change in people, not merely in objects. ... and achieves these changes through personal interactions with a number of individuals and collective actors in a social context'. This is similar to the description by Ratner (1997:54, section 3.5) discussing the philosophy of Vygotsky where the unit of analysis is the awareness of the gap between the object of study and the interpretation necessary to fill the gap.

Caraballeda and Daniellou (1997) looked at ergonomics contributions to organisational design, criticising them for taking a structuralist approach, with implicit models about organisations. They considered that ergonomists should take account of both the social interactions, in the context of organisational charts and procedures and the structure of buildings or software, which will influence the social interaction. This places their views on the qualitative side of the organisational continuum, and sets the scene for Daniellou's later development into what I have categorised as actor network theory. They described their approach at two levels, as 'cold adjustments' for interventions dealing with management route and formal rules, and as 'hot adjustments' for informal changes by the workers. This, they said, 'allows for a participative approach to organisational redesign to involve the

executive and shop floor management of different professional groups. It forces the company management to realise that a number of different logics have to be considered in order to ensure long term efficiency, as a contrary to the supposed unique economic or technical logic.'

Falzon (1999) looked at the domain of ergonomics research from an historical perspective. In particular he drew on the debate in psychology (section 3.5) between supporters of laboratory and field studies. He became a strong advocate of field studies, saying that 'context appears to be such a strong determinant of behaviour that it cannot be eliminated for the sake of experimental rigour and variable control. On the contrary, laboratory studies appear as distorting reality to such an extent that they fail to provide appropriate data'. He followed in the steps of Wisner and De Keyser suggesting that ergonomics, as practised in the francophone countries, very strongly favoured field research, with observation as a central method of analysis.

His summary is key to positioning francophone ergonomics as a model for other ergonomics practice. On a philosophical level he commented that 'ergonomics seems to have a leaning to a structuralist ontology, based on its predominantly positivist tradition'. However he felt that there was a move to empower workers with ergonomics (Corlett, 1993) and this would put more emphasis on an interactionist (qualitative) approach. So the ergonomist could set up the external structure to facilitate the change but success would depend on whether the individual internalised the change within their world view (ontology) and acted upon it.

Daniellou (2001) discussed models of change which he had read in ergonomics publications as having different backgrounds: this ties in with section 3.3 on organisational theories. He says that 'in many cases the ergonomic contribution to change is an expert one: ergonomists give the scientific position about what is acceptable or not in the work place. They will prescribe solutions, just like physicians prescribe a medicine ... Other authors refrain as much as possible from adopting expert positions in ergonomics. Their idea is that changes in workplaces are the results of social interactions between a number of actors (employers and employees etc.). These ergonomists perceive that they contribute changes in the workplaces through fostering the social debates and feeding them with specific information. They bring in facts and suggestions, but the actual change will be the results of the negotiations between the actors. So the ergonomist's contribution in this case is

made of indisputable facts and disputable interpretations'. This sounds like the description of actor networks, placing francophone ergonomics on the qualitative side of the continuum (figure 3.7).

3.7 Discussion: A new paradigm for ergonomics?

In this chapter I have looked at ergonomics in the context of the qualitative-quantitative continuum (figure 2.2). The development and scope of practice was reviewed and it was identified that the debate has been on going in at least two of the feeder disciplines for some time.

The feeder discipline of life sciences was conspicuously absent as I was unable to find any evidence that there had been any move away from the positivist tradition of the physical sciences using quantitative methodology.

In the context of organisational theories there is a difference in the location of francophone and anglophone ergonomics. Anglophone still seems to be firmly on the quantitative side, although moving towards the centre position, whereas francophone seems to have been engaged in philosophical reflection for at least thirty years and to have repositioned itself at the qualitative end, adopting an interactionist perspective.

As I said, within psychology and design, there is evidence of the debate. Psychology shows similarities to sociology and anthropology (Woolgar, 1996:11) with a slow reversal, or coming full circle, to re-adopt previous theoretical positions of a more interactionist perspective. Design is dichotomised between art and technology as exemplified by the commentaries from product and engineering design. Product design has ergonomics in a relatively more quantitative position, whereas engineering design has located the relationship as more qualitative. I think this says more about the ontology of the two disciplines rather than about ergonomics itself.

So where does this leave ergonomics? There is evidently a difference in theory in the international arena. Daniellou (2001) looked at definitions of ergonomics in the IEA federated societies and found commonalities in their references to science, the 'knowledge about the characteristics of human beings', and to the 'application of that knowledge to the design of systems and devices of all kinds'. He suggested that this 'cross-bred identity' should lead to an invitation for an epistemological examination of the nature of ergonomics and summarised three debates around the nature of

sciences and its application to ergonomics. He started with the need for epistemological reflection to include the debate around laboratory versus field studies, followed by paradigm shifts, and finally the difficulty in human prediction.

This indicates the position of francophone ergonomics. I will now look at anglophone ergonomics in the USA and UK. Moray (2000) gave a very detailed diagram of ergonomics using a model similar to Klein's onion (section 3.2.4, social dimension). The layers started from a central core of physical devices and spread outwards to include physical ergonomics, individual behaviour, team and group behaviour, organisational and management behaviour, legal and regulatory rules and finally social and cultural pressures. At the outer edges of his onion Moray (2000:860) described macro-ergonomics as 'one of the most far-reaching concepts being used in the USA' but he then went on to suggest that even this only took note of the outer layers in a patchy way.

Wilson (2000a and b) took an extensive look at the definition of ergonomics, putting his emphasis on 'understanding human behaviour and performance in purposeful interacting socio-technical systems' and the 'application of that understanding to design of interactions in the context of real settings'. His emphasis was on both a systems perspective and holism, but locates the social dimension as an external factor, (rather than an internal aspect of the individual person) with financial, legal and political dimensions. In light of Grint's comments on the lack of use of socio-technical systems theory (3.3.1.3) by large UK organisations the continued location of ergonomics within this model is surprising. He locates ergonomics on the 'cusp of the sciences and the humanities', in the centre of the qualitative-quantitative continuum, saying that 'ergonomics has more in common with anthropology, where the unit of analysis is interaction in contrast to psychology where the unit of analysis is the individual'. There seems to be some move towards the qualitative pole on some levels but perhaps lacking a philosophical foundation, as in francophone ergonomics, to underpin a paradigm shift.

So there is definitely a mood for change and a paradigm shift in ergonomics, perhaps just to a more inclusive position, or middle ground, rather than 'throwing the baby out with the bath water'. Some of the following authors have started to develop theses to support this middle ground, or more inclusive, position.

At the IEA Congress 2000 there were several reflective papers on both philosophy and methodologies in ergonomics. Cameron (2000) described four levels of scientific knowledge which she suggested should be the foundation for a new paradigm characterised by 'holism'. She drew heavily on the work of Harman (1998), but went further in applying the model to ergonomics. The four levels are shown in table 3.6. and she proposed (and I agree) that ergonomics has traditionally been mostly at levels one and two. The increasing work at organisational levels (macro) has moved ergonomics to level three and this exploration of alternative methodologies is now taking it up to level four.

Table 3.6 Four levels of knowledge (Cameron, 2000:566)

Level 1	Physical sciences (Physics, Chemistry, Engineering)	Empiricists. Used methods, concepts and explanations that were structured at the level of physical causality.
Level 2	Life sciences (Biology, Physiology)	As for level 1, but need more abstract concepts, such as the holistic concept of an organism.
Level 3	Human sciences (Sociology, Psychology)	As for level 2 but additional concepts such as personality, comprehension and attention. Also some phenomena of interest require the study of humans in teams, organisations rather than individuals.
Level 4	Spiritual sciences (Art, Philosophy)	This again builds on the previous three levels but also needs even more holistic concepts such as universal purpose (Harman, 1998:93).

Vicente (1997) entered into the debate about the philosophical base of practice for ergonomics, also identifying four levels but this time for practice. These went from the highly controlled laboratory experiments to qualitative descriptive field studies. He suggested that the need to explore alternative options was due to a 'gap between the basic and applied worlds', but that the broadening of ergonomists' perspectives created much greater 'prospects for making a difference in the applied world'.

Kanis (1993, 1994) has also been progressively unpicking quantitative issues of validity, reliability and measurement variation in product design research. His arguments are similar to those used by Chalmers (1982) in his critique of positivist science. In 1998 he moved to a position of inclusivity, saying that 'what is important is the use variation', trying to identify negative examples. Kanis seems to be seeking

the middle ground philosophy but has yet to look at the extreme polar positions of qualitative methodologies in order to find his own ontological perspective.

Sanderson and Fisher (1997:1509) suggested that the use of qualitative methodologies (ESDA, section 3.6.3) will 'become an increasingly viable data analysis option for human factors', but that as most ergonomists 'have not been trained in qualitative data analysis of any kind..[they]..are at a loss as to how to proceed beyond mere anecdote'.

This creates an opportunity for the next generation of ergonomics, with an accompanying paradigm shift, to build an even stronger base of practice by expanding the theoretical academic foundations to support the inclusion of qualitative methodologies from social sciences. This move is supported by Moray (1994, 2000) who has recognised for some time that the methods of sociologists, anthropologists, and ethnographers offered a methodology which was 'more sensitive to the context of analysis of individual work situations, rather than methodologies resulting in generalisations based on statistical averages, but was still looking to be able to generalise the findings of this type to study other and different systems'.

At this point I will return to figure 3.3 to compare it with Daniellou's (2001) discussion on terminology. He suggested that as far as ergonomics theories were concerned there were numerous tacit assumptions. 'The words and concepts of work, health, improvement and technology are used without much explanation of their visions of what lies behind these concepts'. He looked at one model of the human, used by many ergonomists (figure 3.3) and expanded it to four dimensions (similar to the four levels of Cameron, 2000): biological, cognitive, psychic and social. This included an ethical dimension for work with respect to the construction of the persons' identity and its role in the weaving of the social fabric. He suggested two kinds of models for ergonomics: one in the fundamental feeder discipline (physiology, psychology) the other to look at the social factors. I think his second model is very definitely underpinned by a qualitative position as he went on to discuss the role of the ergonomist (as a reflective practitioner) within the research or change process, describing this as drawing 'attention to their [ergonomists] decision making processes, their negotiation skills, their interactions with different actors, the

kind or power and responsibilities they take on, the ethical problems they encounter, the human costs they go through...’.

As ergonomics relies on its feeder disciplines for much of the empirical research, this means that attempts to produce scientific knowledge in ergonomics usually encounter epistemological difficulties reflecting the multi-disciplinary in-put, rather than one single discipline. This may be considered a weakness, or it may create an opportunity for ergonomics to ‘take part, with a head start over other disciplines, in epistemological debates that are developing about the relations between science and action in complex situations. Its strengths are the reciprocal of its weaknesses; work situations involve a number of constraints that no research would dare to impose in the laboratory’ (Daniellou, 2001). He closed by identifying two conditions that are probably at stake if ergonomics is to be regarded as an epistemologically leading discipline:

1. The need for the ergonomics research community (mostly academic) to take epistemological issues (theory) in earnest and tackle them in their congresses.
2. The quality of the relations between ergonomics academia and ergonomics practice and their ability to act as reciprocal suppliers.

So ergonomics is maturing. The evidence for this comes from Falzon (1999), with respect to the increase of papers looking at the philosophy of ergonomics, and also from Moray (2000), highlighting the fact that ergonomics itself has now started to spawn new disciplines, in human computer interaction.

A new paradigm for ergonomics is perhaps already here but just awaiting both language and epistemological translation.

Chapter Four.

Case Study of Ergonomists:

(1) Theoretical exploration of using qualitative methodology in ergonomics

*I keep six honest serving-men
(They taught me all I knew),
Their names are What and Why and When
And How and Where and Who.
I send them over land and sea,
I send them east and west;
But after they have worked for me,
I give them all a rest.*

*I let them rest from nine till five,
For I am busy then,
As well as breakfast, lunch, and tea,
For they are hungry men.
But different folk have different views.
I know a person small –
She keeps ten million serving-men
Who get no rest at all!*

*She sends 'em abroad on her own affairs,
From the second she opens her eyes –
One millions Hows, two million Wheres
And seven millions Whys!*

'I keep six honest serving men...' by Rudyard Kipling

In Keating (1993:100)

4.0 Introduction

This chapter describes a case study with twenty-one interviewees to look at the use of qualitative methodology in hospital ergonomics. My aim was to further explore the questions of the thesis at an individual level with academics and practitioners. The findings from the case study are divided between two chapters, four and five. The procedure for the case study is described in this chapter, together with the findings for the first three of the following areas:

1. The interface between ergonomics and other disciplines/professions.
2. Perceptions of ergonomics – scope and application.
3. The role and application of qualitative methodologies in [hospital] ergonomics.
4. The characteristics of the health care industry and how these affect the practice of ergonomics in hospitals.

Chapter five gives the findings and discussion for the last two questions, with data from question three included in both chapters four and five. The two chapters are intentionally written in different styles. Chapter four uses the traditional style with the relevant literature review (chapters two and three) separated from the study and then drawn on for the discussion. In contrast, chapter five has the literature review embedded throughout the findings and discussion, giving a more interactive analysis (Wolcott, 1992:17).

In the discussion for this chapter (section 4.7) two issues are considered: (a) the model emerging from the case study in comparison with the proposed model of interactions from chapter three, and (b) the argument for a new paradigm in ergonomics.

Finally the relationship of the internal environment of the academic discipline and the external environment of professional practice is seen as pivotal in establishing rigour in the use of qualitative methodologies in ergonomics.

4.1 Relevant content from literature review

Chapter two concluded by proposing a middle ground philosophical position which supported the use of both qualitative and quantitative methodologies. This proposed that the positions of transcendental and subtle realism might be appropriate for the discipline and practice of ergonomics. Chapter three concluded by drawing attention

to a new paradigm (section 3.7) from francophone ergonomics. This seems to fit under the realist ontology, and particularly fits - with respect to the epistemology of relativism for the practice of ergonomics (section 3.6) - with the actor network model from organisational theory. The concept of hot and cold adjustments allows for the different descriptions of reality and different logics by different groups in an organisation (managers and workers). The ontological position seems to support a model of interactions where a person has many facets which may or may not be expressed in different situations, and interactions which will be at a number of levels, with variation in individual, group and organisational perceptions. Hughes and Sharrock (1997:165) described this as 'individuals as agents who are capable of making decisions and choices and who, consequently, can carry out the requirements of those positions and, thus, may transform the structure that they or others will subsequently occupy'.

This summary of the literature review from chapters two and three is a post-hoc summary and does not give an indication of my knowledge at the start of the case study on ergonomists. In contrast, my position and level of knowledge at the beginning of the case study is represented by the conceptual framework shown in section 4.3. The changes that were made to it over the course of the two years of data collection and analysis show a deepening knowledge of the subject areas, in particular the qualitative-quantitative debate and the philosophy of ergonomics.

4.2 Methodology

Qualitative methodology was chosen as a suitable approach to explore the four research questions mentioned above, with ergonomics being seen as socially situated for both research and practice (Hignett, 2001a). This approach enabled me to explore the questions by having:

1. Access to information through interactive interviews, with the flexibility to develop the questionnaire both during an individual interview and throughout the study.
2. An inclusive perspective to reflect on the diversity of the perspectives held by academics and practitioners involved in ergonomics.

The methodology used from the outset was qualitative classification, and the philosophical position started with a broad interactionist perspective with a

deliberate intention not to tie myself into one of the methodologies until I had a clearer idea of my philosophical viewpoint. Chapter two sets this out in terms of in the middle ground (section 2.5) giving an ontological position of subtle or transcendental realism. This means that I believe that there is a physical structure beyond our minds, ‘..things exist and act independently of our descriptions ... objects belong to the world of nature’ (Bhaskar, 1975:250). However I also believe that different people will have different perceptions of them, the idea of non-competing multiple realities (Murphy et al, 1998:65). This is accepting the view of Hammersley and Atkinson (1995:17) that ‘.. there is no way in which the researcher can escape the social world in order to study it’. So two people may interact with the same situation or product and have very different experiences and perceptions of it and both can be equally valid.

The term case study is used to describe both this and the occupational therapy project (chapter six). Yin (1994:1) described this as the ‘preferred strategy when ‘how’ or ‘why’ questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real life context’. The exploratory nature of a case study allows flexibility and because of this tends to lend itself to qualitative methodologies and analysis. Robson (1993:150), drawing on the work of Miles and Huberman (1984), set out the structure for a case study as: a conceptual framework; a set of research questions; a sampling strategy; and clearly described methods and instruments for data collection. This is the structure I have used both in planning and reporting.

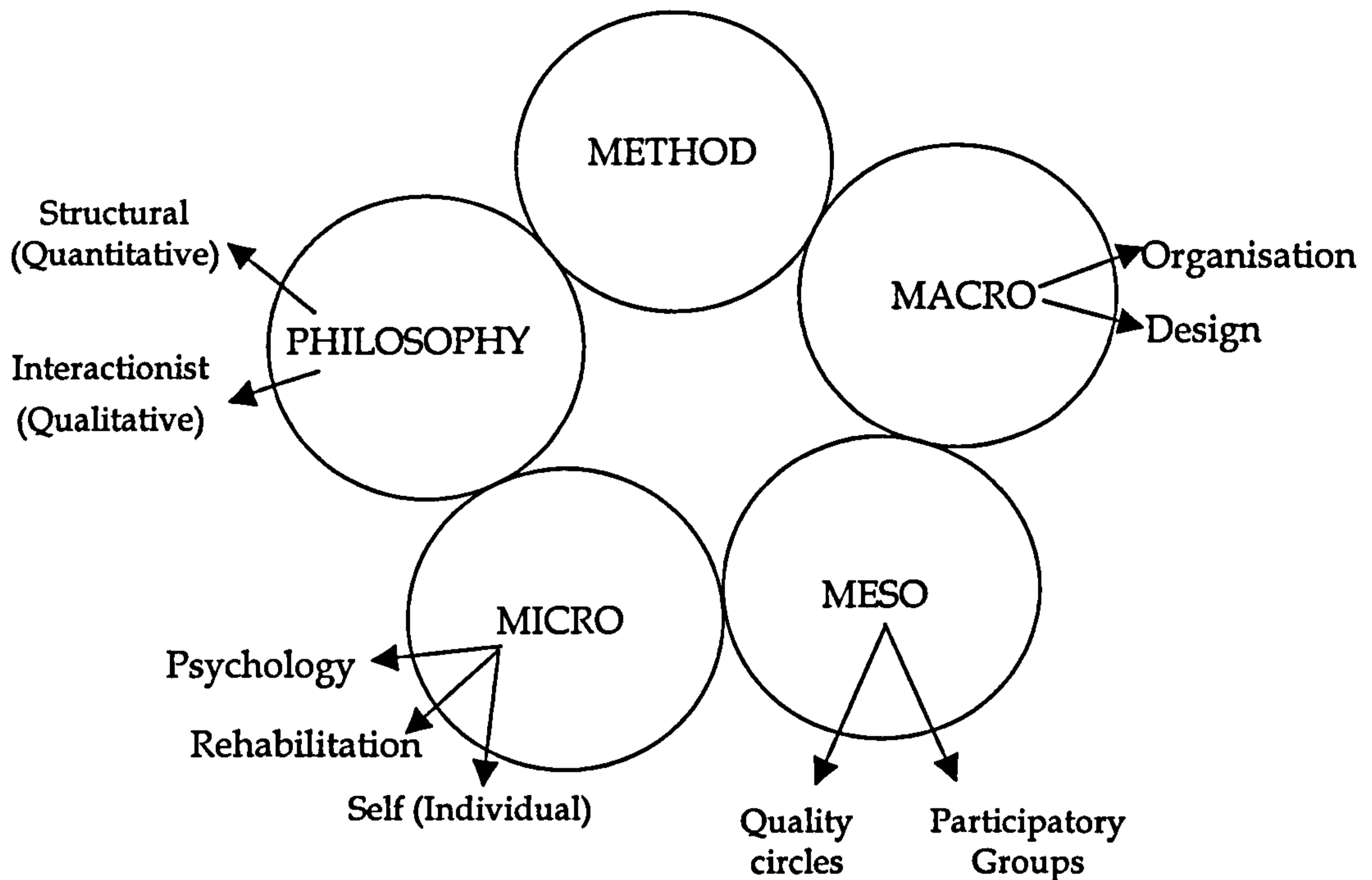
I reflected on my position with respect to most of the interviewees and decided that it felt as if I was ‘studying up’ (Bell, 1978). This is because I felt that I was exploring the practices and philosophies of interviewees who were mostly more ‘powerful’ (and experienced) than me with respect to academic status.

4.3 Conceptual framework

The conceptual framework (figure 4.1) reflects my knowledge and thoughts at the start of the case study. Inevitably my thoughts changed during the course of this thesis and I have tried to represent the changes honestly throughout the analysis as they were recorded in my Ph.D. diaries. The literature review has also continued

throughout the four years I have been working on the thesis, additional work has been published and I have sourced earlier work.

Figure 4.1 Conceptual framework



4.4 Aims

1. To explore the interface between ergonomics and other disciplines/professions by asking experts about personal perceptions of ergonomics (scope and application).
2. To consider the role of qualitative methodology in [hospital] ergonomics research and practice.

4.5 Method

Interviews were used to collect data on the four question areas. The ontological and epistemological descriptions for interview data are given earlier in chapter two (table 2.7, section 2.3.2.1). Epistemologically this means that a legitimate way to generate data on the questions was to talk with people to find out about their views and accounts. The underlying ontological position takes peoples' interpretations and

interactions, based on their knowledge and views, as meaningful properties of their social reality, and therefore are sources of knowledge about the research questions.

I used semi-structured or focussed interviews with a questionnaire proforma which developed during the course of the study as show in figure 4.2 and described in section 4.5.3.

Figure 4.2 Case Study Process

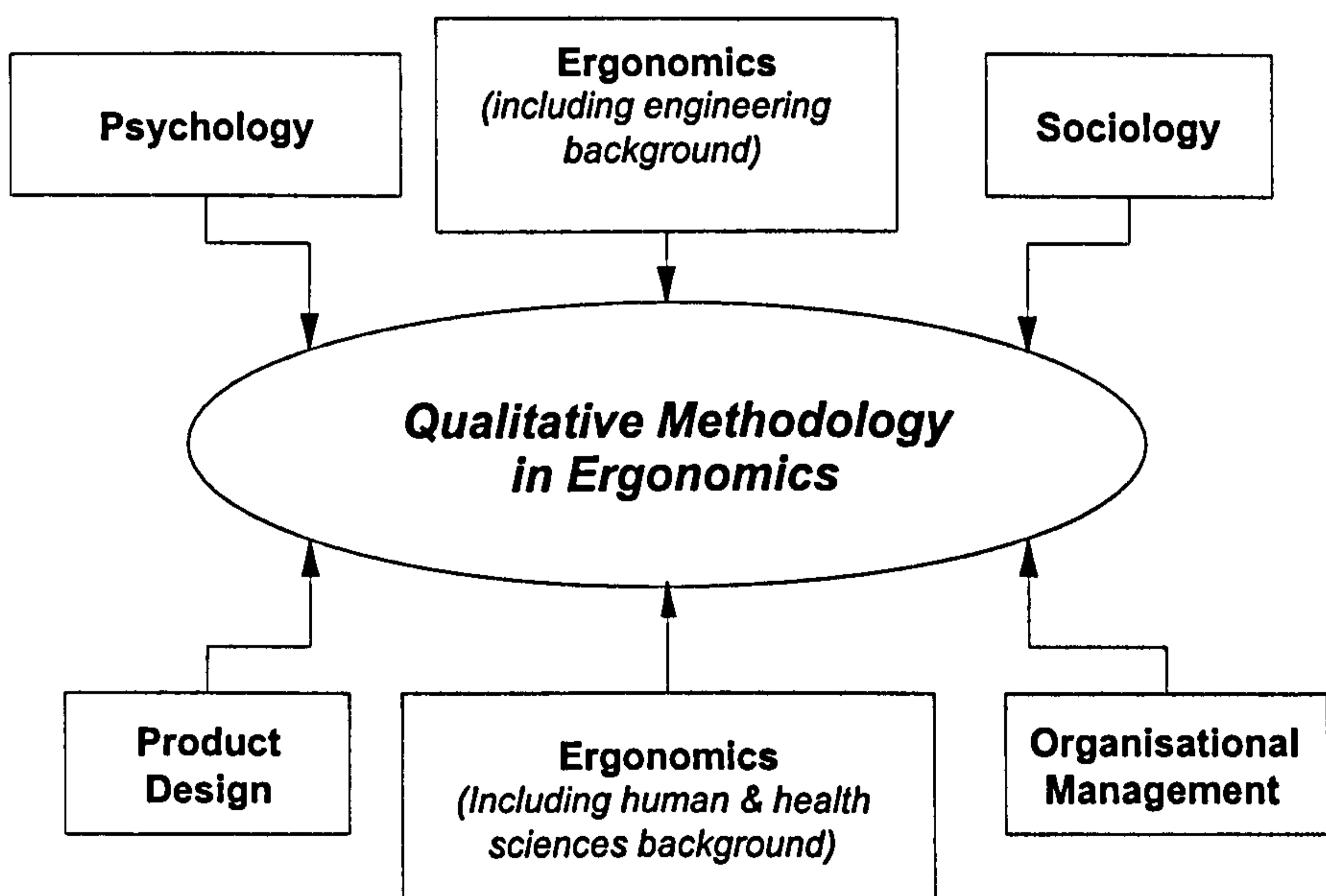
Time Line	Data Collection	Data Analysis
<p>Design phase</p> <ul style="list-style-type: none"> • Choice of methods • Interview schedule • Sampling plan • Access, consent 	<p>Interviews Audio-tape, field notes</p>	<p>Develop initial coding framework from background reading and researcher's experience</p>
<p>Collection/Analysis Questionnaire version</p> <p>1 (Sept '98)</p> <p>2 & 3 (Nov/Dec '98)</p> <p>4 (March '99)</p> <p>5 (May '99)</p> <p>6 (Sept '99)</p> <p>7 (Feb '00)</p>	<p>Interviews</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p>	<ul style="list-style-type: none"> • Transcription of tapes • Iterations of coding with analysis of interviews <p>Hierarchical tree (NUD*IST) 1 (3 Aug '99)</p> <p>Hierarchical tree (NUD*IST) 2 (6 Aug '99)</p> <p>Hierarchical tree (NUD*IST) 3 (9 Nov '99)</p> <p>Hierarchical tree (NUD*IST) 4 (17 May '00)</p>

4.5.1 Sampling Strategy

Individuals who had written on the subject of ergonomics philosophy were intentionally sought out. Some had similar viewpoints to mine and some were known to have different views (negative examples). I made the decision to only seek informants from the feeder disciplines rather than the evolved disciplines. This resulted in the exclusion of human computer interaction literature and interviewees from the case study.

Purposive sampling was used to spread the net (table 2.9, section 2.3.3) and resulted in interviews with a small number of people with specific characteristics or experience in this area. Then I followed up contacts, suggested by the interviewees (snowball sampling), to seek out other people whom, they felt, could contribute to the exploration of the research questions. The next stage used intensity sampling to focus specifically on individuals with experience in hospital ergonomics and the final strategy used was analysis sampling to seek for extreme or deviant cases. This stage included gaining interviews with international representatives who could contribute a non-anglophone perspective.

Figure 4.3 Background of Interviewees



Twenty-one individuals were interviewed from the disciplines shown in figure 4.3. The range of disciplines represents the diverse backgrounds found in ergonomics (table 3.1, section 3.1.1). Sociology and product design were included when specific informants with an interest in my research questions were identified at The Ergonomics Society conferences in 1998 and 1999 (Hanson, 1998; Hanson et al, 1999). The success of the sampling strategy is shown in table 4.1. The subject areas are shown in the last column as ergonomics (E), qualitative methodologies (Q), and hospital ergonomics (H). Fourteen of the interviewees were able to provide information about all three areas, with seven discussing only two of the subject areas.

4.5.2 Interviewees

The interviewees were all asked to participate by me, either in person or by letter. An information and consent form (appendix two) was sent, with a copy of my first philosophical paper (Hignett, 1999) from April 1999 (fifteen interviews). My intention was to give people an opportunity to review the question areas that I was interested in, together with my viewpoint, before agreeing to be interviewed.

All the individuals approached agreed to be interviewed, although for three it proved impossible to arrange a convenient time (two from ergonomics/psychology and one from health sciences/ergonomics). Other interviews were booked to try and ensure that I achieved saturation with respect to the information from the different discipline areas, although unfortunately the input from psychology remained limited. I only interviewed one academic working in a psychology department (rather than ergonomists with a background in psychology). All the other input areas had at least two interviewees, with the ergonomists directly accounting for sixteen of the interviews as shown in table 4.1.

A total of twelve academics and nine practitioners were interviewed. The interviewees were classified as academics if their substantive post was in a university. Many also did some consultancy work in ergonomics, but much of this seemed to be linked, at least in part, to a research interest. The practitioners also had some overlap with the academic community by providing lectures on ergonomics and non-ergonomics courses. Their substantive employment was to provide an ergonomics service without any underpinning research goals. They were generally not involved with research projects or ergonomics programmes at universities.

Table 4.1 Interviewees

Interviewee number	Background A = Academic P = Practitioner	Approx. time of experience in ergonomics (years)	Subject areas E = Ergonomics Q = Qualitative methodologies H = Hospital ergonomics
1	Ergonomics/ Engineering (A)	30+	E/Q
2	Sociology (P)	30+	E/Q/H
3	Ergonomics/ Engineering (A)	20+	E/Q
4	Ergonomics (P)	10+	E/Q
5	Product Design/ Engineering (A)	30+	E/Q/H
6	Sociology (A)	0	E/Q/H
7	Ergonomics/ Organisational Management (A)	30+	E/Q/H
8	Ergonomics/ Organisational Management (A)	30+	E/Q/H
9	Psychology/ Health Sciences (A)	0	E/Q/H
10	Ergonomics (A)	20+	E/Q
11	Ergonomics/ Human Sciences (A)	20+	E/Q/H
12	Ergonomics/ Human Sciences (A)	30+	E/Q/H
13	Sociology (A)	0	Q/H
14	Ergonomics/ Health Sciences (P)	5+	E/Q/H
15	Ergonomics/ Health Sciences (P)	20+	E/Q/H
16	Ergonomics (A)	20+	E/Q/H
17	Ergonomics/ Health Sciences (P)	5+	E/Q/H
18	Ergonomics/ Product Design (P)	5+	E/Q/H
19	Ergonomics/ Health Sciences (P)	5+	E/H
20	Ergonomics (P)	5+	E/H
21	Product Design/ Psychology (P)	5+	E/Q/H

4.5.3 Data collection

The questionnaire was developed iteratively over the eighteen months of data collection (appendix three), around the themes shown in table 4.2 and linked to the conceptual framework (figure 4.1).

Table 4.2 Themes of questions and conceptual framework

Themes from questionnaires	Exploratory Area(s)	Conceptual framework
What model of ergonomics do you use (a) for teaching, (b) in practice?	<ul style="list-style-type: none"> The interface between ergonomics and other disciplines/professions Perceptions of ergonomics - scope and application 	MACRO/MESO/ MICRO/ PHILOSOPHY
What impact do you think that social factors have on ergonomics research and practice?	<ul style="list-style-type: none"> The interface between ergonomics and other disciplines/professions Perceptions of ergonomics - scope and application 	PHILOSOPHY/ METHOD
Do you think ergonomics methods and methodologies explore why people do things, as well as who, what, when, where and how?	<ul style="list-style-type: none"> Perceptions of ergonomics - scope and application 	MACRO/MESO/ MICRO/ PHILOSOPHY
What is your impression of qualitative methodology, and how would you say it differs from quantitative methodology?	<ul style="list-style-type: none"> The role and application of qualitative research in [hospital] ergonomics 	PHILOSOPHY
Can qualitative and quantitative methodology be combined or are the philosophical differences too great?	<ul style="list-style-type: none"> The role and application of qualitative research in [hospital] ergonomics 	PHILOSOPHY

I audio-taped the interviews and later transcribed them verbatim in preparation for analysis. Contact summary sheets were completed (appendix one) to capture my immediate thoughts about the interview and summarise the main points from each interview as shown in table 4.3.

Table 4.3 Iterative questionnaire development

Questionnaire	Date developed	Number of interviews used in:	Contact data sheet summary New (or remaining) target questions identified following interview(s)
1	Sept '98	4	<p>Consider how rigour can be demonstrated in qualitative studies. Need to develop questionnaire to explicitly explore hospital culture issues.</p> <p>Explore participatory ergonomics - taking whole self in, giving everyone equal importance.</p>
2 & 3	Nov./Dec. '98	0	
4	March '99	2	<p>Are there any examples of practitioners actually using qualitative methodology?</p>
5	May '99	7	<p>Does ergonomics have an inclusionist philosophy (user-centred)?</p> <p>Consider the practical application of qualitative methodology (research/practice divide as for quantitative!)</p> <p>How rigorous are qualitative studies? (practice/research)?</p> <p>Should you use quantitative for environmental issues and qualitative for people?</p> <p>How much do ergonomists reflect on their own practice?</p>
6	Sept. '99	3	<p>Look at the contrast between how academics and practitioners work.</p> <p>Are practitioners as clear as academics about the methodologies and methods used?</p> <p>How much experience do ergonomists have of using qualitative methodology software?</p> <p>Is ergonomics a vocation? (personal beliefs)</p>
7	Feb. '00	5	<p>Do sociologists and anthropologists do applied work?</p>

As the study progressed the new or target questions started to develop into questions for the data rather than the interviewees. For example the contact summary sheets

from questionnaire six included the question 'is ergonomics a vocation?' This area had been asked from questionnaire one as 'how does your work in ergonomics reflect your own beliefs and philosophy?' So the task was to search the interview transcripts to seek any data relating to this question.

4.6 Analysis and Findings

This section will follow the three steps identified in chapter two (section 2.3.4) of data reduction, data display and conclusions drawing/verification.

4.6.1 Data reduction

The data were initially reduced using the contact summary sheets as described above. The interview transcripts were imported into the data management tool, NUD*IST N₄ (Gahan & Hannibal, 1998). The data were summarised, coded and broken down into categories using qualitative classification (Miles and Huberman, 1994; Sanderson and Fisher, 1997:1475). I used the memo facility in NUD*IST but also kept a project diary to work on data display ideas and possible representations.

4.6.1.1 NUD*IST

NUD*IST stands for Non-numerical Unstructured Data Indexing Searching and Theorising (QSR, 1994). It is a qualitative software package which supports both coding and retrieval as well as on-screen indexing. As new versions of NUD*IST have been issued more sophisticated functions have been added. These have mostly supported more on-screen interaction for coding through the use of memos, reports and most recently coding stripes, with codes assigned a colour to facilitate identification.

There are two databases, one for the documents and the other for the developing index system. The document database can be used for both on-line (e.g. imported transcripts or field notes) and off-line (e.g. large documents or visual data) sources. For interviews there is a style guide which is used to set the size of the text unit and facilitate future searching. The whole document can be coded (e.g. for the background of the interviewee) or smaller sections and text units (from one line to one paragraph) relevant to a specific question or theme. Figure 4.4 shows coding attached to a segment of an interview transcript. The text unit is set for one

paragraph, so the sections (365 and 369) have the coding for Hospital/Caring (<3 3>) attached. The documents can be searched using a range of searching techniques e.g. for a particular word or phrase. More complex searching is possible, but I have not used the full capability so have limited experience with more detailed searches.

Figure 4.4 Coding on interview transcript

Q.S.R. NUD.IST Power version, revision 4.0.
 Licensee: Sue Hignett.
 PROJECT: ergonom2, User Sue Hignett
 ++++++

Margin coding keys for selected node in document:
 <3 3> /HOSPITAL/Caring (Figure 4.8)
 +++ ON-LINE DOCUMENT:
 +++ Retrieval for this document: 7 units out of 487, = 1.4%
 ++ Text units 362-369

*Sue	362
(laughs) no!. I wanna pick up on your examples, but the, the big question that I've got is - do you think ergonomics in hospitals or health care is any different to ergonomics in any other industry?	363
*Interviewee	364
Long pause. umm. well I think it, I think it presents problems which you don't see in any other industry, and, actually you must see them in other industries but its very, very obvious in the sort of, the hospital environment, and I think, a lot of that is linked to the umm relationships that people have within that setting	365 <3 3>
*Sue	366
right	367
*Interviewee	368
and where you look at situations where trust has to exist at the level that is has to operate on within hospital settings, where you have to, in many, many situations you have to deal with an interaction between people which both parties have to really have very high belief in, umm where there are, can be very strong emotional influences at a level which is just about as sharp as you can get I think in terms of interactions between people (tape changed)	369 <3 3>

The index system can be set up at the start of the project based on the conceptual framework and then changed during the analysis. At any stage a report can be produced to include all segments of documents which have the required code. This enables intra-code checking to ensure that the same criteria are being used if coding takes place at different times during the research project. The codes assigned are shown as nodes on the hierarchical trees. One of the useful changes between versions three and four is the availability of free nodes (QSR, 1997). These enable data to be coded to a particular node without the node having to be attached to the tree. For the purpose of representation I have shown them as a separate branch of the tree (figures 4.5 and 4.6).

The operational use of N₄ was built on my previous experience of analysing qualitative data. My first experience was for a case study on nursing work (Hignett and Richardson, 1995) where I initially used a traditional cut and paste approach but then recoded the data using a qualitative software package called Textbase Alpha (Tesch, 1990). This provided good experience for my next project with midwives (Hignett, 1996a) where an earlier version of NUD*IST, three, was used (Richards and Richards, 1991). The Occupational Therapy case study was carried out before the ergonomists case study and was analysed using NUD*IST three and N₄. During the course of the ergonomists case study a further upgrade of NUD*IST was published (Nvivo). Nvivo was evaluated by recoding the first eight interviews but, although it offered greater scope with respect to searching and illustration of coding on the text (coding stripes), I felt that the hierarchical tree display offered less with respect to data representation. The interviews were all coded again (as described earlier) in N₄ which gives consistency for the use of the data management software throughout this thesis in the two case studies.

A qualitative data management software package does not analyse the data as a statistical package might. It simply provides an environment to store and explore data and ideas and minimises the time which used to be spent on cut and pasting the data into codes and themes. I have found that the speed offered by NUD*IST in coding the data facilitated my thinking, rather than being slowed down to the speed at which I could cut and paste either by hand or on the computer.

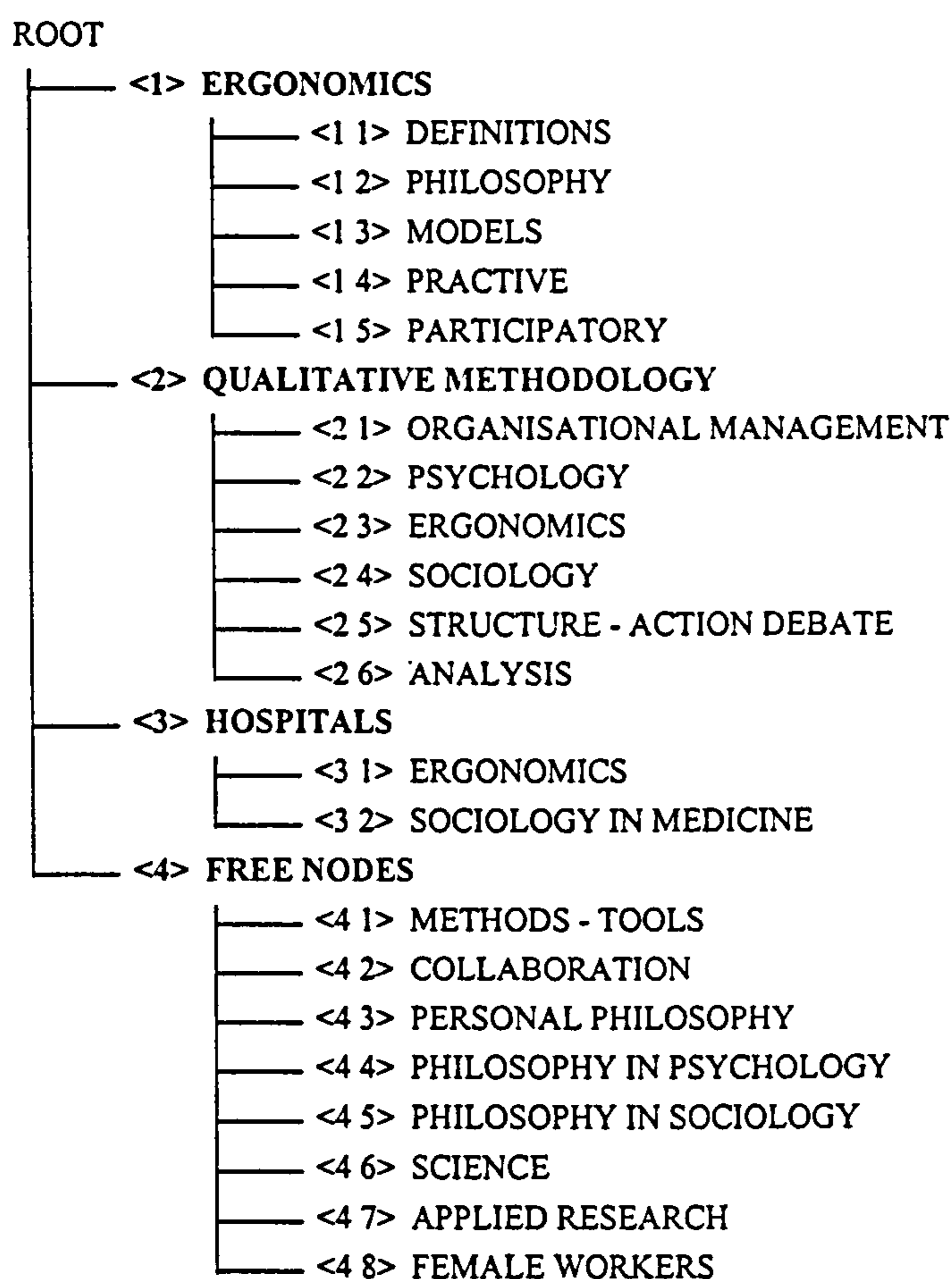
The facility of thinking on-line with the index system also provides a more creative environment and enabled me to code the interviews several times to try and look for

alternative interpretations and meanings. An example of a coded interview is given in appendix four.

4.6.1.2 Hierarchical Trees

The first hierarchical tree (figure 4.5) has three branches of ergonomics, qualitative methodology and hospitals. There are an additional eight free nodes which have not been linked to any of the trees at this stage. This tree is the result of coding the first three interviews.

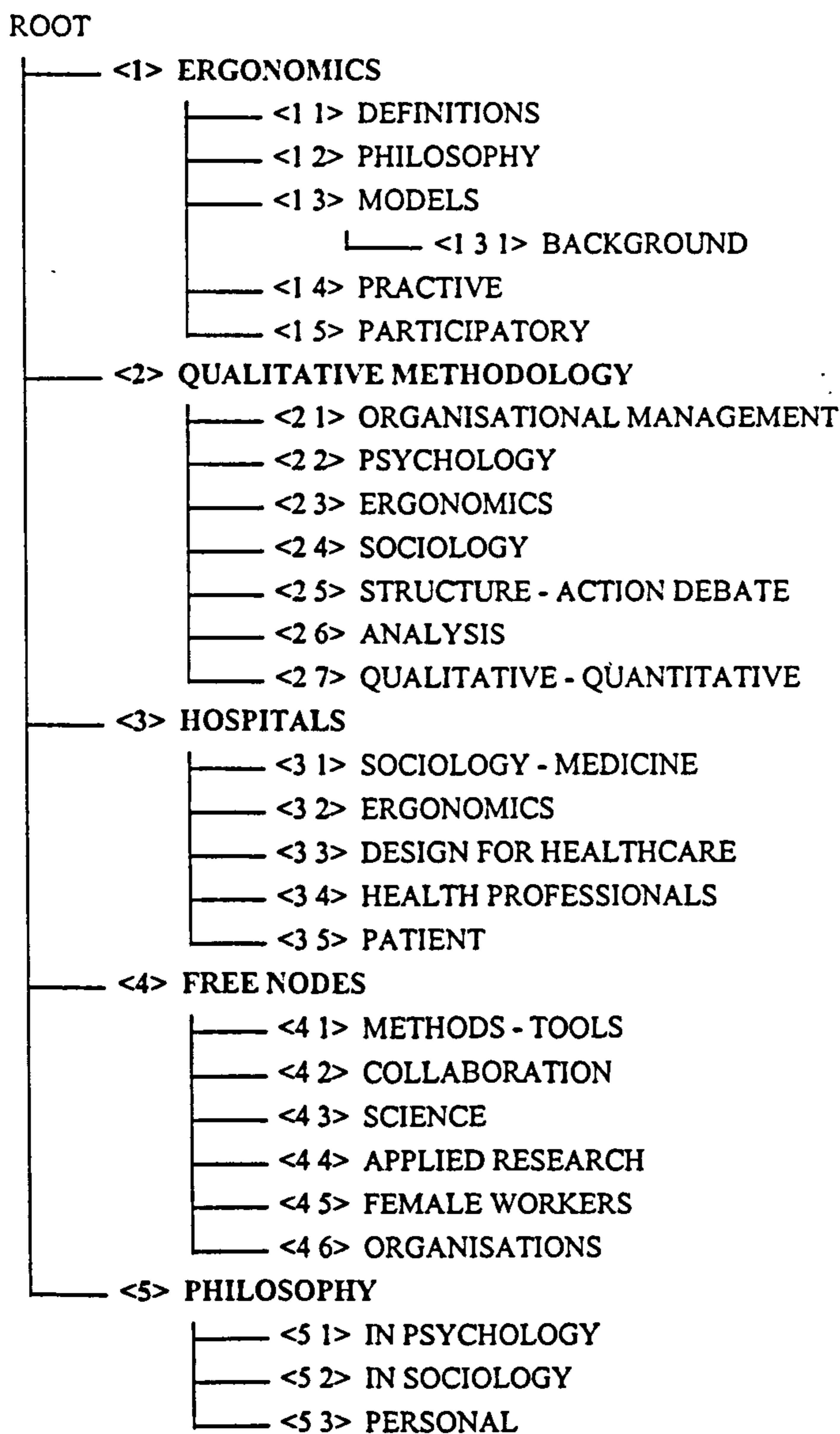
Figure 4.5 First hierarchical tree (from 3 interviews)



The second tree (figure 4.6) is similar to the first tree but with data relating to philosophy in psychology, sociology and individuals' personal philosophy coded as a separate tree. This shows the start of the exploration of this theme from the conceptual framework. During this time I attended taught modules with the Graduate School at Nottingham University. Two of the modules covered the philosophy of social science (spring 1998) and qualitative methodology (spring 1999).

These impacted on the first and second trees by providing additional information which has been included as part of the literature review in chapter two. The influence on the data analysis is evident with a more in-depth examination of issues raised by the interviewees about philosophy in psychology, sociology and their personal perspectives. The node for philosophy in ergonomics (<1 2>) was still very unclear so was left as part of the ergonomics branch. It was used for comparison with the other nodes on philosophy to search for commonalities and differences.

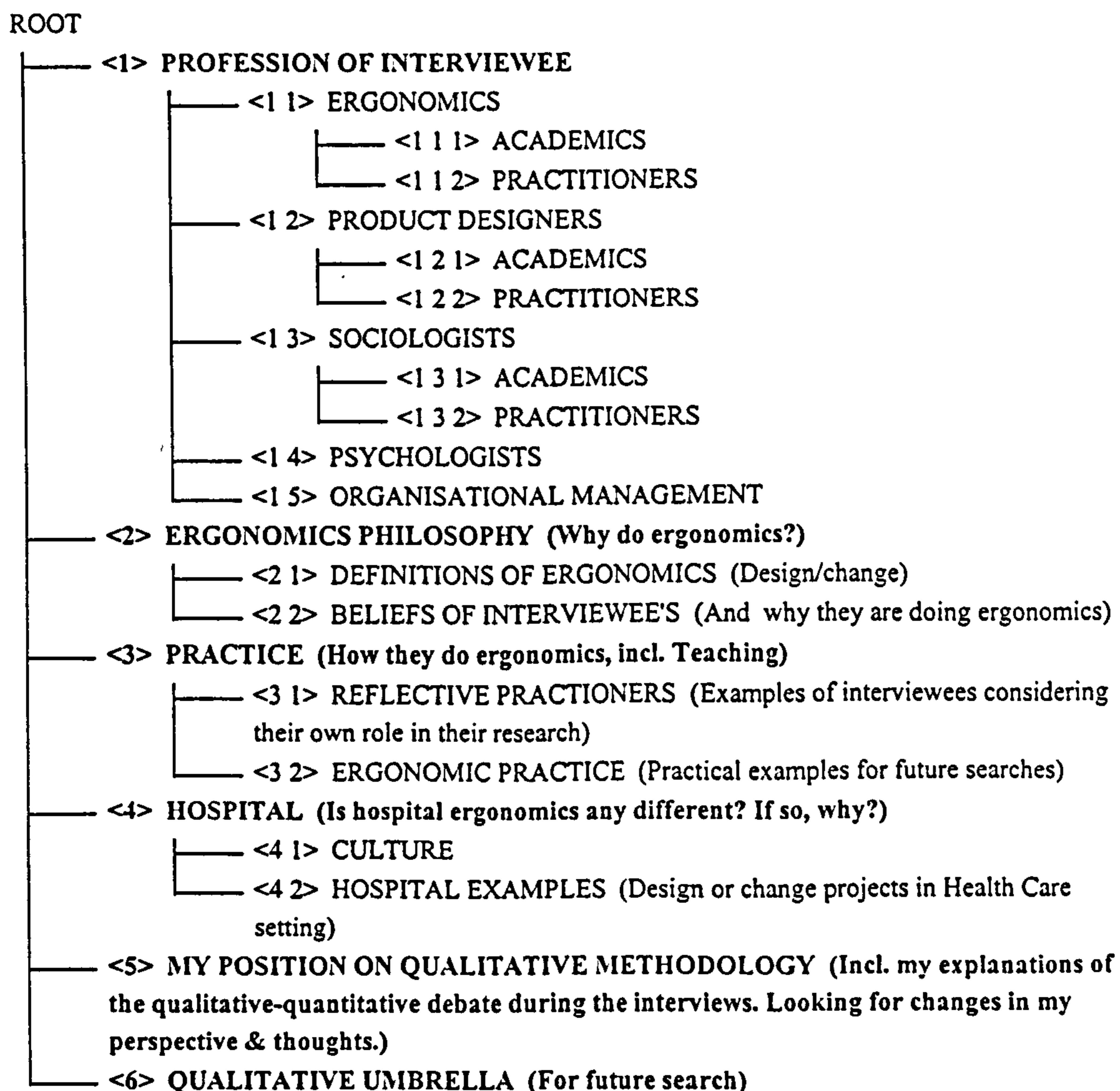
Figure 4.6 Second hierarchical tree (from 8 interviews)



By November 1999 I had carried out 16 interviews and decided to code all the interviews again with a new structure (figure 4.7) to use a different search strategy

for the index system. This time I set up a node for the background of the interviewee and sub-trees to indicate whether they were classified as an academic or a practitioner. I also split the ergonomics tree from figure 4.6 into two nodes to look at why people said they were doing ergonomics, to include their definitions of ergonomics and how their personal beliefs had influenced their career choices. The second node (practice, <3 1>) grouped themes around reflection in practice, whether they were seeing themselves as part of their research or trying to maintain an objective position rather than acknowledging their influence. The practical examples given for ergonomics (<3 2>), hospital ergonomics (<4>) and qualitative methodology (<6>) were roughly grouped to facilitate the next level of searching. An additional tree (<5>) enabled me to review how I had described my perspective on the qualitative-quantitative debate to the first sixteen interviewees over the eighteen month period.

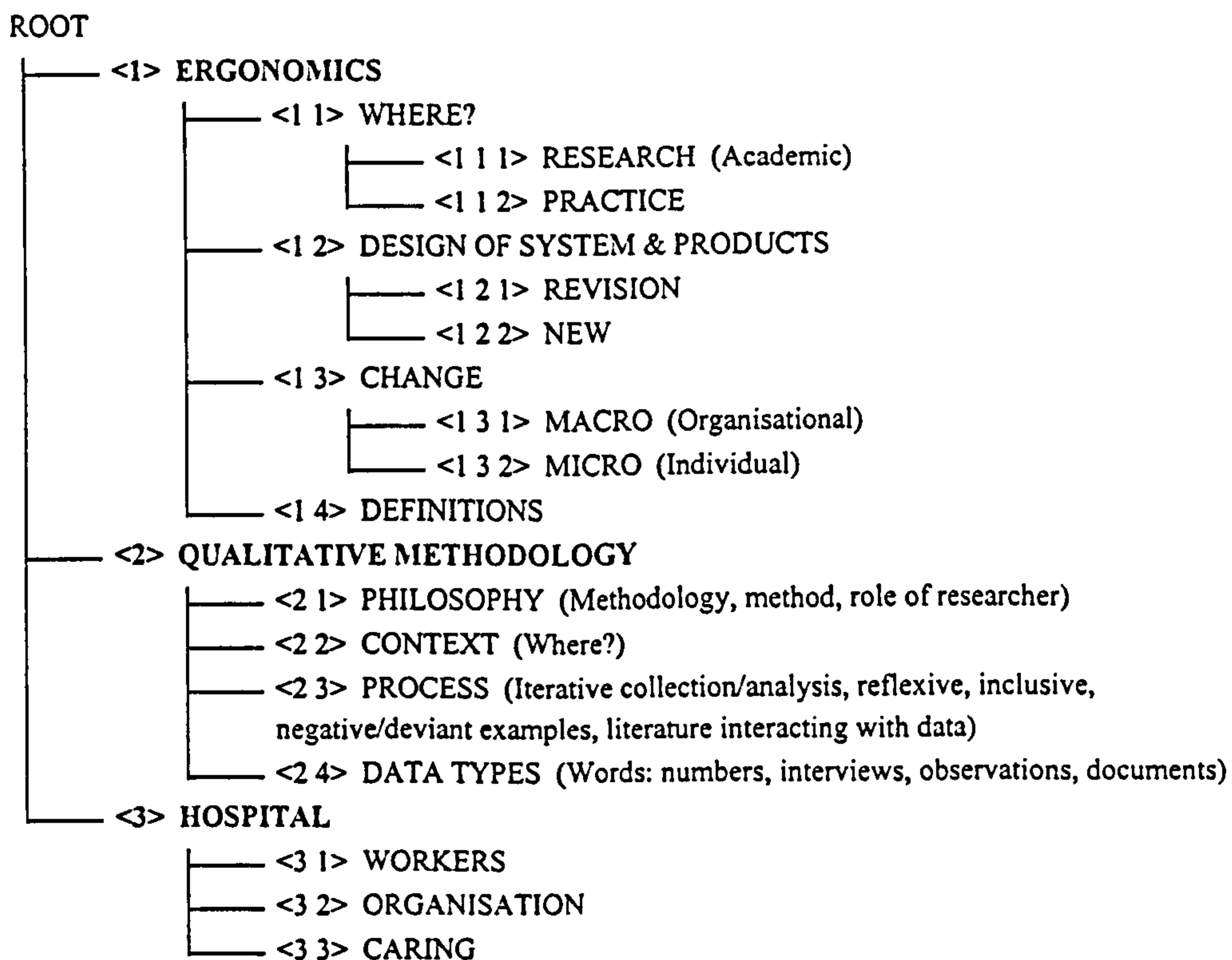
Figure 4.7 Third hierarchical tree (November 1999, from 16 interviews)



The next stage was to review this tree with my supervisor, John Wilson. This was done on two separate occasions, firstly in November 1999 to look at the data and codes relating to the questions on ergonomics (<2>, <3>) and secondly in April 2000 for the codes on qualitative methodology (<5>, <6>). This resulted in the final tree (figure 4.8) in May 2000.

At this stage my second positional paper was written for presentation at the IEA congress in August 2000 (Hignett, 2000a). This again raised questions about the philosophical position of ergonomics. It started to highlight the themes of 'where' ergonomics is practised (<1 1>) drawing attention to the strength of the multi-professional background but at the same time how this could be seen as a weakness within academia. Another theme was the definition of ergonomics, focussing on interactions with people. There were a number of papers presented at this congress which are used in the development of the following data display (figure 4.8) and also have been drawn together in section 3.7.

Figure 4.8 Final hierarchical tree (17 May 2000, all interviews)



4.6.2 Data display

The next stage is data display where I attempted to interpret the codes from the hierarchical tree into a representational model (figure 4.9). This has used the strengths, weaknesses, threats and opportunities (SWOT) framework from Marmaras (1999) as the internal and external environments.

Figure 4.9 The role of qualitative methodology in ergonomics

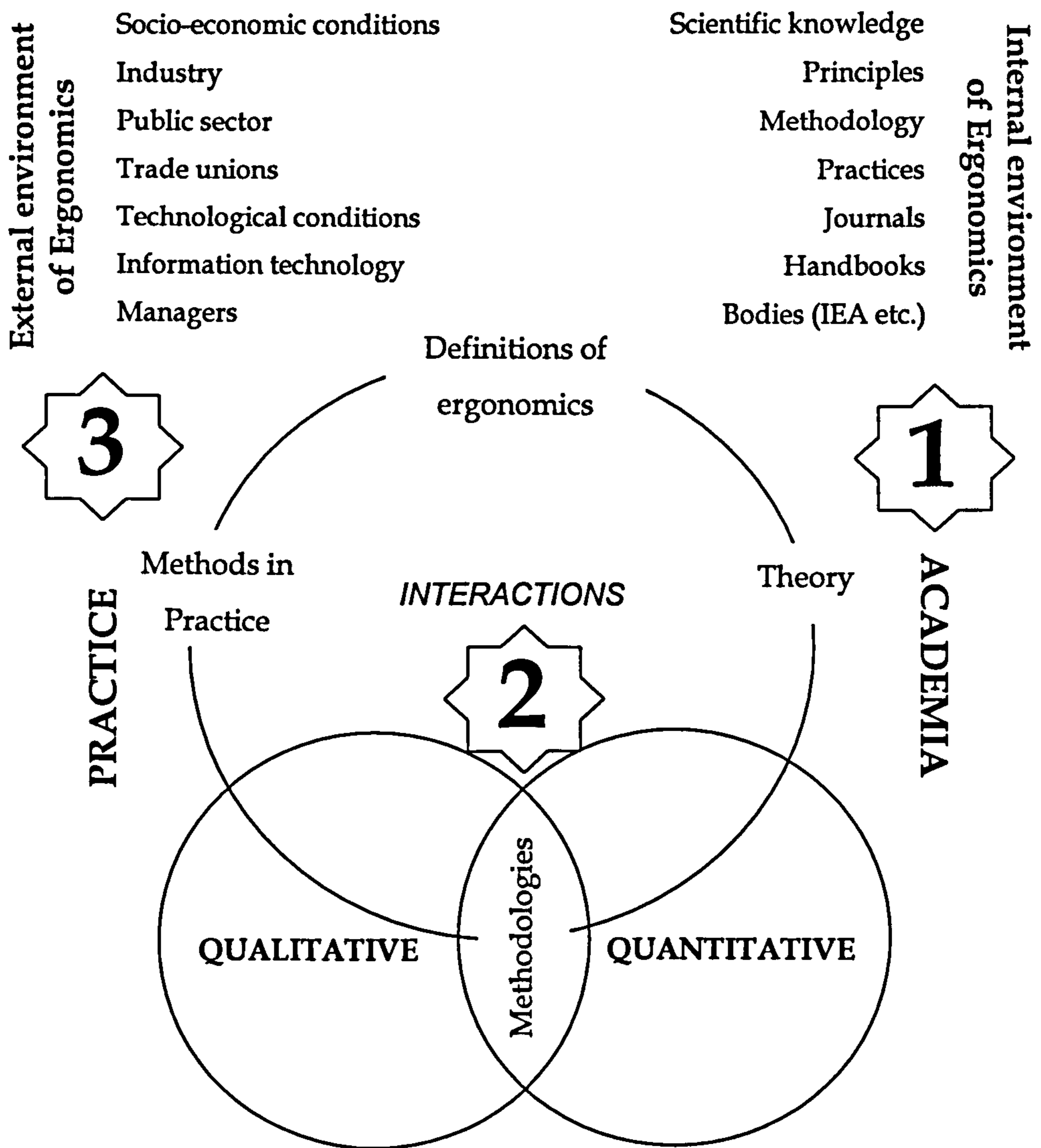


Table 4.4 brings together the themes from the seven questionnaires (table 4.2) with my original conceptual framework (figure 4.1) and the final hierarchical tree (figure 4.8) to check that all the areas have been addressed and there is a coherent flow. It results in three key areas: theory, methodologies and methods in practice as shown in table 4.4 and figure 4.9.

Table 4.4 Checklist Matrix

Themes	Theme in conceptual framework (Figure 4.1)	Coverage in final hierarchical tree (Figure 4.8)	Place in representational model (Figure 4.9)
What model of ergonomics do you use (a) for teaching, (b) in practice?	MACRO/MESO/MICRO PHILOSOPHY	Ergonomics Where? Research <1 1 1> Definitions. <1 4>	Theory Definitions of ergonomics Internal environment of ergonomics
Do you think ergonomics methods and methodologies explore why people do things, as well as who, what, when, where and how?	MACRO/MESO/MICRO PHILOSOPHY	Ergonomics Change. <1 3 1>, <1 3 2>	Theory Definitions of ergonomics
What is your impression of qualitative methodology, and how would you say it differs from quantitative methodology?	PHILOSOPHY	Qualitative Methodology Philosophy. <2 1> Context. <2 2> Process. <2 3> Data types. <2 4>	Methodologies Qualitative/Middle Ground/Quantitative
Can qualitative and quantitative methodology be combined or are the philosophical differences too great?	PHILOSOPHY	Qualitative Methodology Philosophy. <2 1>	Methodologies Qualitative/Middle Ground/Quantitative
What impact do you think that social factors have on ergonomics research and practice?	PHILOSOPHY METHOD	Ergonomics Where? Practice <1 1 2> Design. <1 2 1>, <1 2 2> Change. <1 3 1>, <1 3 2>	Methods in practice External environment of ergonomics

The next three sections will give details of each of the key areas, with examples from the data.

4.6.2.1 Theory

The theory behind both academic teaching and research, and professional practice has been placed within the internal environment of ergonomics.

As table 4.4 shows, this section draws mostly on the two questions from the questionnaire:

1. What model of ergonomics do you use: (a) for teaching; (b) in practice?
2. Do you think ergonomics methods and methodologies explore why people do thing, as well as who, what, when, where and how?

The responses to these linked to the initial conceptual framework (figure 4.1) with respect to the models (macro/meso/micro, figure 3.5, section 3.2) as well as the underlying philosophy of the discipline and the interviewee. The coding (figure 4.8) includes most of the ergonomics tree <1>, with three of the sub-trees separated out into the section on methods in practice (section 4.6.2.3) to look at the difference between internal (academic) and external (practice) environments.

By taking an inclusive position for the analysis, examples are given from a broad spectrum of viewpoints and presented in terms of the qualitative-quantitative continuum. I will start with the more traditional (quantitative position) or physical perspective of ergonomics, using a concentric rings model, for example:

'to describe what ergonomics is, I would show the old concentric rings, user in the middle, equipment, environment and I'd say whatever we do its about the relationship between the person and the function that they're doing, and it's about equating their physical capabilities with the requirements, with the physical requirements or psychological requirements or whatever, whatever they are. So there are two diagrams, concentric rings and a set of balance scales, with capability on one and requirement on the other, those would be the two key issues..' (Interviewee no. 19)

This was a view only expressed by a small minority of interviewees (academics and practitioners). Mostly they responded with a less traditional position, saying that there was a need to move on, to look at alternative methodologies and disciplines.

'I would say that the heart of ergonomics still lies at a physical level, and micro level, and at a kind of, with a scientific paradigm that says there's real data there to be collected and you turn it into solutions and you offer solutions, but then we've got all the other forces which are, not so much trying to dislodge it, but trying to live along side it..' (Interviewee no. 7)

It was suggested that focus of ergonomics has changed over the last 50 years, moving from a micro (associated with physical or individual perspective) to a macro, organisational or social perspective.

'we changed the agenda from physical, or adding the cognitive to the physical, adding the macro, the group, to the individual, and so on, so we've broadened out in these various ways, but that brings with it the need to change the strategy, the need to change the form of engagement, and even the concept of the nature of science you're engaging in..' (Interviewee no. 7)

A micro level intervention was perceived to be more controllable, with only one interface. The macro level intervention was used to describe design or change projects involving culture, organisational logic, systematic decision making and was seem to be more important but harder than the micro.

'..many of the issues now at the macro level are probably more important and yet least understood ..' (Interviewee no. 12)

The time frame for this change was fairly recent, possibly within the last 10 years.

'and I have to say that really over the last 5 years my, my own mental model has moved, it recognises the micro issues but is much more interested in some of these physical-life, mental-life, social-life, work-abilities issues and how there are a lot of factors that are going to influence that, but therein lies one of

the keys, that fact is you can, you can see ways of changing work ability, but it can't simply be done by addressing work or work organisation, or, or just the individual and their, their perceptions on life and what they do with their lives, and I think you've got to get the whole lot together, which is very much a broader agenda than I would've ever imagined ergonomists being interested in 5 years ago, or certainly 10 years ago' (Interviewee no. 12)

At this point the model of the person is important and the previous and following quotes give an indication of how this is changing to include social factors. The hexagon model of human interactions (figure 3.6) includes emotional and social aspects so perhaps would provide a better representation for the following description.

'it's about fitting the product to the person and that's not just about fitting it to them cognitively and physically but also aspirationally and emotionally and all sorts of things' (Interviewee no. 21)

As the extension of ergonomics continued so a reflective position can be identified where some interviewees suggested that their traditional positivist position might be limiting them.

'.. all that science seems to do is just muddle things very often because we have such limited information about what's really going on, and it's at such a micro level, that once that's fed into other people's belief structures, it can fuel a fire here and damp something there, but it doesn't really help, particularly, I think, as a philosophical debate level about whether or not these kind of things are what you want in your society. So for me presenting or collecting hard evidence is important but I don't expect that in its self to influence the change process more than a certain amount, so understanding what else is influencing people has to be part of ergonomics' (Interviewee no. 11)

This is perhaps mid-way across the qualitative-quantitative continuum, with the next steps moving more definitely towards the qualitative pole.

'I think you have to have the hard data, but then getting behind that and getting to peoples attitudes and beliefs, if you really want to facilitate change I think that has to be part of it, and that getting those attitudes and beliefs, is not necessarily a scientific process. I think that there are some approaches there which help, but I think that in many ways you're looking at something qualitative, and it's very, very powerful'
(Interviewee no. 11)

At the further position it is worth including quotes from the international interviewees, representing the francophone perspective. This takes the position previously classified as actor network (section 3.3.3.5) where the organisational theory supporting this viewpoint is very firmly from an interactionist ontology.

'what we are interested in is what we call the activity, which is the way he or she will use his or her body and mind, knowledge, personality to cope with the tasks. It's not just fulfilling the task but in a way its accomplishing the task, because it's more than what is physical..' (Interviewee no. 16)

'The target of the ergonomist is not the things but the people. So what we are aiming at is to change people's representations of work places, work situations, what happens in work places and so on. So the target of ergonomists is people's mind, people's way of addressing the problems, and so that means that we have to act, or interact with people every time ..., because the object of our work is not things but people.' (Interviewee no. 16)

This brief summary shows that there is still a considerable range of positions within ergonomics, but also evidence for the start of a paradigm shift, perhaps not to completely overhaul the personal model used in teaching and practice but to certainly extend their scope. The shift towards a more inclusive model of the person

perhaps gives the possibility for finding out why people do things, rather than just what, how and where.

Alongside the above questions were a range of definitions of ergonomics, including: multi-disciplinary; integrative discipline; helicopter view; cross-border view; social change; intersection; holistic; focus on interactions; and human/user centred. These incorporated the range of input disciplines, putting ergonomics in a central applied role.

'I think ergonomics is one of those, it's what I would describe as a mediating science ... standing at that intersection between a range of other disciplines and trying to sort of pull them together in way to produce, that will produce useful real world solutions. And in that sense I mean ergonomics, y'know, necessarily has both the sort of social dimensions and the engineering dimensions. I think what it probably misses, what is probably lacking ... at the moment .. is a breadth of social science dimensions.' (Interviewee no. 6)

Although this sounds an attractive position, giving a clear route for the future with closer collaboration with social science disciplines and the accompanying modifications in ergonomics education, there is a drawback in the UK at least.

'We have always recognised ergonomics having a sort of multi-professional, multi-disciplinary dimensions to it, which really by implication means it doesn't belong anywhere ... from the real world point of view, I think that's a tremendous strength, but in terms of how the subject is perceived in higher education, universities, it's a disaster' (Interviewee no. 12)

So the academic world, or internal environment, of ergonomics seems to be having difficulties. On one hand the educational framework in the UK does not seem to reward applied, integrated research in its current assessment system and on the other hand there is the recognition that there needs to be a broader scope for ergonomics, with more interventions and research being carried out at the meso and macro levels.

'for me if we don't turn out practitioners we're wasting our time.. and if you're not fixing things out there, or paying

attention to what happens out there, what are you doing?’

(Interviewee no. 8)

There is also a backlash from practitioners who feel that the academic-practice gap is growing, with practitioners needing to move forward and use methods (possibly without the supporting methodologies) which can address real world issues.

‘the only problem I have with academics at the moment is that obviously when you’re wanting to be, to follow the scientific method all the time, and wanting to measure things and quantify things, then it’s very tempting to stick to things that are very easy to quantify,... but it’s far more difficult to quantify things like what sort of form language will give the feeling of modernity, or what sort of colour use will give the feeling of status..’ (Interviewee no. 21)

However practitioners rely on academics to give them a set of procedures, or a methodological tool box from which to work so there needs to be a bridge for two-way communication between the practitioners and academics to fulfil both their needs. It would seem that the academic world is trying to extend its scientific knowledge and explore other methodologies but perhaps with a certain reticence. It may be that the practitioners and commissioners of ergonomics research will be the driving forces in this extension.

4.6.2.2 Methodologies

The two questions here both fell within the conceptual framework circle of philosophy.

- What is your impression of qualitative methodology, and how would you say it differs from quantitative methodology?
- Can qualitative and quantitative methodology be combined or are the philosophical differences too great?

The range of options put forward roughly fitted with the range previously discussed in chapter two, although the reasoning behind them was somewhat varied.

Although some interviewees had limited knowledge of the theory or practice of qualitative methodology, of those with experience in qualitative methodology none excluded using both qualitative and quantitative methodologies.

'I don't really think that these are two completely different worlds, they are different worldviews but they're not different worlds. And I really think that when you look at the qualitative aspects of research, and that's all the stuff that people find out when they're doing their quantitative studies anyway, that they don't write about but it helps them to understand the process that they just went through' (Interviewee no. 15)

This suggests that although there are different world views, qualitative aspects of research are already being done within quantitative studies, however the next quote takes this further to start to recognise the influence of the researcher's own position.

'if you're not very careful you run into a difficulty in the dispassionate scientists, whose gathering data, is supposed to make judgements just on the basis of data and the person who comes in with a value system who wants to improve things in certain ways. There's a potential problem of conflict there, there are other kinds of explanations, so that is trying to open up yourself to recognising that although you have certain values you mustn't assume that the world is ordered in the way that you have preconceptions about..' (Interviewee no. 7)

There were practical suggestions about how this could be done, though perhaps dwelling more on the operational than philosophical level of just borrowing methods.

'you have to look at the structure of the models in the two areas of ergonomics and anthropology say, and see what the structure of anthropology is and what the structure of ergonomics is and in fact do they connect, and in fact where they connect you might borrow some methods' (Interviewee no. 1)

Where interviewees felt that they had used qualitative methodology in ergonomics, they also felt that was not done systematically.

'what we've done with it, what I've done with it in the past is to try and draw out, with the group, y'know the sort of key

features and key issues and if you like identify where the, where the key, where the main mismatches are, or where the main matches are and so forth. But I've never done that in a systematic way' (Interviewee no. 12)

' it's kind of loose protocol analysis we do on it by and large, ... it's more that and talking amongst ourselves, and y'know having dialogues about what we're reading, what we're looking at, and what's where's this bloke coming from and drawing diagrams on the wall, and trying to catch it that way ... so it's fairly standard, I mean it's protocol analysis, but we approach it fairly relaxed, y'know in that we don't have definite phases. ... we do audit trails for our own back side protection' (Interviewee no. 8)

The following quote, from an academic, presented a problem in wanting their students to be more rigorous but then used terms like reliability and validity, rather than auditability, trustworthiness or transferability (table 2.8, section 2.3.3.1), suggesting a lack of familiarity with the process of qualitative research.

'I kid my research students who do this that it's all a bit wishy-washy, could they get down to earth, what's their actual aim, what is their methods, how are they interpreting their results, just because it's qualitative doesn't mean it hasn't got a rigorous questions of repeatability, validity, ..'
(Interviewee no. 10)

As always there are extreme views, and for quantitative research this includes trying to take ergonomics further towards the quantitative pole, into the laboratory.

'there are some things that are perfectly suitable to be researched in the laboratory ... some basic stuff which act as boundary conditions in terms of human characteristics...'
(Interviewee no. 5)

At the qualitative pole the following interviewee went to the opposite extreme.

'the way we see the world is not in numbers, the way we understand, the way we feel is not in numbers, so there's a

sense to getting inside people and find out what they think about it, and certainly if you want to practice user-centred design you've no alternative but to go through the qualitative route' (Interviewee no. 8)

This leaves us with a middle ground.

'I can't imagine using qualitative methods to assess the environment, but I definitely need qualitative methods to deal with any of the people I'm engaging with ' (Interviewee no. 7)

4.6.2.3 Methods in Practice

I think that the external environment for ergonomics is mostly driven by the practitioners and research funding bodies (including industry). They have the most interactions with the clients in the range of public and private sector industries. Inclusivity was identified as a key issue for ergonomics practice. For this reason the question about social factors yielded quite a lot of data that were coded in the trees for design (<1 2>) and change (<1 3>).

To include all users, design was said to be aimed at the lowest common denominator or safety critical parameters; participatory ergonomics was described as *'giving people a voice'* or *'creating/enlarging'* a space to facilitate participation and representation of stakeholders. The professional practitioner was seen as a change agent, facilitator, or project manager with a key role in influencing decision makers to achieve change, but not always as the expert. There was a feeling of negotiation and compromise in trying to have an impact during an intervention.

There was a certain amount of negativism with the practitioners seeming to defend their practice, and saying that there couldn't always be the perceived scientific rigour that they felt they had been taught to strive for.

'you're not trying to prove general points, you're not trying to create or establish theory that can be applied over many things, you're just trying to say 'well given this choice I've gotta make right now'..' (Interviewee no. 21)

The level of realism was notable: ergonomics in practice is evidently driven by different standards to academic ergonomics. There was a focus on achieving an impact by targeting the appropriate decision-maker.

'I always think that ergonomics is not achieving it's aim unless it's, it's finally reaching the person who makes the decisions ... if you're not influencing that decision then I don't think, however thorough or scientifically proven your methods are, ... if it doesn't get acted on, or doesn't get acted on in the way that you think, then we've failed I think... our aim is to influence decisions, design decisions, or safety decisions or whatever..' (Interviewee no. 18)

'.. feed information about the reality of work and associated costs into the decision making processes, but this is based on both technical process, which is to gain information about the situation, making analyses and so on, it's also a social process of gaining the group of people to discuss this one. For example we don't want to make ergonomic intervention with too low executive management.' (Interviewee no. 16)

This pragmatism also introduced the notion that it was difficult or impossible to achieve repeatability in practice so applying the quantitative gold standards were counterproductive.

'I think every ergonomist has his or her own style ... and we have different values, we have different fears, ... you wouldn't do anything if you didn't involve your personality ... that's a very well known topic from ethnography ... that you have to calibrate that tool and that tool is themselves and it's a point which is very seldom discussed by the ergonomist. So you should not be surprised that two different ergonomists will have different results because they are practitioners; and two different ethnographers, they will have different discussions of their [findings]... both are equally valid and you can only understand the difference if you try to

understand different styles and people and so on, but there may not be one good way of doing ergonomics, but there might be different ways of doing things, and it's not a problem because it's practice.' (Interviewee no. 16)

This French description of applied ergonomics again fits with the actor network model, where their representations of the situation, or interactive practices, defined the problem. The ergonomist was involved where there was a difference in representations and worked to create a common understanding of that difference within the social context:

'The idea is, the actors in the company, they had their own views about the problem, and if their views were relevant they would have solved the problem without us. ... so it's a change, what we call a change in representations .. and that makes possible new negotiations because they are negotiating with a common representation of the situation.' (Interviewee no. 16)

There were also interesting comments about reflective practice, or humility, in which the practitioners had learned not to see themselves as the expert but as a change agent or facilitator.

'I've learned over the years that I have to check out the assumptions behind the theories and the models that I have and how they fit different circumstances.' (Interviewee no. 7)

'All I can do is put before them the evidence that there are other things that are possible ... make sure people who don't have a voice normally do have a voice... but in the end it isn't my job to say 'you should do this' I think I'm an expert at understanding who's involved in a change process.. and in helping to understand their starting position .' (Interviewee no. 7)

'you are working with them [stakeholders] for two reasons, one is that they've got a stake, they care, it matters to them,

and they've probably got some power base, positive or negative if they're for it they'll be able to push it along, or they're against it they'll be able to block it in various ways, so there's a set of issues about that, the politics of the situation. The other is, they have knowledge, they actually understand things that you don't understand about it and we need to get their knowledge into the picture as well as everything else..'
(Interviewee no. 7)

Some practitioners had already started expanding their scope to include qualitative methodologies. It was felt that ergonomists, on the whole, had limited knowledge about qualitative methodology but could borrow from anthropology and sociology when the need arose. This had been tried in a product design context and difficulties identified with the experience of anthropologists/sociologists:

'so at the moment y'know you're stuck with one thing or the other, you've gotta either go for somebody who's got a thorough ergonomics background including an appreciation of design issues, or you've got to settle for going for somebody who's got a, the sort of methodological background that we want, but doesn't necessarily have the design knowledge'
(Interviewee no. 21)

This lack of appropriate knowledge and experience is an issue which should be addressed by the academics. Qualitative methodologies are being used but not with rigour, perhaps more as a 'try it and see' method, or as an art of ergonomics.

' I feel that as an applied jobbing ergonomist, it much more about try it and see. The reality is, it's taking everything that you've kind of absorbed through your training and any experience you've had and it bothers me slightly that I feel it's very intuitive. But only intuitive in that it's a way that you've learnt to think. I don't know that it comes naturally, it's not something that you know. I think you do learn to be an ergonomist..' (Interviewee no. 20)

This may be alluding to the tacit knowledge which accumulated through practice in contrast to the formal knowledge acquired from a taught course. The IEA (2000:36)

listed as one the strategies the wish to 'continue to promote a broad view of ergonomics and its aims' as well as maintaining the 'IEA Core Competencies for Practitioners in Ergonomics' (Core Competencies, 1999). The findings of this study suggest that ergonomics may yet be falling short of its strategic goal and needs to have a more explicit model of practice, supported by practitioners to reflect the external as well as the internal environments.

4.6.3 Conclusion drawing

Figure 4.9 aims to put together the data in a representational model to show the linkage between the internal environment, which generates the theory and leads the way in defining an ontology and epistemology for ergonomics, and the external environment, which is the applied face of ergonomics.

There seems to be an overwhelming view that ergonomics must expand to include social factors in order to address 'why' people do things. This is expressed in different ways by the academics and the practitioners, and even by non-ergonomists as follows.

'ergonomists can no doubt research a million things which don't necessarily have social implications, but when you do applied work you can't ring fence it in that way' (Interviewee no. 2)

In drawing this conclusion I now needed to return to my data to ensure that I had included the negative cases, by checking that my description was inclusive and so representative of all the views. By referring to the continuum with respect to both ergonomics practice and qualitative methodology I am confident that this has been achieved. However although I am sure that all the viewpoints of the interviewees are included I feel that the study has perhaps not reached saturation with respect to the use of qualitative methodology in ergonomics. If time and resources had permitted I would have liked to have extended my interviews to include more international interviewees, in particular to look at the range of viewpoints within the European and North American Ergonomics community and the francophone community.

4.7 Discussion and conclusion

4.7.1 Operational Issues

I hope that using a qualitative approach has enabled me to maintain a reflexive position with respect to both the research questions and the data. Although I had my own viewpoint, as a practitioner, both prior to the study and changing throughout the study, I have tried to represent this truthfully by giving details about the progressive coding from the conceptual framework, through hierarchical trees, checklist matrix and the final representative model. The analytical induction strengthened the development of the data interpretation by searching for the negative cases both in the data collection, which included seeking out interviewees who were unlikely to share my viewpoint, and also in the analysis, by reviewing the categories until an acceptable representation was produced. By coding my questions (figure 4.7, <1 5>) I was able to check whether I had changed my focus. Other than gaining a broader vocabulary with respect to qualitative methodologies and the philosophy of social science my viewpoint seems to have basically remained unchanged, just developing a clearer focus during the course of the case study.

Dingwall (1997:62) recommends that a clear distinction should be made between the data and the analysis. In N₄ this is achieved with separate document and index systems.

I hope that I have tried to deal even-handedly with the people being studied. This chapter has been read and commented on by four of the interviewees (two practitioners and two academics). One interviewee (no. 17) commented that they felt represented in the interpretation, and that there was a lot of complex information presented in a balanced accessible structure in the chapter.

4.7.2 Qualitative methodology in ergonomics

This section of the discussion will draw on appropriate literature from chapter three.

There is more than one way to define and describe ergonomics. Each academic and practitioner was able to elaborate on the models (section 3.2) although there was a general agreement about the evolution through the triangular models of the 1960s onwards. The levels model (figure 3.5) was generally well received but as the

interactions model (figure 3.6), proposed to include the philosophical, social and emotional aspects, was created after the data collection for the study was complete there has been no opportunity to test it with ergonomists. This will need to be part of a future paper submission to an ergonomics journal.

When considering a new paradigm for ergonomics I was unable to find any examples of the use of qualitative methodologies in the life sciences. In light of the current study this is not surprising as most interviewees referred to qualitative methodology in the context of macro or organisational projects. The life sciences tend to explore the boundaries of human characteristics and are perhaps better suited to quantitative methodology. Nevertheless, the transferability of these data into practice is still questionable.

The dichotomy between product and engineering design seemed similar to the academic/practice divide, with practitioners having to respond to the situation as it happened using experience and intuition. The interviewed ergonomists who worked in the area of product design (academics and practitioners) had an explicit need for alternative methodologies and felt particularly strongly that current education was not producing ergonomists with the skills to meet these needs. One academic suggested that the link between academia and practice wasn't very good.

'we know very little about what ergonomists do. We know a lot about what they learn but we don't know what they do..'
(Interviewee no. 16)

I feel that this relationship between research and practice needs further exploration. Some interviewees described it as a bridge whereas others called it a gap. The perspective of one academic was that research was essential to practice.

'I don't believe that you can be a good practitioner unless you do research' (Interviewee no. 3)

However one practitioner had a contrasting viewpoint with respect to laboratory research: this was perhaps aimed at the internal academic environment.

'I don't think there's any value,in laboratory work unless it's based on whatever you've found in real life. It's got to be real-life based' (Interviewee no. 17)

Hancock (2000) suggested that ergonomics needed to move away from a linear view of time (response, cause/effect) towards a cyclical view looking at the relationship between perception and action. He identified two factors, firstly the link between perception and action, which he called 'how' we explore the world. Secondly, and more particularly relevant to my thesis, the gap between perception and action. He called this 'why' we explore the world. He suggested that ergonomics directs the gap by mediating the link. I suggest a slightly different slant on this, that ergonomics should explore the gap before mediating the link. I think ergonomics needs to take an inclusive viewpoint, but I am not sure whether this means changing the terminology as suggested below.

'we are 50 years odd old now, may be it's time to stop saying, we were multi-disciplinary, we came out of multi-disciplinary, our strength came from the different perspectives and beliefs, and value judgements and methods and approaches and theories, have we now got any core we can call our own..' (Interviewee no. 3)

This may work in an academic context, particularly in light of the research assessment exercise (UK) but may not represent what actually happens in practice.

'we talk about ergonomists being able to take this kind of multi-disciplinary role but when it comes to it in real terms we all get segregated again to our own bit, so you've got your physical ergonomics, your cognitive ergonomics, your organisational ergonomics..' (Interviewee no. 4)

Schön (1983:147) has described the gap between research and practice in terms of the focus, with academics seeking to understand things and practitioners seeking to change things. This reflects the differences in 'the kinds of knowledge honoured in academia and the kinds of competence valued in professional practice'.

A middle ground position (section 2.5) seems to be appropriate for ergonomics. Hakim (1987:172) suggested that the 'benefits of mixing methods, in an appropriate context, can lead to an eclectic and catholic use of any and all research designs that may prove helpful in answering the questions'. However, as identified by the interviewees, there needs to be a theoretical framework based on sound strategies and a rationale for the philosophical perspective.

Other researchers and practitioners have discussed 'mixing methods' (Patton, 1990; Brannan, 1992). More recently Silverman (2000:xiii) has suggested that many of the apparent differences between qualitative and quantitative research should disappear. He went on to say that qualitative-quantitative dichotomies are highly dangerous, 'at best, they are pedagogic devices for students to obtain a first grip on a difficult field ... at worst, they are excuses for not thinking, which assemble groups of sociologists [or other disciplines] into 'armed camps' unwilling to learn from one another.' One of the interviewees had a similar viewpoint.

'I don't think there ought to be a battle about qualitative versus quantitative, I think it's a question of what's appropriate for what, and how do they work together'
(Interviewee no. 2)

Wilson (2000b) has suggested that ergonomics should be regarded as 'one of the first truly multi-, inter-, and cross-disciplinary subjects that the world requires if we are to understand and improve the lives of peoples and societies going into the 21st century'. However, before ergonomics can aspire to this status, I think the relationship between academia and practice needs to be improved or, in terms of figure 3.6, strengthening the circle connecting theory and methods in practice via definitions and methodologies for ergonomics. The feedback for this chapter has reinforced my view that there is a difference between academics and practitioners in the perceptions of, and definitions used for, ergonomics. This seemed to relate to the internal and external environments of ergonomics. Interestingly the academics saw themselves as bridging this gap, even suggesting that the Research Assessment Exercise (RAE) was an external pressure, rather than one that is generated within the academic arena.

In contrast the practitioners were more comfortable with the identification of a gap as reflecting their views. As I am a practitioner it is possible that this difference in reception of my interpretation of the findings is as much due to my personal bias and overlay, but possibly also to a difference in approach, with academics being more on the quantitative (exclusionist) side of the qualitative-quantitative continuum and practitioners more on the qualitative (inclusionist).

As the academic discipline controls the internal environment of ergonomics research and education I think their central role should be overtly supporting professional

practice. Perhaps ergonomics needs to be seen more as a vocational training course with more emphasis on practical models and external industrial placements. Both academics took issue with this interpretation, suggesting that there already was provision in syllabi and that 'much of research and practice can be conjoint'. This suggests that the theory behind the methodologies being used in ergonomics research (mostly quantitative) is also appropriate in practice. I suggest that the findings from this case study do not support this, and that practitioners are finding that they need to extend their scope of practice to include alternative world views, in particular social factors, which need supporting by qualitative methodologies.

Chapter Five

Case Study of Ergonomists:

(2) Identification of the characteristics of hospital ergonomics

*This is where people are born and die,
where suffering and pain of all sorts - physical and psychic,
moral and spiritual - are concentrated;
where anxiety, sadness, anguish, bewilderment, anger and
fear are pervasive, where care and caring abide.
Comfort, hope, trust and faith exist too, and healing, recovery
and even cure occur.*

*Hospitals are also places where every form of human
aloneness, woundedness, disorientation and misery is
assembled and laid bare along with the ravages of human
violence.*

*In the hospital the comedy and tragedy of human existence,
it's nobility and it's ignominy, lie close to the surface, are
juxtaposed and intermingle.*

*A microcosm like this teems with the basic religious problems
of meaning, order, direction, identity, relatedness, good and
evil, justice and mercy, that our lives and our deaths
represent and contain.*

(Fox 1989:151).

5.0 Introduction

Chapter five is the exploration of hospital ergonomics, and its themes, required by the third and fourth areas of the case study with ergonomists.

3. The role and application of qualitative methodologies in [hospital] ergonomics.
4. The characteristics of the health care industry and how these affect the practice of ergonomics in hospitals.

Twenty-one interviews were carried out with relevant academics and practitioners from a range of backgrounds. The data were collected and analysed as described in chapter four. Only seventeen of the interviewees had experience of the health care industry (academic or practical), some having been National Health Service (NHS) employees (as ergonomists or in other professions), others had worked on specific projects as consultant ergonomists, and yet others just had experience of hospitals as users of the service.

5.1 Literature review

In the main introduction I indicated that chapters five and six would be written in a different style to the chapters in part one. The aim of this is to show an alternative style of writing in qualitative research. The literature reviews are embedded throughout the findings and discussion to give a more interactive analysis (Wolcott, 1992:17) and facilitate the testing of the data against the literature (inductive analysis). A comparison of the different styles of parts one and two will be discussed in chapter seven.

A second literature review was carried out to look at ergonomics in the health care industry. Ten years of publications from six sources were hand searched: Applied Ergonomics; Ergonomics; Human Factors and the proceedings from the conferences of The Ergonomics Society (UK); The Human Factors and Ergonomics Society (USA); and the International Ergonomics Association Congress. The purpose of this search was to develop a background about research and practice in hospital ergonomics against which the findings of this case study could be discussed.

The search looked at the number of papers about hospital ergonomics. It excluded papers which looked at the patient interface without any reference to the

worker/carer, for example papers about legibility of labels on tablet bottles were omitted. 341 (3%) papers were found from a total of 10,504.

These 341 papers were then further analysed to look at the:

- **Affiliation of the authors** - was the research done in a university or health care setting? Most of the authors were affiliated to universities (61%). Hospital-affiliated (author-led or collaborative) research accounted for only 16% of the papers although the research may have been carried in a health care setting. Other affiliations included private consultancies and unions.
- **Staff group studied.** The highest proportion of research papers were about nursing staff (35%). Although medical staff account for only about 10% of the personnel, they had a higher proportional representation with 22% of the papers (table 5.1). Comparing doctors and nurses (the 'others' group for both staff numbers and papers were not included in the comparison) revealed that nurses accounted for 5 out of every six staff members but only 3 out of every five papers. In contrast the doctors represented only 1 in every six staff but accounted for 2 out of 5 papers.

Table 5.1 Research on Hospital Ergonomics

Staff groups	Approximate staff percentage	Percentage of papers
Doctors	10%	22%
Nurses	50%	35%
Others	40%	43%

- **Methodologies used.** Only 15% of the papers (39 out of the 255 giving details about methodologies) indicated that they had analysed their data qualitatively. Of these, 11 either used a named approach (Naturalistic Decision Making, grounded theory, content analysis) or a named qualitative data management tool, NUD*IST (Non-Numerical Unstructured Data Indexing Searching and Theorising), Textbase Alpha, KWALITAN (Knibbe and Friele, 1996), MacSHAPA (Sanderson, 1995). In contrast 216 papers analysed their data quantitatively, with over 50% of these (110) using descriptive methods rather than statistical tests. These papers would be classified in figure 2.1 in the centre of the diagram, away from the polar positions of both qualitative and quantitative methodology.

- **Area of research question.** A large number of papers were about musculoskeletal problems (36%) followed by product design or evaluation (28%). There was a small, but growing, area of publications on human error (8%) looking at anaesthetic and surgical error.

These findings are considered as part of the discussion about hospital ergonomics in section 5.6.

5.2 Conceptual Framework

Unlike the previous chapter this part of the case study does not have a well structured conceptual framework. As I mentioned in the introduction, I have over 18 years of experience in the health care industry but relatively little experience in other industries. The characteristics I expected to be identified included the high proportion of female workers, with related gender issues, and the physical and mental issues relating to the handling of people's bodies.

The development of the themes during the data collection and analysis are shown in the hierarchical trees in chapter four. It can be seen that there was very little change in the questions during the iterative development of the questionnaire proforma (appendix three).

5.3 Aims

1. To try and identify the characteristics of the health care industry with respect to the organisational and cultural factors.
2. To discuss these characteristics in the context of the literature and data from the ergonomists case study.
3. To explore how these characteristics might impact on the practice of ergonomics in hospitals.

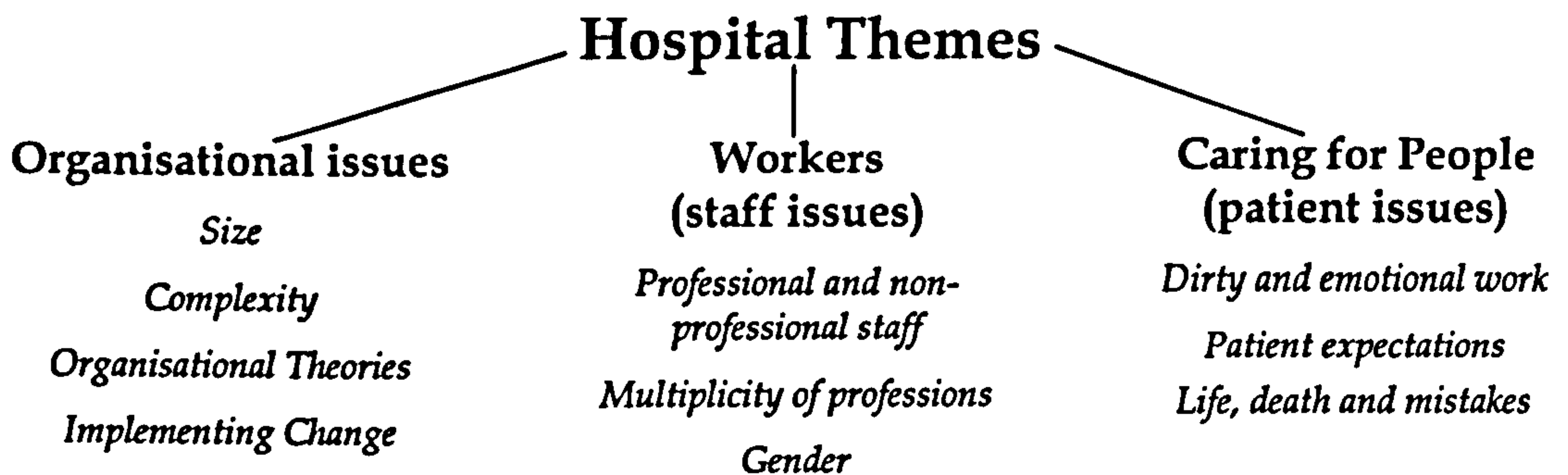
5.4 Method

As this is the second part of the ergonomists case study, using the same data, the methodology and method are described in chapter four.

5.5 Analysis and Findings

The final hierarchical tree (figure 4.8) resulted in three sub-trees for data about hospital ergonomics as shown in figure 5.1.

Figure 5.1 Hospital Themes



These three trees will be discussed in the following sections to look at three levels of characteristics of hospitals:

1. Organisational issues: size; complexity.
2. Staff issues: professional groups; gender.
3. Patient issues: dirty and emotional work; expectations; life, death and mistakes.

The three steps of data reduction, data display and conclusion drawing are all present but in a slightly different presentation to chapter four. Data reduction was shown for the raw data in chapter four (section 4.6.1). The data display again uses a checklist matrix (table 5.2) to link the exploratory areas with (a) the questions used for this part of the interview (appendix three), (b) the final hierarchical tree (figure 4.8) and (c) the sub-sections in the analysis and findings. These sub-sections are used for the conclusion drawing and verification by testing the findings against the literature review which is embedded in the following analysis.

Table 5.1 Checklist Matrix

Exploratory Area(s)	Themes from questionnaires	Final Hierarchical Tree
<ul style="list-style-type: none"> To explore the role and application of qualitative research in [hospital] ergonomics. 	Examples of research on hospital workers and practical applications of hospital ergonomics	Organisation Workers Caring for people
<ul style="list-style-type: none"> To explore whether hospital workers differ from workers in other industries, and why? 	How do hospital workers differ from other industries?	Workers Caring for people
<ul style="list-style-type: none"> To explore the role and application of qualitative research in [hospital] ergonomics. To explore whether hospital workers differ from workers in other industries, and why 	Is hospital research different from research in other industries?	Organisation Workers Caring for people
<ul style="list-style-type: none"> To explore whether hospital workers differ from workers in other industries, and why 	What do you think are the characteristics of hospitals?	Organisation Workers

5.5.1 Organisational issues

In this sub-section I felt there were two main themes: the size and the complexity of the hospital organisation.

5.5.1.1 Size

The NHS is the biggest civilian employer in Europe and the largest employer for women. The health care sector accounts for 5% of the UK workforce, employing 1.5 million people in 1990 of which 1 million were NHS staff (Dargie, 1999:10; Ranade, 1997:34; Perry, 1996:2). 78% of these workers were female, and the largest group were nurses accounting for 50% of the total workforce. The NHS is therefore a key player in the labour market, particularly for female labour. In addition to the directly employed staff many thousands in the private sector are dependent on the NHS. This includes the 50,000 self-employed practitioners in the family health services (general practitioners, dentists, high street pharmacists, ophthalmic services, etc.) who work under contract.

The big modern hospital was described by the interviewees as a town or a microcosm of society with many different activities, social and religious groups, and interactions. The complexity was considered to be one of the characteristics of the health care industry.

'these big modern hospitals, it's like a town, it's like you're going to a new town' (Interviewee no. 9)

'I just think the complexity of it, and the fact that, there's all these, it's just like a microcosm of society, and it's so complex that I think makes it quite special and the way you operate within it. There are ways to get things done, and there are ways not to get things done, and y'know, it actually does help if you know, if you've been brought up in it...' (Interviewee no. 14)

A hospital can range from a very large complex, teaching organisation with over 1500 beds to a very small general practitioner (GP)-led community hospital with less than 10 beds. For both there will be a mix of staff to provide all the services. Some of the staff will be permanently employed and others will be external consultants/contractors. Green and Thorogood (1998:127) described hospitals as large, powerful institutions with a complex division of labour, a heterogeneous mix of professional and non-professional staff who may only share the most abstracted aims, such as that of improving the health of their patients.

From a physical perspective there has traditionally been some commonality between different hospitals, whether in the layout or the signage. This changed with the introduction of autonomous Trusts in the 1990's but now, as part of the NHS Plan (2000), a national identity is re-emerging.

Summary characteristics from this sub-tree

- The NHS is the biggest civilian employer in Europe.
- 78% of the work force are female.
- There is a complex division of labour including professional and non-professional staff.

5.5.1.2 Complexity

The complexity sub-tree has two levels to identify characteristics of hospitals relating to:

1. The description of the hospital in terms of organisational theories.
2. Implementing changes at local hospital and national levels and how this affects ergonomics projects.

5.5.1.2.1 *Describing the hospital in terms of organisational theories*

It will be seen in the following discussion that many writers are still describing hospital organisations in terms of a hierarchy, using the classical model, and indeed arguing for a change by saying that Fordism and Taylorism is inappropriate for nursing. The difficulty of subjecting 'human' services in the public sector to a Fordist model was a criticism of Fordism in the 1970s. It was difficult to increase productivity and control costs because of the labour-intensive and professionalised nature of industries like health and education (Ackroyd and Bolton, 1999:372).

Porter (1999:109) made a similar comment about Tayloristic management with respect to the patient, saying that 'if the patient, as consumer, is the centre with individualised packages of care, then Tayloristic management is inappropriate'. She also looked at Fordism and Taylorism from the view of the professional nurse practitioner in terms of a progression to a post-Fordist model where power and autonomy of the nurse would be increased in their individual practice. This shows the increasing clinical responsibilities that clinical nurse practitioners are starting to have in taking on some of the roles of medical staff and thus decreasing the doctors previous authoritarian position of dictating rigid rules and conditions for clinical case management.

'..whether it's hospitals, nursing homes or home health care, any segment of it, it's much more like an assembly line now than it's ever been and, the organisation of work is becoming, in some cases, more simplified, to take into account the Henry Ford model of assembly' (Interviewee no. 15)

To decide which organisational models best described hospitals some authors (Morgan et al, 1985:143; Fox, 1989:145) looked at the line management structure of nursing staff. They found at least three lines of hierarchy, hospital administrators

(bureaucratic), nursing or professional management and clinical (traditionally medically-led) management. This was identified in the case study:

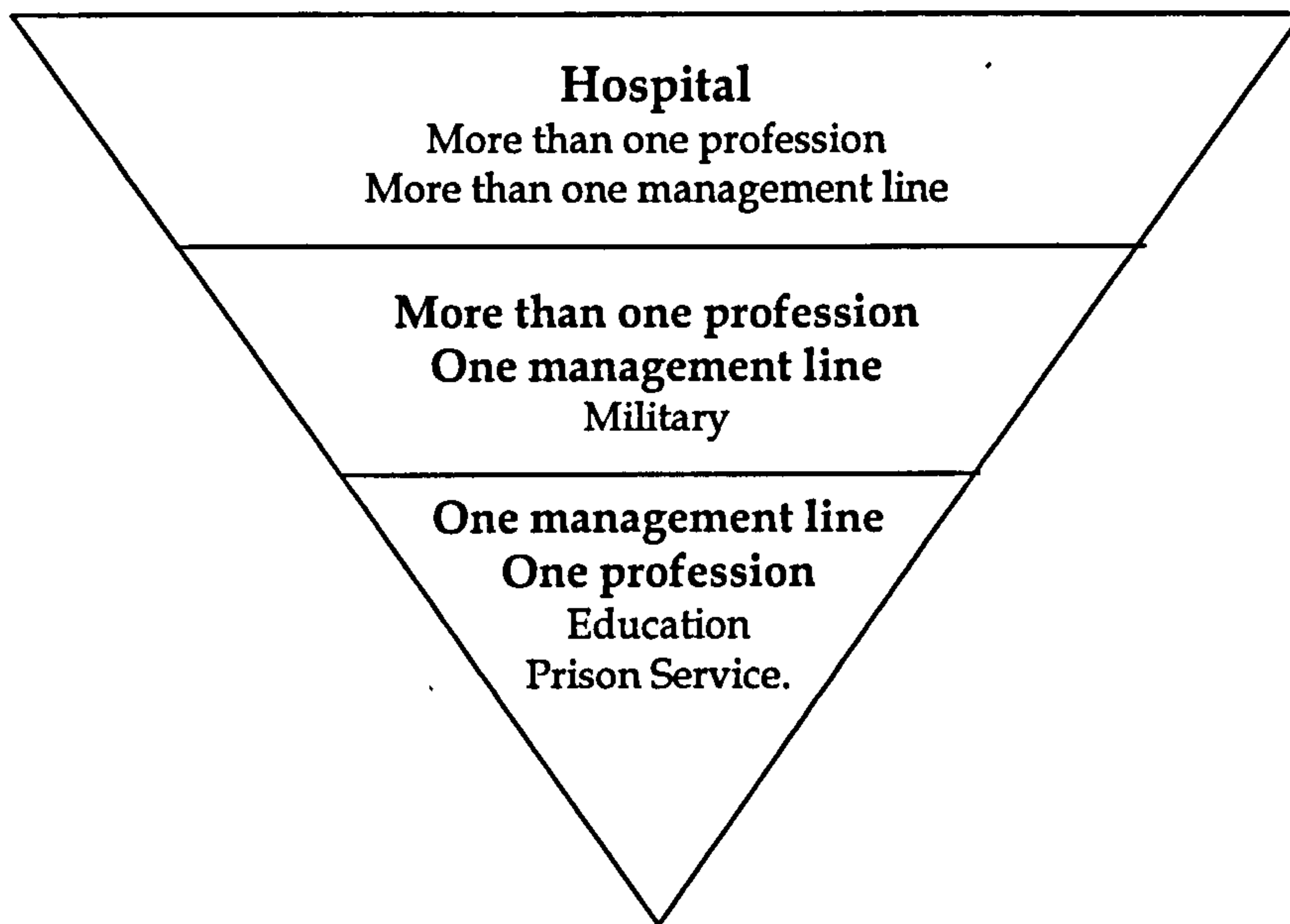
'and it's about trying to work out who to speak to and who to empower and y'know, like work. I mean the amount of time I've spent looking at organisational trees trying to work out who I need to speak to next ' (Interviewee no. 19)

These parallel lines of professional authority (Fox, 1989:145) added to the number of hierarchies within the hospital and also to the complexity of the organisation. Each of the professional groups in the hospital had its own department, with different levels and styles. This all adds to the complexity of managing an ergonomic or change project.

Figure 5.2 shows my representation of this organisational complexity, with a hierarchy to show the effect of more than one managerial line and professional group. This contrasts with two other layers, starting with one management line and one profession which might describe the structure in education and perhaps the prison service. At a second level the military could be used as an example of a multi-professional organisational but with one clear managerial line. So I am suggesting that a hospital is not only multi-professional but has the additional problem of at least three managerial lines. There will be a clinical line for the management of the patient, a professional line (e.g. for medical staff) and an administrative line for each service area (e.g. surgery).

The three-way hierarchy adds to the complexity with respect to accountability, authority and power. Quantitative measures of performance are applied at the level of units of provision, or 'cost centres' (directorates). This means that meeting the clinical targets may not be the responsibility of individual nurses. NHS managers may not directly control the work of nurses through performance. But they probably control the supply of other things, for example: (1) the context in which the nurses carry out their work and exercise their professional autonomy; and (2) the number of patients and therefore the amount of time (staff-patient staffing ratio).

Figure 5.2 Complexity of Health Service Organisation



So management will probably be setting the key parameters within which the nurses have to work. This has the potential to create an interesting situation with respect to the power relationships between the hierarchies.

'..there are three sources of power from the management which is of course connected to the health authorities, and you have of course the doctors, and then you have the nursing staff which is also a source of power and you cannot do anything if you can't make agreement with all these three...'

(Interviewee no. 16)

Quality management is an alternative way that has been used to look at the organisational structure. Ranade (1997:157) discussed the difficulties in transposing a model of total quality management (TQM) developed to meet the needs of private sector manufacturing industry to a public sector welfare service like the NHS. For example, in the manufacturing industry TQM was primarily designed to reduce variation in products and eliminate waste. In health care it may be more important to increase the variation in services to meet the needs and demands of individual patients. This may include services to act as an advocate for patients (e.g. midwives and birthing plans (Witz, 1994) or empowering patients (Pfeffer and Coote, 1991)). Morgan and Murgatroyd (1994) argued that the main focus of TQM development in health care, both in Britain and North America, was for patient audits and patient

satisfaction followed by the development of service standards rather than on improving systems.

'I think is sort of half accurate and half just cynicism, then it seems to me that people came along and said 'oh no, that's all very slack and sloppy, and we ought to do this along a sort of proper industrial lines, and have real quality control y'know imprinted on all lot' ... and all the machinery of sort of quality management was put in place which was so demotivating, so alienating, and so deskilling to the people who did have professional values that they either gave up their professional values or gave up their profession, or just basically raised two fingers to the whole thing.' (Interviewee no. 9)

So can other organisational models be applied to hospitals? Two of the interviewees tried to describe hospital organisations using systems theory, in an analogy for a manufacturing system, but described this as trying *'to impose logic on an unco-ordinated reality'*. There seems to be some evidence of the use of the human relations model and even of the systems model in describing the hospital as an open system (Van Cott, 1994:55). This was used, with difficulty, to encapsulate openness of hospitals for public access and accountability. The product flow, or patient pathway, can be described and has been used as one method of costing treatment (diagnostic related groups, Tudor Hart, 1994:82). However I found that to then try and overlay the bureaucratic-professional, professional-professional, and patient interactions introduced too many pathways or layers for a diagrammatic representation.

'..we talk about organisations as open systems but there are degrees of openness, you know it's too broad a term and a hospital is, I felt, was open like a railway station platform is open' (Interviewee no. 2)

The recurring themes of the complexity and interface with the patient seem to be fundamental in how health care differs from other industries. Hosking and Haggard (1999:83) suggested that the aims of a bank or theatre (open systems) were relatively easy to define in contrast to the complex aims of a hospital and health service. They linked the complexity to the constant re-evaluation of the organisation in political, medical and social contexts.

'you start to try and draw your person, equipment interaction and always there's another person in the picture as well, so it's actually a people-people interactions are, are quite a big focus ' (Interviewee no. 11)

Van Cott (1994:55) called this difference 'people-centred and people-driven' in contrast to other industries which are technology-centred where the human role is to monitor the equipment or supervise small numbers of other staff. This relates to the core business of the hospital providing the public service of health care (to include both public and private sector organisations).

'the product that the hospital has, as a business, is caring for patients, and caring for patients isn't seen as a 'product'. So whereas, whereas in industry or in commerce you're producing something which you're selling or a service that you're providing..' (Interviewee no. 17)

'..perhaps the whole business starts out with a different set of priorities, I mean hospitals, we hope, exist to, to serve the interests of the people, of various kinds in them, whereas of course armies don't exist to serve the interests of the people in them, they, they to some extent at the expense of the people in them, so I think y'know the, there is a different basis to that philosophy.' (Interviewee no. 9)

In most organisations there will be a difference between the formal and informal structures, usually drawing the lines between management and staff (Belknap, 1956). Miller and Gwynne (1972:69) took this to another level to include patient interactions.

'..you obviously have very much two sets of users, I mean you have the doctors and nurses who operate the equipment, and of course you have the patient who goes into the equipment, or is treated by the equipment.' (Interviewee no. 21)

In trying to use organisational theory to describe hospitals, although there is evidence for the classical and bureaucratic models there are also arguments, as put forward earlier in this section, for why these are inappropriate. The difficulties in applying the theories seem to hinge on the interface with the patient whether it is (1)

the openness of the organisation (like a railway platform) which challenges the ability of the organisation to control access and the physical environment or (2) the responsiveness of the service to individual patient needs. In order to describe the hospital using systems theory I think that there is a need to genericise the service provision but there are arguments against using a production model as this might diminish the role of the patient in the organisation (as well as being boring for the staff). The current development of Primary Care Trusts seems to aim to change the power relationships and give the patient (in the guise of the community practitioners) more influence, described in Boseley (2000a) as 'moving from paternalism to partnership'. However it may be that patients would prefer to be consumers rather than active participants and this will be further addressed in section 5.5.3.2.

At a fundamental level the use of organisational theory for hospitals was questioned by Alaszewski et al (1998:48) who said 'that most organisational theory literature is based on studies of private sector or public administrative organisations'. They did acknowledge the parallel literature on welfare or caring organisations but considered that this tended to be based on descriptive studies of organisations, both case studies and surveys rather than theoretical considerations. This difficulty in applying organisational theories to the NHS or individual hospitals fits with Klein's description of the NHS as an 'anomaly', 'an anachronism', and the 'odd-man out' (2001:vii). He suggested that the NHS had changed very little organisationally and with respect to the method of funding since it was set up in 1948 and so was now increasingly out-of-step with a 'rapidly changing society'.

Summary characteristics from this sub-tree

- The health care industry is still moving away from a classical (Tayloristic) organisational model. Hospital organisational structure has been described in terms of an open system (diagnostic related groups).
- There are at least three hierarchical lines in a hospital: hospital administrators (bureaucratic); professional management (e.g. nursing); and clinical (patient care) management.
- This model of three hierarchical lines is a significant characteristic for hospitals. Other industries rarely have such a complex management structure.

- The core business of the hospital is caring for patients. This adds another dimension to the interactions model beyond human-machine or human-system interactions.
- Key difficulties in describing hospitals in terms of organisational theories include; (1) the openness of the organisation ('like a railway platform'); and (2) the responsiveness of the service to individual patient needs.

5.5.1.2.2 *Implementing change*

Since the inception of the NHS in 1948 there have been at least five attempts to manage the balance of the provision of, versus the demand for, health care (Ranade, 1997:3). The structure of the NHS was more or less stable until 1974, when a first reorganisation involved the restructuring of local authorities and health authorities in the Department of Health and Social Security. Under the first Thatcher administration (from 1979) there was a move away from a centrally planned and administered NHS in favour of local general management (District Health Authorities), with the implementation of parts of the Griffiths enquiry (1983). More emphasis was placed on monitoring expenditure by central government resulting in changes to the culture with an increased financial awareness. The numbers of managers increased (many of whom were clinical staff) to result in a ratio of one manager to four clinical staff by 1993 (Ackroyd and Bolton, 1999:369).

The economic-led culture was further enhanced with the creation of an internal market with purchasers: health authorities, GP fund holders, and providers: hospitals, non-budget holding GP's (Pinch, 1994:207). This change was part of the drive to increase accountability for resources in the NHS and introduced contracting for services, together with increased emphasis on audit (financial). The next change was the use of league tables and performance indicators, in particular looking at mortality and waiting times. Annandale (1998:284) discussed the radical changes set in train by the NHS and Community Care Act of 1990, saying that 'these have gained so much momentum that the formal structure of health care now bears little resemblance to that which existed even a decade before'.

During the 1990's further autonomy was introduced with the formation of 450 hospital trusts for acute, community and mental health services. This model is now being extended to primary care, where groups of general practitioners are coming

together as Primary Care Trusts. The difficulties of trying to work within an industry in perpetual change was highlighted by one of the interviewees, saying:

'I mean if you really, if you really are about trying to make a difference, change things for the better, then I wouldn't start with the Health Service, 'cos I think, I think it's the management of change within it, specifically with respect to ergonomics, is very, very difficult, given that it's an organisation in perpetual change ... I think it's slightly worse now, you've got Trusts, because Trusts are autonomous ... when I started off we had districts, we had areas, half way through the study they abolished bloody areas,... and then within literally, I don't know, about two years of the recommendations come out, they'd abolished what they'd set up. Every five years they change the thing...'
(Interviewee no. 12)

White (2000:11) described the difficulty of implementing change as trying to turn a 'super tanker'. Changes generally occur very slowly. Klein (2001:217) took this further and suggested that over the last 50 years the NHS has 'proved remarkably resistant to attempts to steer it from the centre. Central policy initiatives were aborted, adapted or modified in the process of making the implementation ... The NHS marched to the tune of developing professional practices and expanding technology possibilities with individual professionals free to indulge in their own improvisations'. This will be further considered in the sub-section on the professional groups in hospitals and their relationships (section 5.5.2.2).

'I don't think hospitals, for a whole host of reasons, are a good place to demonstrate fantastic changes because the pressure they're under, the resources they have and so on, are so limited, I think you are, anything you can do there is almost miraculous against that background' (Interviewee no. 11)

Implementing change is often a key part of ergonomics projects and it was suggested that 80% of the effort when working in hospital ergonomics was needed to progress the project and with only 20% on understanding the problem. The reverse was perhaps the more usual model for ergonomics projects, with 80% of the time spent on understanding or solving the problem and only 20% on progressing the project.

'different in terms of the scale of complexity of getting anything done, like the effort shifts, so that 80% of the time is devoted to 'who needs to know about this and what are the options, what kind of, who can we recruit to help with this or that or the other', and that's a bit different. Sometimes in other industries the effort is in understanding the problem and it can be a rather swifter process to have something done about it.' (Interviewee no. 7)

'..a large proportion of my work within the NHS is about understanding systems. It's about how do I get, we know what we want to be doing, y'know it's not, a lot of it's not rocket science, I mean there are occasions when you've got to go in and do something new, but a lot of it's just reinventing old stuff, but it's about how do you get it done.' (Interviewee no. 19)

Summary characteristics from this sub-tree

- There have been at least five national reorganisations of the NHS since 1974 to try and balance the provision of, and demand for, health care.
- The internal culture of the NHS is very good at resisting changes.
- The above factors reverse the balance of 80:20 found in ergonomics projects in other industries to 20% understanding or solving the problem and 80% on progressing the project.

5.5.2 Workers (staff issues)

This sub-tree sought to group data relating to staff issues to try and identify any characteristics defining this population group. Two main areas were explored. The first related to the multiplicity of professions found in health care. The two largest professional groups (medicine and nursing) are reviewed historically and issues identified around the intra-, and inter-professional cultures. The second area relates to the high proportion of female workers. The literature points to evidence for gender stereotyping for care tasks but the case study generated very little data in support. One of the significant findings from the case study data was the perception of the interviewees that there is currently very limited ergonomics information or data on female workers.

5.5.2.1 Professional and non-professional staff

One of the interviewees felt that the difference between health and non-health care workers could be described as givers versus takers.

'the people who work in health care are carers,there are givers and there are takers and health, people who go into health care ... are givers. ...That's the carers who are untrained, it's the carers who are qualified staff, it's the carers who were qualified staff who are now managers, and it's the carers who were once managers who are now senior advisors to the Trust in professional status. But they're all part of this giving culture' (Interviewee no. 19)

Clarke (1978:67-68) found that although many of the jobs in a hospital required further qualifications, when asked why they worked in the NHS '40% of the staff gave an interest in the job, wanting to help people or a life-long ambition as their reason. But the other 60% gave practical reasons only, or said they were following the example of members of their families or friends'. Non-professionally registered staff (especially women) stressed 'the practical considerations e.g. hours and location were convenient compared with other jobs in the areas, most of them added that they were keen on doing the job as well'. So there may be a difference between motivation of the professional (registered) staff and non-registered staff. However the nature of the health care professions is changing with more monitoring and public accountability for both clinical and financial actions.

5.5.2.2 Multiplicity of professions

There is a considerable literature in sociology about the health care professions and some of this will be drawn on in this section. Saks (1998) gave an historical and contemporary overview of professionalism in healthcare in Britain, saying that the study of professions was dominated by a taxonomic tradition up to the 1960s. This was based on the belief that the professions both:

1. Shared special features that distinguish them from other occupations. An example in medicine would be the management of uncertainty and risk with respect to health care (Alaszweski et al, 1998:93).
2. Played a positive part in society.

This model did not survive beyond the 1950s when Saks suggested that the 'interactionists took the lead by defining professions not as a neutral, scientific category but as a socially negotiated symbol in the politics of work' (1998:174). One of the interviewees calls this the 'industrialisation of professions':

'the industrialisation of professions, I think there's been a long term sort of cultural trend in this country, and in a lot of others, against the value system that said the people were, who were in the sort of old style professions, the lawyers, the architects and the doctors and the nurses and the teachers and so on, I mean they were expected to be dedicated to what they did, they're expected to have a certain kind of value system, supposed to be self motivated, and they weren't particularly watched over and policed and sort of prodded with, with three appraisals a minute' (Interviewee no. 9)

Part of the deal for professional status in the NHS was self-regulation of clinical practice. The medical profession set up self-registration in 1858, the Medical Registration Act, followed with legally based self-regulation in the second National Health Service Act in 1946 (Saks, 1998:177). This was followed by the Pharmacy Acts in the 1860s, Dentists Act in 1878, Nursing Registration Act in 1919 and finally the CPSM (Council for Professions Supplementary to Medicine) in 1960 for most of the other non-medical clinical staff. However Nursing and PAMs (Professions Allied to Medicine, e.g. therapists) have failed to secure full professional closure, although there continue to be moves for protection of title.

As was mentioned in the previous section, and has been seen with recent clinical malpractice cases (Boseley, 2001a), medicine has a poor record for both audit and evaluative research (Ranade (1997:13). It has been suggested that fashion, whim and personal preference have often driven the choice of a particular procedure, and many common interventions have been unvalidated, or even of proven ineffectiveness and in the worst case to actually have resulted in iatrogenic (medically caused) illness (Cochrane, 1971; Department of Health, 2000; Boseley 2001b). Recent government edicts have introduced more accountability with Controls Assurance and Clinical Governance (HSC 1999/065; 1999/123). Two new agencies have been set up to monitor the provision of services: NICE, National Institute for Clinical Excellence, and CHI, Commission for Health Improvements (Klein, 2001:210). These will challenge the historical clinical autonomy of medical staff such that they could make clinical management decisions without financial or resource management pressure. There are still doctors who have powerful positions, or a high status, in hospitals without being part of the organisational management.

'..there are people who are very powerful who might only do one session a week ... a consultant who is on key committees, very influential, very high status but is actually only there half a day a week' (Interviewee no. 2)

The relationship of the medical staff with other staff groups relates to both the administrative hierarchy as well as the clinical (patient) management hierarchy. The previous quote referred to the involvement of medical staff in organisational management, the following one to the relationship between nursing and medical staff.

'..y'know the nurses kind of tug at their forelocks if the doctors are around and that to me, well I didn't think that happened any more. But it obviously does, it's probably engrained in the culture' (Interviewee no. 20)

Most health professionals have limited autonomy with respect to diagnosis and treatment. This is addressed in the NHS Plan (2000) where there is a proposal for 'doctors and nurses to be trained together to relax the elitist divide' (Boseley, 2000a) and there is an increasing number of clinical nurse/therapist specialists with extended roles and increased autonomy (White, 2000).

The position and power wielded by medical staff derives from their relationship with the NHS. Many hospital consultants and general practitioners are self-employed within the NHS, part of the 50,000 consultants/contractors who work under contract and rely on the NHS for most of their business. The current Labour government is proposing changes within the NHS Plan (2000), including a restriction on private work for medical staff for seven years after completion of training, which is reported to be meeting some resistance (Boseley, 2000b). Other drivers for change are being seen with some doctors even introducing internal performance review programmes (Hawker, 2001). This starts to bring medical staff closer to other professional groups who have had their own managerial hierarchies for a number of years (Causen and Exworthy, 1999:86).

Ranade (1997:115) pointed to an interesting discussion in Harrison et al (1992:8-9) about the power and discretion displayed by doctors. This draws on their special distinguishing features with respect to the management of uncertainty and risk and the 'ambiguity inherent in the whole medical enterprise as to what works and what does not work'. Higgs (1997) described four paradigm shifts in medicine, going from bedside medicine, pre 16th century (pre-scientific), through hospital medicine (16th to 19th century) and onto laboratory medicine in the 20th century, with the focus moving to a molecular level. From the late 20th century there has been a move towards surveillance medicine with an emphasis on public health (Armstrong, 2001:20). Harrison et al summarised by pointing out the influence of the dominant groups in an organisation. For health care they suggested that the dominant group was the medical profession who have imposed their values and interests on the health services. The final move towards a paradigm of surveillance is close to the social model of medicine and as such offers a much greater scope for the use of qualitative methodologies in medical research.

So how do the other professional groups fit into this picture?

'there is, there's the medical staff, the nursing staff, the PAMs, y'know, everybody's got their own sort of slightly different agenda' (Interviewee no. 17)

One difference between nurses and doctors is that nurses offer continuous embodied care (Mowforth, 1999:49). This caring role for nurses has been contrasted with doctors, with medical staff attempting to provide a cure (Webb, 2001:268).

Ranade (1997:14-15) and Carpenter (1993:95) looked at the history of nursing from the feminist perspective where women were identified as the natural (but necessarily unqualified) healers and carers of the sick. There was a gradual displacement of this role by men through an alliance of Church, State and Universities after centuries of struggle (Ehrenreich and English, 1979). This ensured that the practice of medicine was based on the possession of a university education, from which women were barred. The Church denounced non-professional healing as heresy (condemning many women midwives to the stake as witches in the 15th and 16th centuries). The 19th and 20th centuries saw the final triumph of scientific medicine under male control. Women re-entered the healthcare arena in the subordinate role of nurses in Florence Nightingale's reorganised profession for 'respectable' ladies in a relationship with medicine which paralleled the patriarchal structure of the bourgeois family. The influence of the church and military on modern-day nursing is still very evident.

'one would only have to look at the history of nursing to see the ways in which, there's almost a sort of semi religious elements, which brings in all those notions of self denial and, so on, ... but the morality is the church rather than the military in one sense, I mean the military end of nursing is the kind of, discipline on one level, but the morality is about, angels of mercy' (Interviewee no. 13)

The next two professionalising phases for nursing were with Mrs Bedford Fenwick (1919), who sought to improve the marketability of nursing skills through developing training and a scheme of state registration, and more recently with Project 2000 (Causen and Exworthy, 1999:92) which developed educational reforms in 1980s.

Back in 1955 Haberstein and Christ (quoted in Miers, 1999a:87) made the comment that nurses had rarely analysed their position as workers and as employees. They had been more interested in the vocational nature of their work and their claims to professional status and professional autonomy. They identified three types of nurses:

1. Traditionalists, who focussed on the patient and were deferent to the doctor;
2. Professionalisers, who were skills focussed and self-assertive;
3. Utilisers, who saw themselves primarily as workers.

It is interesting to review these comments and groupings 45 years later. There still seems to be division, with Ranade (1997:48) putting forward two possibly contradictory ways: one based on enhancing the carative aspects of the nursing process (traditionalists), the other extending the nurses role to practice some tasks previously defined within the medical domain (professionalisers). The tasks carried out by the 'utilisers' are now mostly done by non-registered nursing staff (auxiliaries). This work is described by Lee-Treweek (1997) as the 'hands-on care; heavy, dirty and low paid... It is labour framed by difficult conditions that are created by others: management, nursing home owners; trained nurses. The move towards more private homes over the last 10 years has brutalised the work setting of nursing auxiliaries'. The problems associated with working in private homes are also identified in the case study on occupational therapists (chapter six).

The emotional aspect of nursing in relation to interactions with patients is looked at in section 5.5.5.3. There are organisational aspects to this with respect to Tayloristic work theories (Menzies, 1970:5; quoted in Miers, 1999b:66), where a production line model disregarded the nurse-patient interaction and treated nursing staff as detached workers who could be moved around at will. This has been addressed by nurses in the move from a task nursing model of care to primary nursing. In the latter model, the patient is allocated to a named nurse for the duration of their care (or stay in hospital). This change has been noted by Mackay (1989:181-2) who pointed to a decline in the hierarchical management of nursing teams.

Perry (1996:2) also suggested that nurses had moved away from the medical model and towards a social model for maintenance and development as part of their professionalising project. She described the social model as more holistic to include the patient's individual temperament and social circumstances. The social model of health care is extensively used in occupational therapy and is described in more detail both in the discussion (section 5.6) and chapter six.

Summary characteristics from this sub-tree

- There may be a difference in the motivation of staff working in the health care industry. Internally this may be between professional and non-professional staff, and externally, in comparison with other industries, it was described as givers versus takers.

- The culture within professional groups is maintained by self-regulation and clinical autonomy. This links with the three hierarchical lines identified in the previous section.
- Medical staff have a disproportionate amount of power with respect to both clinical and management decisions in comparison with other professional groups. This status is currently being challenged by changes in medical practice and external government reforms.
- Nursing evolved from a historical tradition in the military and the church. Nursing roles have been split in recent years by downgrading some tasks ('hands-on care') to non-registered nursing auxiliaries and, at the same time, extending the scope of nursing practice upwards, with clinical specialists, to take on some of the medical duties.
- Nursing is moving away from the medical models of care towards a more social (holistic) model of care.

5.5.2.3 Gender

As I said at the start of this chapter, one of my preconceptions about hospital ergonomics was a question about the high number of female workers so it would be difficult to discuss hospital workers without considering gender. Does this high proportion have an effect on the culture?

'..there may be cultures that are specific to predominantly female professions and semi-professions which may be about sacrifice, and all of that stuff, that actually may not be true of, I don't know, car workers in the Midlands ... one would only have to look at the history of nursing to see the ways in which, there's almost a sort of semi-religious element, which brings in all those notions of self denial' (Interviewee no. 13)

The literature gives evidence for gender stereotyping in terms of both caring and payment. Paid care work has been considered to be a low status occupation and almost an extension of housework (Giddens, 1993:516; Miers, 1999a:86). This has led to dubious assumptions, for example that 'women are equipped to deal with bodily substances and that they enjoy this work as an extension of their 'natural' role and engage in it by choice' (Lee-Treweek, 1997:48). Garmarnikow (1978) identified a

perceived analogy between doctor/nurse/patient and father/mother/child, further reinforcing the low status of nursing by again linking it with the domestic sphere.

Lee-Treweek (1997:48) reported on a study which found that the ability to cope and forms of toughness in nursing were also seen in other all female work cultures (Pollert, 1981, Mackay, 1989, Ashley, 1980). These authors all provide evidence for the gender stereotype put forward by Savage (1987:66) such that 'nurses are ... caring, nurturing, intuitive, domestic, pretty, and feminine, whilst doctors are tough, decisive, rational, clever and masculine. Thus women are nurses and men are doctors'. Both Mackay and Ashley found that trained nursing staff valued tough behaviour and undervalued the importance of support and care for those in the profession. There are other aspects in the nurse/patient relationship, one of these is the level of overt sexual attention encountered by nurses from both patients and the public (Stanko, 1988:95). Lawler (2001:287) suggested that a reason for this might be that 'nursing practice incorporates kindness, a caring approach, warmth, gentleness and friendliness to the patient - all of which can be perceived as sexual availability if not sexual invitation'.

So is this stereotyping just linked to women workers in health or to other industries with women workers? Crompton and Harris (1998:301) compared two occupations which are increasingly done by women: banking and medicine. They looked at the issues of managerial versus professional roles, and private versus public employment, using fifteen biographical semi-structured interviews with women in each occupation in four countries (Russia, Czech Republic, Norway and Britain). They found that within the profession of medicine, women were specifically choosing disciplines or specialities which were regarded as being family friendly (such as radiology or general practice), with convenient or at least regular hours of work.

A point which was raised by more than one interviewee was the relative lack of data or information on women within ergonomics.

'if you look at any of the standard texts there's really, there has never been, in my view, sufficient general data gathered on either females, or anything more than the fit population which is invariably youngish ..' (Interviewee no. 12)

'I mean it was all on air crews and pilots, and miners and what were predominantly male, male occupations, the biggest one that I would've argued should've been looked at much more, in the past, has never been done in a systematic way, and namely it's the health care professions, there's been lots and lot's of y'know very small little things done, but there's been nothing of comparable size to some of the other male populations that've been looked at' (Interviewee no. 12)

Another theme relating to gender was promotion. Grint (1998:209) contrasted the same industries, banking and health. The UK clearing bank industry employed about 1 million employees with about 60% women (a lower proportion than health care). However less than 5% of higher management posts in the 1980s were filled by women. This has improved for two banks in the 1990s, with an increase to over 60% of managers being women. A similar glass ceiling was noted for health, with about 14% of unit managers being women in the 1980s. Grint pointed to the career break for child rearing as the main factor for the relative absence of senior women managers in the NHS.

'we do get women rising through the sort of management ranks into senior positions. The men, if you looked at the percentage of, of the ratio of, male to female ratio in management, it wouldn't match the ratio in non-management work force' (Interviewee no. 20)

The same trends in promotion and status were found in hospital laboratories (Packer, 1996:129) and pharmacies (Tanner et al, 1999).

Summary characteristics from this sub-tree

- There is evidence in the literature for gender stereotyping in health care work ('women are equipped to deal with bodily substances').
- There is a 'coping' culture in nursing which was also found in other all female work cultures.
- There is currently very limited ergonomics information or data on female workers.
- A glass ceiling for promotion was identified in the health care industry with respect to administration, hospital laboratories and pharmacies.

5.5.3 Caring for people (patient issues)

In this sub-tree I have tried to identify characteristics around the core business of the health care industry, caring for people. The issues have been grouped in the following sub-sections:

1. The emotional impact of caring and how culturally taboo aspects of handling other people's bodies are addressed.
2. The patient's expectations of the service.
3. Life, death and mistakes in service provision.

Caring for people often involves dirty physical work and challenging emotional work in situations where the patient can be both physically and mentally vulnerable. The role of the patient in the interactions interface is significant and they should always be seen as an active participant. This participation will vary between both clinical specialities and individual patients. For example when considering midwifery there are two patients, the mother and baby (Hignett, 1996a) and, as indicated in the following quote from this case study, the baby will be an active part of every interface:

'as far as the mother's concerned they're interacting with another adult, who I guess you can talk through to certain extents, so that the mother does it [breast feeding] in a way that doesn't hurt the midwife, actually in this case both of them are having to engage with, cope with, work around, the constraints of a baby, who actually basically is not open to rationale discourse at any level' (Interviewee no. 13)

A similar issue with interface negotiation may be encountered with a range of patients including mentally ill, mentally handicapped, confused and medicated patients. The case study in chapter six (Occupational Therapists) identifies concerns around violence and unpredictability of patients.

Fox (1989:152) gave a very clear description of what she felt was the central difference between hospitals and other industries 'the relationship to the conscious and unconscious, living and dead human body. The body is at the absolute centre of the hospitals medical work, and also a good deal of its non-medical activity. In the name of prevention, diagnosis, therapy and care the body is unclothed. It is touched continually by many pairs of hands, including private, highly connotative regions,

orifices and cavities of the body that are ordinarily touched only in the most intimate personal relations and contexts. The body is persistently under observation. Many of the diagnostic and therapeutic actions conducted in the hospital involve taking substances from patients' bodies – blood, urine, mucus etc. Under no institutional 'roof' other than the hospital is the human body handled and worked on in all these ways'.

5.5.3.1 Dirty and Emotional Work

Nursing care may be needed for every part of the body which is potentially accessible (Lawler, 1998:236). However in western cultural traditions, certain parts of the body are more accessible (arms, legs, head) and more readily touched than other parts. As nurses learn how to provide care they will probably have to overcome their own cultural taboos and adjust to a particular professional subculture that permits handling other people's bodies. In order to do this a level of privacy and dignity has to be maintained for both the nurse (or carer) and the patient.

A great deal of nursing work is dirty (Fox, 1989:146) and there may be risks of contamination and infection from handling both live and dead bodies. Miers (1999a:86) reported a cultural analysis which identified nursing as dirty work and led to an inhibition of their status and recognition, linking with the domestic association as discussed in the previous section.

The physical aspect of nursing work was raised by the interviewees as part of the handling of patients.

'..your average nursing auxiliary isn't going to understand the anatomy of the back and sort of the biomechanics involved in the sort of moving and handling patients ... they might know that, yes, their back aches if they go home at the end of a heavy week, or the end of a heavy day' (Interviewee no. 17)

Lee-Treweek (1997) found, in a study of nursing homes, that the work was described as 'often physically heavy (involving lifting weights which would be unacceptable in male-dominated industries), physically dirty (involving tasks such as washing soiled bodies) and highly repetitive'.

Other aspects of handling people include the emotional impact of other people's nakedness. Lawler (1998:237) looked at the nurses' first experience of suffering, disfigurement and death, and suggested that speed was often used by nurses as a

method to manage difficult or potentially embarrassing situations. Technical vocabulary or jargon is also used to cope with the full significance of handling bodies.

'in many, many situations you have to deal with an interaction between people which both parties have to really have very high belief in, where there are, can be, very strong emotional influences at a level which is just about as sharp as you can get I think in terms of interactions between people'
(Interviewee no. 11)

Hochschild (1983) called the emotional control needed to carry out the caring work 'emotional labour'. This encompassed how nurses felt when learning to do body care and perform other tasks in a manner typical of the occupation. She said that the emotional impact was now acknowledged, but still felt that 'one characteristic of a 'good' nurse was the ability to hide emotional reactions and to cultivate an air of detachment – a sort of professional distance from one's work'.

'But I think that thing about health care that's, by and large different, is the focus on the intuitive, if you're really good in what you do, the focus on the really listening to your intuitive self about what patients are telling you, and being very much in touch with them emotionally, but not being able to, but being in control of your emotions at the same time. I think there are very few other industrial environments where that's the case' (Interviewee no. 15)

There was a sense in this theme of coping, or putting up with difficulty because of a vocation because they thought it was better to put the patients needs before their own safety (Ackroyd and Bolton, 1999:384).

'it's a caring profession therefore people are putting their patients first, and they're, they're sort of, everything they do is about caring for the patient and maybe, maybe some of the care is misguided in that they'll put themselves at risk in order to care for the patients' (Interviewee no. 17)

The coping culture, which has been traditional in health care, has resulted in staff taking risks. This can include risks of violence from patients, especially when working in mental health or secure hospitals. The risks and hazards that patient

illnesses and treatment may pose for patient, staff and the public are addressed more publicly than before. Controls Assurance (HSC 1999/123) sets out the framework for managing both clinical and non-clinical risk and some hospitals have now been prosecuted under health and safety legislation (HSC, 1992) for both clinical and non-clinical incidents to staff, patients and the public.

Summary characteristics from this sub-tree

- A great deal of nursing work is dirty, involving contact with live and dead bodies.
- Clinical staff have to adjust to an emotional professional subculture which permits handling of intimate parts of other people's bodies.
- This emotional subculture is linked with vocational factors that include putting the patient's needs before the staff's needs.

5.5.3.2 Patient Expectations

The relationship between the health care service and patients usually starts with the patient initiating contact, so the patient-staff relationship is based on a voluntary agreement (Alaszewski et al, 1998:95).

'..there's a general public view point that the health service is everybody's right, ...it's something that one should have rather than something that is a service that's being provided It's something that is expected' (Interviewee no. 17)

There is a social responsibility for publicly funded services of 'preventing harm to individuals, users, agency employees and the public' (Alaszewski et al, 1998:94). This is enshrined under the duty of care: 'You must take reasonable care to avoid acts of omission which you can reasonably foresee would be likely to injure your neighbour. Who, then, in the law is my neighbour? The answer seems to be the person who are so closely and directly affected by my act that I ought to have them in my contemplation as being so affected when I am directing my mind to the acts or omissions which are called in question' (Dimond, 1997:89).

One of the interviewees had experience of doing research in the NHS from several years ago when they reported an almost subservient and apologetic attitude by patients towards the NHS.

'so first of all they're [the patients] very apologetic for being a trouble and then they try not to pitch their expectations too high because it's too much trouble for the poor NHS, y'know, so that if you don't reach that amount of improvement in mobility, perhaps it's your fault, y'know' (Interviewee no. 2)

In the last 20 years there have been large changes in patient expectations of the NHS (Dyer, 2000). In 1995 every household in the country received a copy of the Patients Charter at a cost of £1.4 million (Ranade, 1997:154). The following basic rights were enshrined and some have been used as measures to create the league tables referred to earlier:

1. The right of a patient to know before going to hospital if s/he is/will be in a mixed sex ward
2. National standards address security and cleanliness in hospitals as well as single-sex washing and toilet facilities for patients in hospitals
3. The standard that children should normally be admitted to children's wards under the care of a consultant paediatrician rather than adult wards
4. 18 month guaranteed in-patient waiting time
5. 26 week standard for first outpatient appointment and target that 90% of all out patients will be seen within 13 weeks
6. 12 months standard waiting time for coronary artery by-pass grafts and associated procedures
7. 3-4 hour standard for emergency admissions to hospital through A&E departments. To be strengthened to 2 hours from April 1996.
8. Standards addressing timeliness of community nursing visits
9. Standards addressing hospital catering services

More recently the NHS Plan (2000), distributed to households, will have re-informed expectations as well as setting new ones.

'You've got all these charters written all over the place, you've got lots of procedures that you're expected to follow and people need to see why it's real. I did a little bit of work in the prison service and they had some of the same characteristics' (Interviewee no. 7)

So how do patients see hospitals? Some of the interviewees had experience of using the health care service both for themselves and for relatives. Two extremes are found, from positive experience of the health care system taking over:

'..it was all sort of starting to fall on my shoulders and I didn't know quite what I was supposed to do but I'd got to do it anyway. But she'd get in there [hospital] and suddenly you feel so supported, I mean just like having all your cares sort of taken off your shoulders ... this is one of the few places in the world where I've ever felt safe' (Interviewee no. 9)

In the second there is an example of the domination of the medical profession setting the pace.

'..there's a mind set. From a personal experience of, any contact with medical staff creates a completely different mind set in me to anybody else ... I become completely a user, and would respect anything that was told to me and I mean possibly as I am getting older I might challenge it a bit more, but, I see an authority there with medical profession that I find it difficult to challenge'. (Interviewee no. 18)

This gives little evidence for Klein's (2001:ix) suggestion that the 'challenge to the implicit paternalism of the original model NHS [would be] posed by the transformation of the patient into a consumer'. He described this as changing into a 'supermarket society' where patients expect to have 'an ever increasing choice from an ever expanding list of goods delivered to ever improving quality standards: access to the web provides information not only about what is on the shelves but also about the expanding options for medical intervention' (p229). So the challenge of balancing provision and demand continues with patients reportedly becoming more knowledgeable. There is a danger of demand spiralling out of control where, as we become healthier, we have higher expectations and start to see health care as both a right and a duty (Porter, 2001:9).

With this increase in knowledge and expectations there is also a change in the culture. Litigation for accidents and mistakes in health care provision are rising (Dyer, 2000) as will be seen in the next section.

Summary characteristics from this sub-tree

- The patient-staff-system interaction is voluntary, initiated when the patient has mental or physical concerns or problems.
- The health care industry is underpinned by a social responsibility which has been defined in law as a 'duty of care'.
- Patients expectations of the service range from being apologetic for using NHS resources through to rights defined in the patients charter.
- Interviewees who had used the health service gave personal examples of the supportive hospital climate and oppressive medical culture.

5.5.3.3 Life, death and mistakes

The cultural move from paternalism to partnership (Boseley, 2000a) might also fit with the two models of care described by Miller and Gwynne (1972) with respect to risk-taking. A minimum risk environment was called the 'warehousing model of care', whereas a more stimulating, riskier environment was described as the 'horticultural model of care'. In order to provide both care and cure there are different type of service provision required. An example of this for manual handling will be further considered in the next chapter in treatment handling (section 6.5.1). This tries to look at the difference between completely safe care handling and rehabilitation (Hignett, 1994a) where the patient must be put into potentially dangerous situations in order to learn or relearn skills (e.g. walking).

The changing climate in patient expectations is also changing the response by the medical staff to errors and adverse events. Vincent (1993:17) reported a rise in litigation with patients seeking compensation, both for financial recompense and to try and ensure that the same accident does not happen again.

Accidents and adverse events in health care are numerous but often insidious except for occasional media-worthy issues (Klein, 2001:209). The causes are not always easy to isolate and usually have multiple origins, especially where there are multi-professional, safety critical environments e.g. theatres (Van Cott, 1994:255).

'I mean there is one big difference in that, y'know the product going through your establishment is a human, they're vastly varied and if you do anything wrong to it you're in deep trouble straight away ... which is not necessarily the case in manufacturing ... y'know you can get away with your

*mistakes there, all right, where you bury yours well and good,
but otherwise you're in trouble' (Interviewee no. 8)*

There is a growing field of application of human factors in medicine, especially in the area of human error. This growth was discussed by Caldwell (1996:531) and a parallel was drawn between medical practice and 'other technologically dynamic, error-critical systems', e.g. aviation, nuclear and petrochemical industries.

Helmreich and Merritt (1998:12) reported a case study comparing the operating room (OR) to an airplane cockpit. They described the OR as 'a milieu where a number of professionals must come together to perform multiple and complex tasks in a noisy and cluttered environment'. There were at least two types of medical staff (anaesthetists and surgeons) in addition to theatre nurses, nursing and anaesthetic assistants, and operating department assistants (ODAs). The hierarchy in the power relationships could be confounded with professional background versus experience for junior doctors and senior theatre nurses. Also there was potential conflict between the two medical disciplines (anaesthetists and surgeons) for the 'control' of the patient. When they contrasted this environment to the cockpit, they found that the ultimate authority in the OR was not defined which could lead to potential problems. This is another example of the complexity of the hospital organisational structure. Carthey et al (2000) are trying to change the focus from a punitive, or looking at 'what goes wrong', to a supportive ('what goes right') perspective. They have looked at coping strategies but so far have not suggested that their results can be transferred between surgical specialities.

At the moment approximately one in ten patients are known to suffer adverse consequences as a direct result of their admission to hospital (Department of Health, 2000; Boseley, 2001b) and there are initiatives to change this through audit, further research and education. The literature search for hospital ergonomics found that an increasing number of papers were reporting research on anaesthetic equipment and working practices.

Summary characteristics from this sub-tree

- The culture of risk taking in medicine is moving from paternalism (warehousing model of care) to partnership (horticultural model of care).
- Accidents and adverse events in health care are numerous but the causes are not always easy to isolate and usually have multiple origins.

- Human error research in medicine is a growing area of ergonomics research. Contrasts have been made with other error-critical systems in the aviation industry.

5.6 Discussion and Conclusion

Most of this chapter has focussed on the second question of the two aims, the characteristics of the health care industry. The reason for this is that few of the interviewed hospital ergonomists had used qualitative methodologies either in their practice or in research projects. The limited experience of the interviewees in hospital ergonomics is not surprising in the context of the literature search which found only 341 (3%) papers from a total of 10,504. When one considers that the health care industry accounts for 5% of the UK workforce this seems low and it suggests that there are many issues in hospital ergonomics that have not yet been considered (Daniellou, 1997).

The characteristics of the health care industry which seemed to have large impact were the organisational structure, the staff issues (professional groups and gender), and patient issues. The inertia of the NHS was identified at a practical level, with internal resistance of change even with five-yearly overhauls.

It is suggested that hospitals are different to all other industrial organisations. The findings indicated that hospitals present a particularly complex setting in which to practice ergonomics. This is partly due to the organisational structure (with multiple professional and managerial lines) but also to the core business. Health care is a service industry like banking, but additionally they are also a public service (like the railways). The difference for ergonomics practice may lie in the definition of the 'user' in the context of a user-centred design or task analysis. Every member of the UK population is a potential user of the NHS so the definition of the user group is difficult for many areas. As a service industry the clients (patients) are not paying at the point of contact (unlike banking or transport services) and they do not have to be there (unlike education or the prison service). For banking and transport services the 'users' are all either paid employees or paying customers. A closer comparison might be education, but here the 'users' are paid employees (teachers and support staff) or children, who are legally required to attend the school. The prison service again has a complex user definition with the inmates giving an additional interface to

the employees, but again the prisoners have not chosen to be there, that choice is made for them. These examples show the tension described by Goffman (1961) for 'people-processing institutions, such as hospitals and prisons', due to the 'human beings [*being processed*] to whom are attached rights and moral obligations and who possess an ability to react'. As Pattison (2001:197) said 'within a universally provided service, potentially every member of the population is, has been, or will be a NHS user.' This makes the definition of 'user' very difficult for ergonomics. It creates a unique 'user' group and therefore a unique interface which needs a more context-sensitive methodology to support both research and practice.

This difference in health care organisational structure was also seen in the triple management framework. The comparison with other industry types in the last paragraph could also be used to look at the management structure. It was suggested that the education and prison industries were examples of single management and professional structures, whereas the military had a clear management line but multiple professional groups. This is a simplistic representation but hopefully emphasises the importance of understanding different industrial cultures.

The NHS is the largest civilian employer in Europe with over 78% female workers. The effect of the gender balance on the culture of the industry is evident in the literature though less in the case study. What became apparent from the case study was that most of the interviewees had not given the issue much thought but could see, when prompted, that it might be relevant in a health care setting.

'I think also there's more of a caring, I mean the caring philosophy's completely different to me, you tend not to find it in manufacturing ... I think there are differences, I think that, that gender differences would, I mean without meaning to be sexist I think that there is a difference in the way that women look at the world and the way that men do..'
(Interviewee no. 8)

'ok the difference it [gender] makes is primarily cultural, and maybe I'm wrong in putting it down to being a sort of male-female thing, but in a largely male pop, sort of environment, you land up with, there is very big sort of macho culture ... I

think that's very different with nursing staff. Because in a largely female population there is, they're more caring of each other' (Interviewee no. 17)

This is partly due to the complexity of the management structure for the variety of professions which contributes to the difficulties encountered in running ergonomics projects in hospitals. The area of female workers in hospital ergonomics seems to be under-researched: this relates both to the type of work - dirty and emotion - and to social and cultural issues about gender stereotyping. The theme of workers identified factors differentiating the two largest and most influential professional groups, medicine and nursing. The historical development showed how the current social stereotypes have evolved (from the military and the church), with a resultant disproportionate distribution of power between medical and nursing staff.

It was seen that the organisational models for hospitals are moving away from the positivist pole towards a more interactionist position (figure 3.7) reflecting the change in working in partnership with patients rather than the traditional or classical paternalistic organisational theory. Models of clinical practice also support this move. This has been described as a change from the medical model where the emphasis was on treatment using drugs and surgery (Bond and Bond, 1994:6) towards a social model. The latter emphasises rehabilitation and prevention of illness and is found in the occupational therapy models of practice (chapter six). It appears that the medical model fits more comfortably within the quantitative paradigm so the move towards the social model is another indication of a more interactionist approach which will be better supported by the use of qualitative methodologies.

Finally the third group of characteristics is patient issues. The relationship between the two principle user groups, patients and staff, was complex and difficult to generalise. From the staff perspective a coping culture (perhaps related to the gender distribution) was identified, whereby the patients' needs and well-being was often put before their own. A subculture was discussed in the literature which permitted the handling of intimate parts of other peoples' bodies, at all stages of life and death.

Medicine is an imperfect science and an uncertain art (Jewson, 1976:13) and as qualitative methodologies are being used for research into clinical practice it seems

appropriate that a similar approach should be used for research into the theory and practice of hospital ergonomics. This includes approaches for looking at the complex and often multiple causes involved in clinical mistakes. My conclusion is to suggest that the complexity of the hospital organisation, especially the management structure, and culture, with the patient interactions, needs a more flexible, context-sensitive approach as offered by qualitative methodologies.

Chapter Six

Occupational Therapy Case Study

*I go home by train
with a cig and a Carly.
Back at the gig
the punters, in bed early
dither between sleep and pain:
'Who were those people?
What were they talking?'*

*The staff,
thankful for the break,
the cultural intrusion,
wheel out the sherry
and pies. Look forward
to a merry Christmas
and another year of caring
without scrutiny.*

*Mutiny!
In a corner,
the wheelchairs, vacated now, are cooling.
In the privacy of darkness
and drying piss,
sullen-backed,
alone at last, they hiss.*

Wheelchairs

(After a poetry reading in a geriatric hospital)

(McGough, 1991:103)

6.0 Introduction

This chapter will describe a case study about manual handling risks in occupational therapy practice. The chapter is used both to address the aims of the occupational therapy case study and to present it as an example of a project in hospital ergonomics using qualitative methodology. The chronology of the work resulted in this case study being completed before the ergonomists study so the findings about the characteristics of hospitals have been incorporated in the discussion rather than the conceptual framework. The same style, of embedding the literature relevant to the emerging themes in the analysis and discussion, is continued from chapter five.

In April 1994 the occupational therapy department in a 1200-bed, acute National Health Service (NHS) teaching hospital started a manual handling risk assessment programme. They used the risk assessment model published by the Health and Safety Executive (HSE) (Manual Handling, 1992) which had been modified using information from the Royal College of Nursing (RCN/NBPA, 1993). This resulted in an assessment proforma with a four-point structure under the headings of task, individual, load and environment. In 1994 I put forward my opinion that this type of model had limitations for use with patient handling tasks with respect to the complexity of both manual handling and the animate load (Hignett, 1994b). I suggested that there needed to be a conceptual shift in the assessment of manual handling operations. The basis for this argument was that the concept of a generic load could not be applied when the load was a human being.

The risk assessment process in the occupational therapy department seemed to confirm this argument as they produced 63 separate documented risks in their practice across a range of specialities including medicine, surgery, oncology and palliative care, paediatrics, outpatients, orthopaedics and neurology. Other professional departments in the hospital had produced between 5 and 20 risk assessments at this initial stage, so I was concerned that the large number might lead to difficulties in risk management. Over the following 18 months I reviewed the risk assessments as part of the manual handling operations audit programme (Hignett, 2001a), but by December 1996 the majority of risks had not been eliminated or minimised, so I facilitated a brainstorming session to start a rationalisation process to identify generic themes. At this first stage, a group of 15 occupational therapists worked together to classify the 63 risks into two groups (table 6.1).

Table 6.1 Risk Assessments

Group One. General	Group Two. Paediatric
1. Patient handling	1. Splinting at school
2. Short-term equipment loans	2. Use of suspended sensory equipment
3. Storage of equipment	3. Patient handling (treatment in the community)
4. Changing rooms	4. Children's centre - moving equipment
5. Occupational Therapy department: access, room layouts	5. Home visits
6. Equipment in the community (delivery and fitting)	
7. Getting equipment in and out of cars	
8. Home visits	

It became apparent that there was both a divergence of opinion amongst specialities and a probable overlapping and nesting within the risk assessments themselves. To further the process, I planned a two year qualitative study with the occupational therapy department with the intention of reducing the number of risk assessments in order to concentrate attention and future work on generic risks. This approach would still enable patients to be assessed as individuals (rather than a generic load) and would focus the staff and manager on specific residual risks which could be generalised across the different clinical specialities.

An explanatory display was used to communicate my interpretation to the occupational therapists, resulting in the production of the three generic themes of treatment handling, interagency communication and non-hospital property.

6.1 Aims

The aim of this case study within the thesis is:

- To use a practical problem (manual handling risks in occupational therapy) as a case study to show the value of using a qualitative approach to identify new ideas and creative solutions in a complex situation.

The specific objectives of the study were:

1. To rationalise the large number of manual handling risk assessments into generic themes.
2. To use these generic themes to identify and plan the management of any outstanding risks.

6.2 Methodology

The use of qualitative research in health care has been the subject of a detailed literature review from the NHS Research and Development Health Technology Assessment Programme (Murphy et al, 1998). This review provides a philosophical context and looks at the scope of methodologies and methods under the umbrella of qualitative research.

The study processes are revealed in visual displays. In this way, I am attempting to represent reality by trying to incorporate a range of multiple perspectives that are non-competing (equally valid) rather than supporting the production of a single reality or the notion that there is only one 'truth' (Creek, 1997). Whalley Hammell et al (2000:11) pointed out that qualitative methodologies were particularly appropriate for occupational therapy as they enabled the interventions (treatment sessions) to be planned to meet the 'unique environment, life stage and goals' of individual patients. They called this the 'clear fit' between qualitative research and contemporary rehabilitation practice. Other authors have also recommended the use of qualitative methodologies for research in occupational therapy (Krefting, 1991; Mattingly and Gillette, 1991; Hagedorn, 1995; Jones et al, 1998).

The application of ergonomics in the health care industry has been expanding in scope, if not in research (section 5.1), over the last 10 years. I believe that there is a need for theory to support the methodological approaches at a philosophical level and the methods used at a technical level in order to generate robust information. To this end, I explored the application of qualitative methodology as an appropriate philosophical and methodological approach in ergonomics in part one, with the contention that it provided a more human-focused approach and was, therefore, likely to lead to greater user acceptance of ergonomics interventions (Hignett, 1999, 2000b).

6.3 Process

6.3.1 Sampling

Nottingham City Hospital has approximately 50 occupational therapists (OTs) working throughout the hospital. OTs are a particularly well-informed group of workers with respect to ergonomics as they provide advice about working and living environments and adaptations for individuals (Levine and Gitlin, 1990; Stuckley, 1997). This was reinforced by one of the outcomes from this project with respect to the identification of areas of common purpose and practice between ergonomics and occupational therapy (Hignett, 2000a).

The sampling framework was developed to reflect the range of specialist occupational therapy services provided by the department: medicine (including care of elderly people), surgery, oncology and palliative care, paediatrics, outpatients, orthopaedics and neurology. Twelve OTs participated in the initial stage, with at least one from each of the specialities, and included two men. For the group interviews an additional 16 OTs participated, again distributed over the various specialities.

All the interviewees were individually invited to participate by me and they completed a consent form to indicate their understanding of the study and their willingness to be observed and audio-taped. They had a broad spectrum of experience, from recently qualified (6 weeks) to over 35 years working experience. My relationship with the OTs was that of an in-house ergonomic expert advisor so could be described as studying down (Bell, 1978).

6.3.2 Data collection and analysis

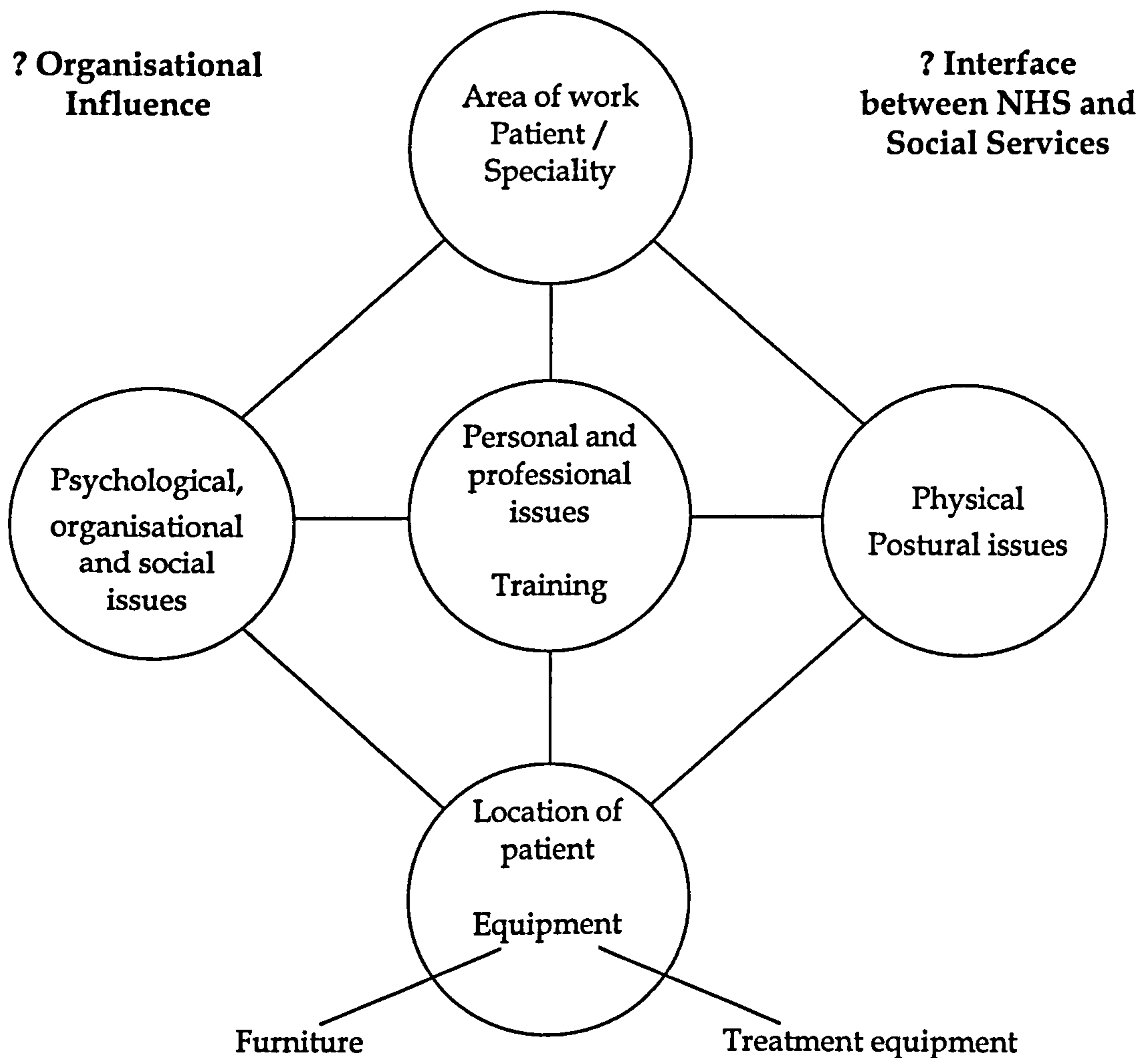
There was a three stage data collection process:

1. Preliminary focus group (15 OTs) to brainstorm the 63 risk assessments. This was also used to focus on the area of work.
2. Observations and interviews with 12 OTs to identify factors and explore issues in detail.
3. Group interviews (16 OTs) to present my interpretation and seek member validation.

6.3.2.1 Conceptual framework

An interview schedule was developed based on the issues raised from the risk assessments, background reading and my experience in health care and risk management. An initial framework (appendix five, July 1997) of the Ergonomic Workplace Analysis tool (Ahonen et al, 1989) was used to identify possible areas to explore with the OTs. The additional areas were included in the first interview proforma (appendix six, August 1997). This resulted in the conceptual framework, figure 6.1.

Figure 6.1 Conceptual framework



The interview proforma was reviewed during the summer of 1998 (appendix seven), before the last four interviews were carried out, to incorporate the analysis from the contact summary sheets and the first four hierarchical trees.

6.3.2.2 The study process

The OTs were observed during treatment sessions involving an identified risk, for example a home visit or using suspended sensory integration equipment (figure 6.2)

Ten observations and interviews were completed to include a range of hospital treatments sessions, home visits and school activities based on the 63 identified risks.

Figure 6.2 The study process

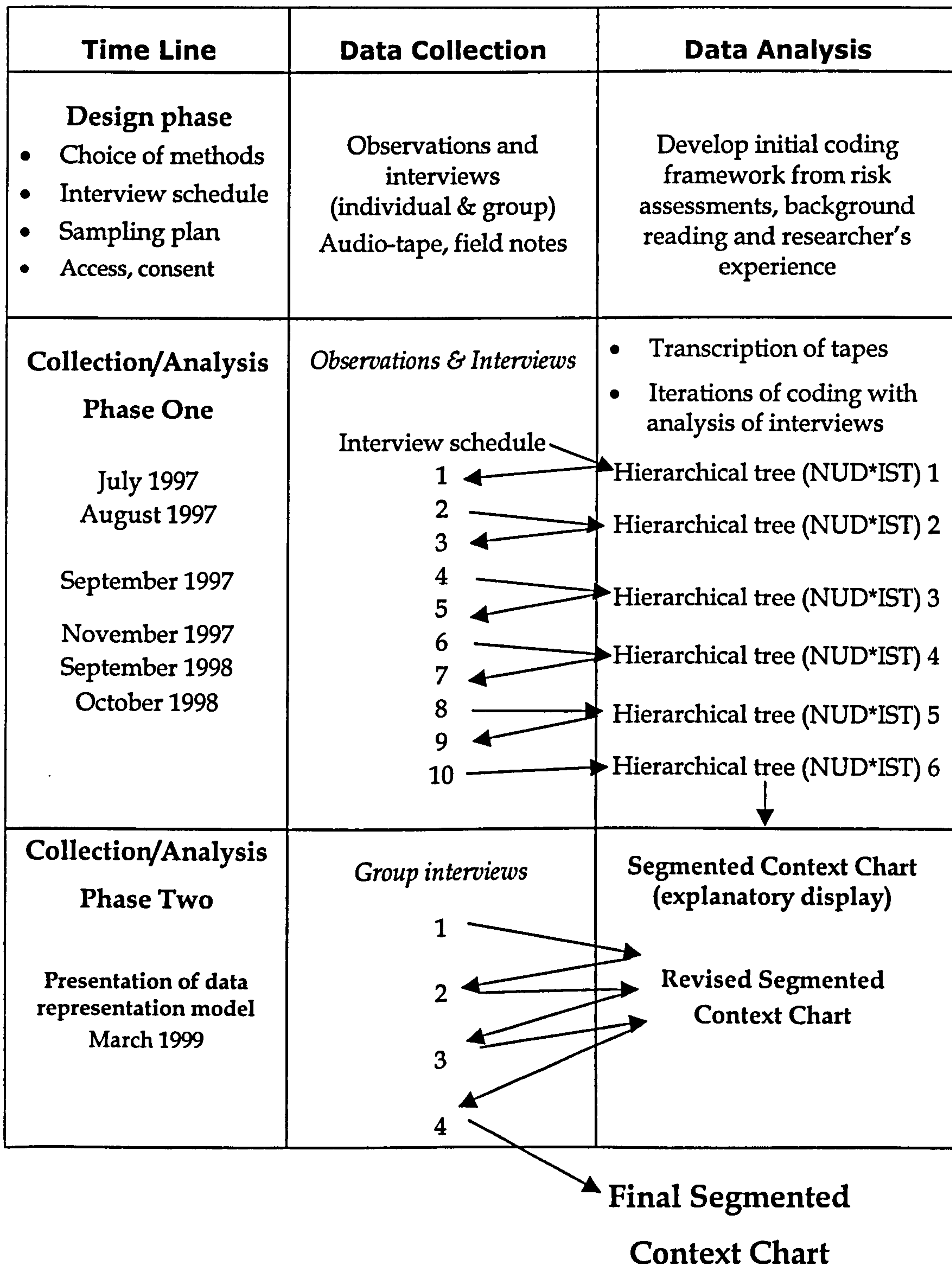


Figure 6.3 Suspended sensory integration treatment session



The interviews were audio-taped, transcribed and analysed, including developing a coding scheme, in an iterative process. Each interviewee was sent their transcript to both check for errors and offer an additional opportunity for confidential or sensitive data to be screened out. The transcripts were then imported into NUD*IST (Non-numerical Unstructured Data Indexing, Searching and Theorising) (Richards and Richards, 1995; Gahan and Hannibal, 1998) before being progressively summarised, coded and broken down into categories. NUD*IST generates an hierarchical tree format as the data description display (appendix eight). These have been redrawn in figures 6.4 – 6.9 to include the tree/node names and identification numbers.

At the start of the project I was using NUD*IST 3 (QSR, 1994), however NUD*IST 4, N₄ (QSR, 1997) was released in 1997 so the first six interviews were initially coded in version 3, and then recoded in N₄ during the summer of 1998.

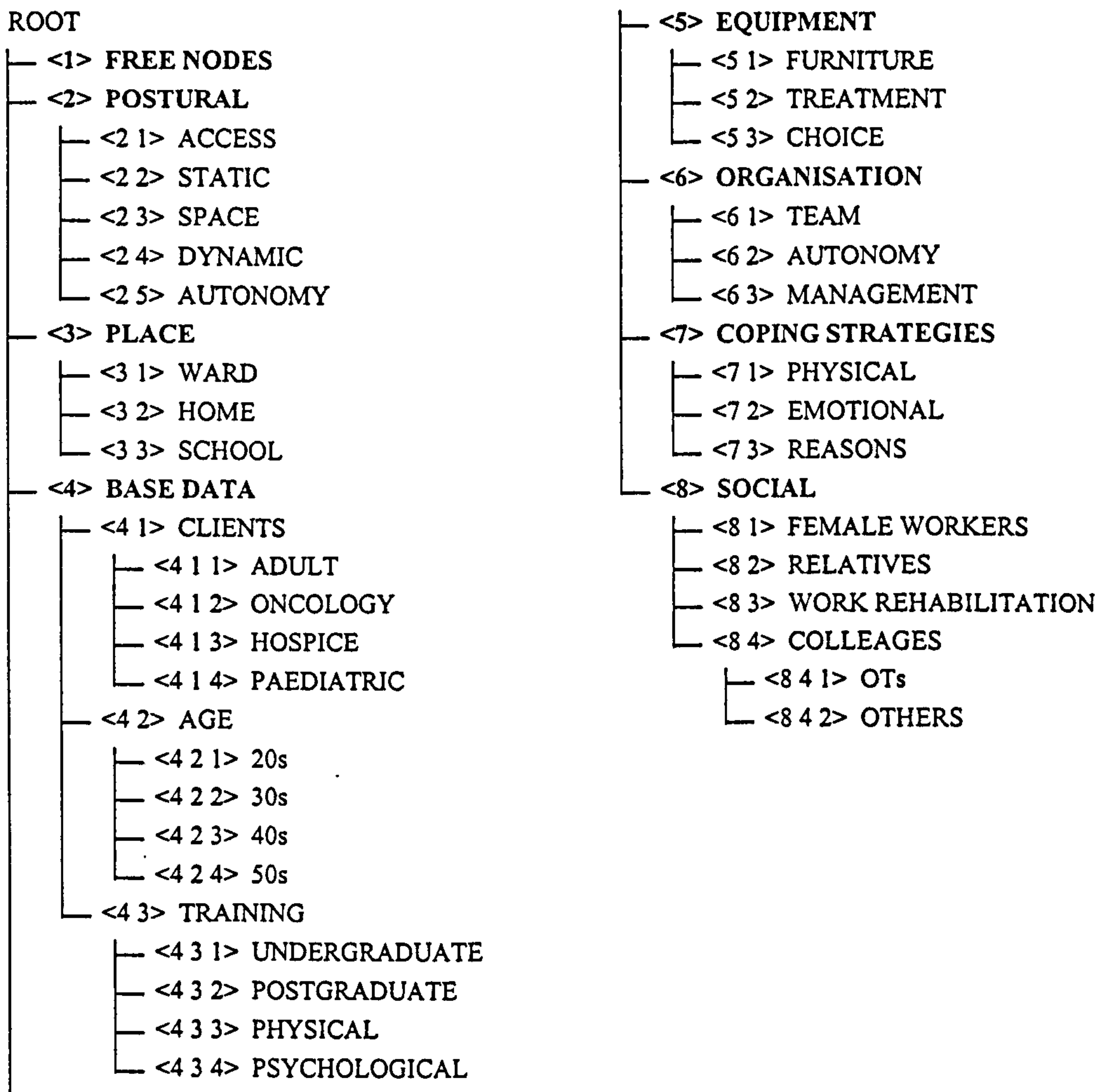
6.4 Analysis and findings

The findings are presented firstly using the format of the hierarchical trees (figures 6.4 - 6.9) and then secondly using the thematic conceptual matrix (figure 6.10) and finally with the explanatory display (figures 6.10 and 6.11).

6.4.1 Hierarchical trees

The first hierarchical tree gives more detail of my preconceptions from figure 6.1 showing my experience and knowledge in the area.

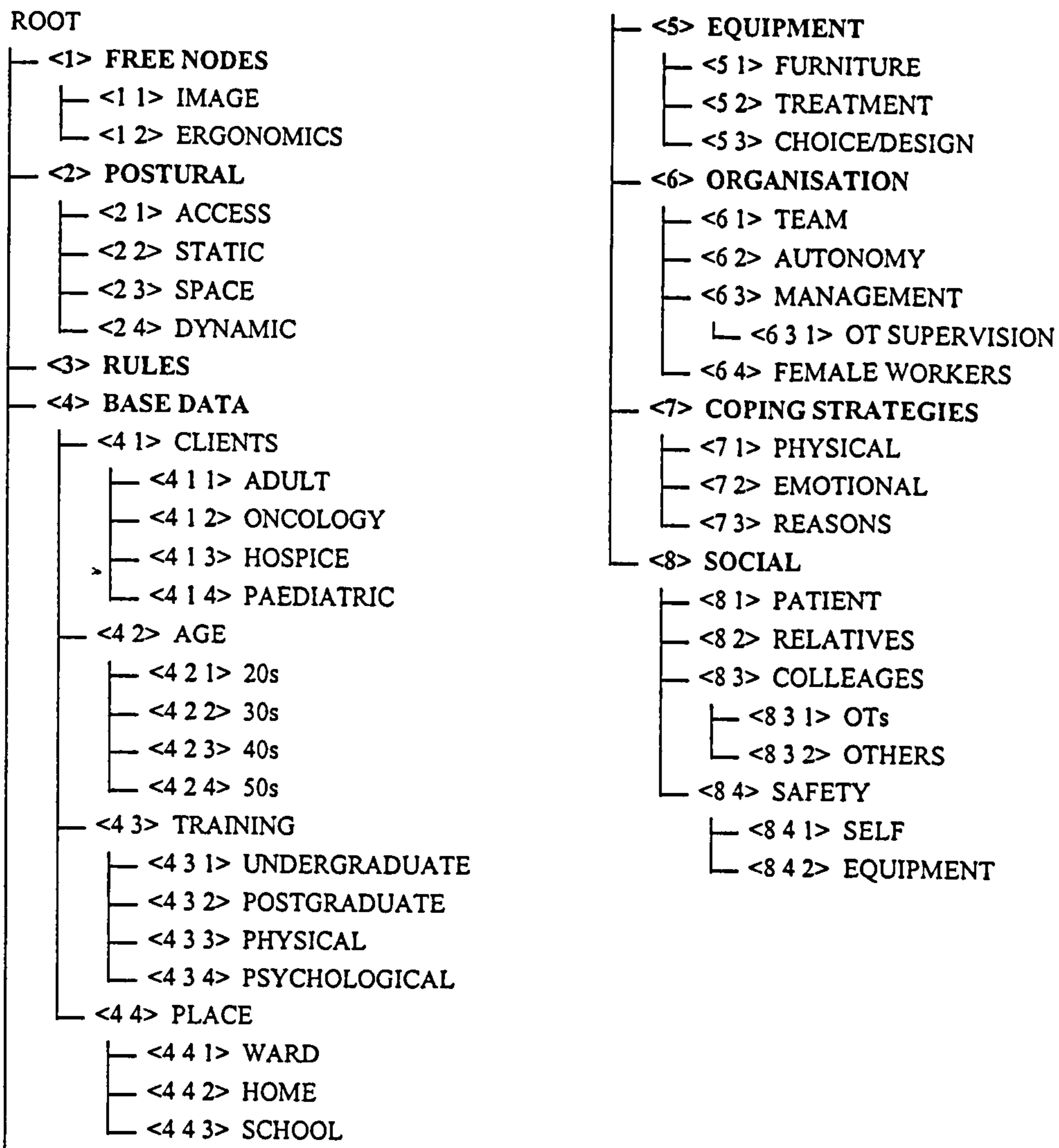
Figure 6.4 Hierarchical Tree One



The second tree was produced after two interviews. Two free nodes have been coded under tree <1> relating to professional image <1 1> and the use of ergonomics <1 2> in occupational therapy. Data in node <1 1> were taken out of this case study, and are developed and written up separately (Hignett 2000a).

The node for autonomy was taken out of the postural <2> tree in figure 6.4 (relating to autonomy in choosing their working posture) and moved to the organisation tree <6> to include wider issues of autonomy of working.

Figure 6.5 Hierarchical Tree Two



Tree <3>, place, was attached as a node to the base data tree in figure 6.5, and replaced at <3> with a new tree, rules. This gave a location to code any issues being raised with respect to legislation as well as professional and local procedures.

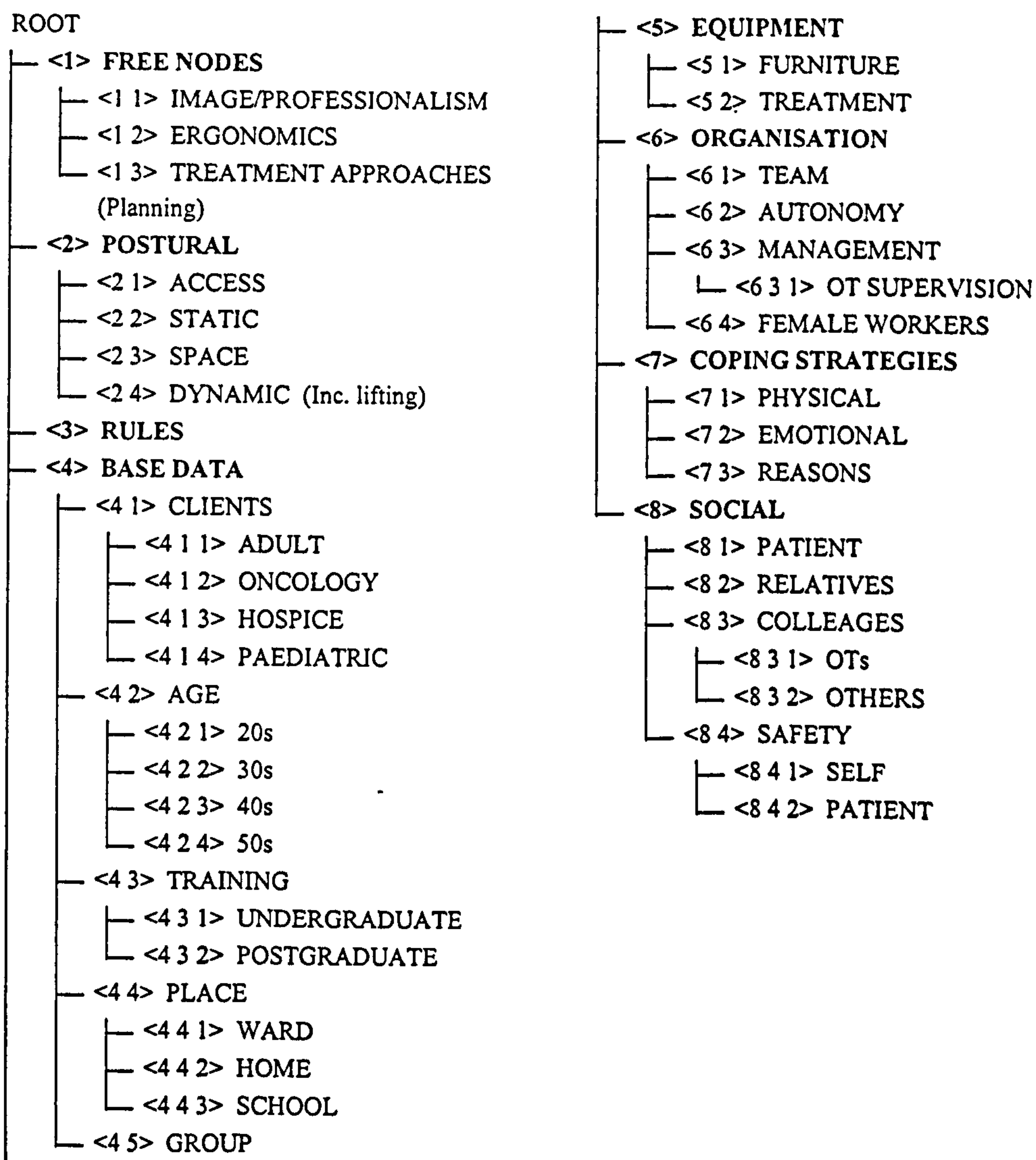
The node for female workers <8 1> was moved from the social tree <8> in figure 6.4 to the organisation tree <6> in figure 6.5. An additional level, <6 3 1>, OT supervision, was added. This was used to code data referring to a departmental non-appraisal system of personal and professional support, called supervision. The supervision system was introduced in the OT department in December 1996 and so was gradually embedding during the course of the project. It supported reflective practice as well as professional and personal problem solving.

The first tree (figure 6.4) has a node for work rehabilitation <8 3>. This was deleted in the second tree as it became apparent, from the first two interviews, that the interviewed OTs felt that they were rarely treating in order to facilitate return to work. An additional node was also added to tree <8> in figure 6.5, patient <8 1>, to code for the influence of the patient on the social aspects of work.

Another additional node was created to code data about safety, <8 4>. This had two sub-trees for issues relating to safety for the OT themselves or the patients.

Tree three (figure 6.6) shows the coding after four interviews. An additional free node was added, <1 3>, for treatment approaches, to include the alternatives considered when sessions were planned.

Figure 6.6 Hierarchical Tree Three



Interview three was a group interview (with three OTs) so an additional node was added to the base data tree <4>. The training node <4 3> was revised to remove two sub-trees. These had been included in the first tree to code for manual handling training at both undergraduate and postgraduate levels, but also to reflect whether the OT had followed a course which specialised in physical or psychiatric occupational therapy. It was found that all the interviewees had followed the physical route in training, and I was informed that OTs specialising in psychiatry tended to work in Social Services or Mental Health Trusts, rather than acute hospitals. The string search facility of NUD*IST was used to check this with no data being found to support the inclusion of a node. All the references were about the physical strand of training in occupational therapy.

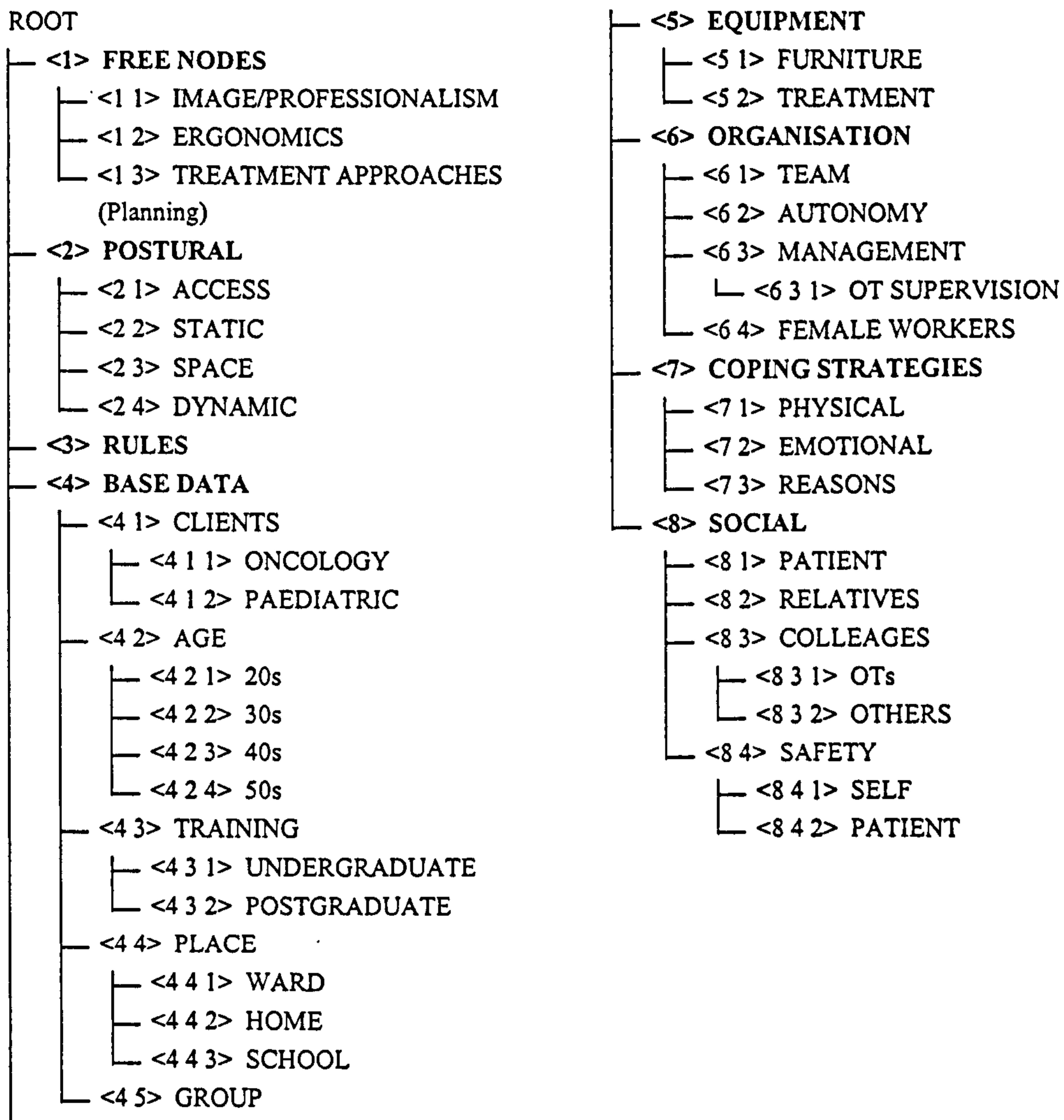
The node for the choice or design of equipment, <5 3>, was deleted as I found that data were being coded to the other two nodes in tree <5> so it was not being used.

Tree four (figure 6.7) was the final coding after the first round of interviews (6) in 1997. The only revision in comparison with tree three (figure 6.6) was in the patient group <4 1>, which was altered to be in line with the specialities for the interviewed OTs. As I mentioned earlier this was the stage at which I switched from NUD*IST 3 to N₄. The first six interviews were recoded in N₄, but no changes were found to be necessary to the tree structure.

There was a gap between interviews 6 and 7 of approximately 10 months. During this time the interview proforma was revised (appendix seven).

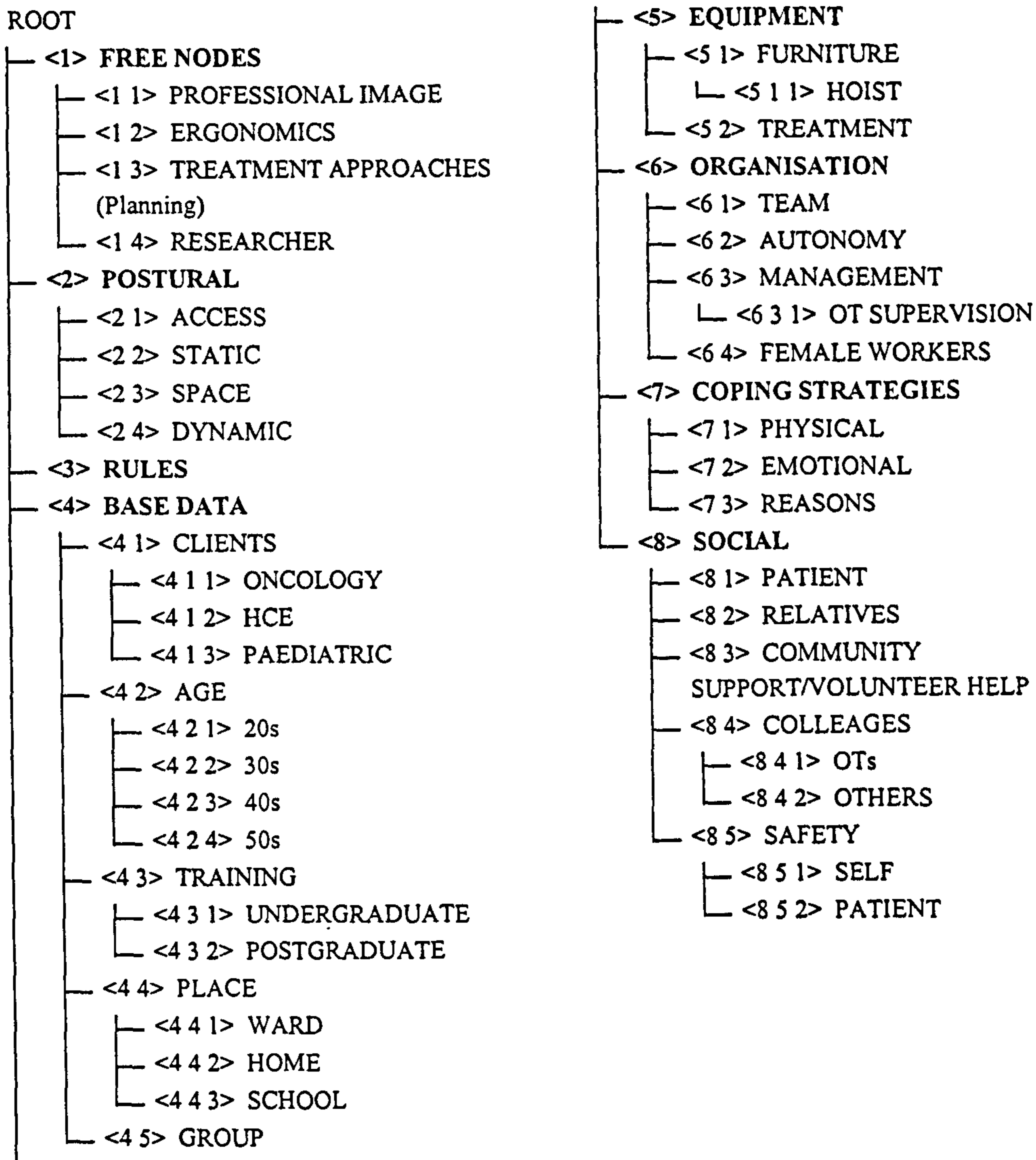
Tree five (figure 6.8) shows the coding after eight interviews. An additional free node was added, <1 4>, to code for my perceptions and to look for changes in the effect I was having on the study, for example in my description of the purpose, or how I was framing the questions. Minimal changes were found, mostly showing a tighter focus as indicated in the interview proforma.

Figure 6.7 Hierarchical Tree Four



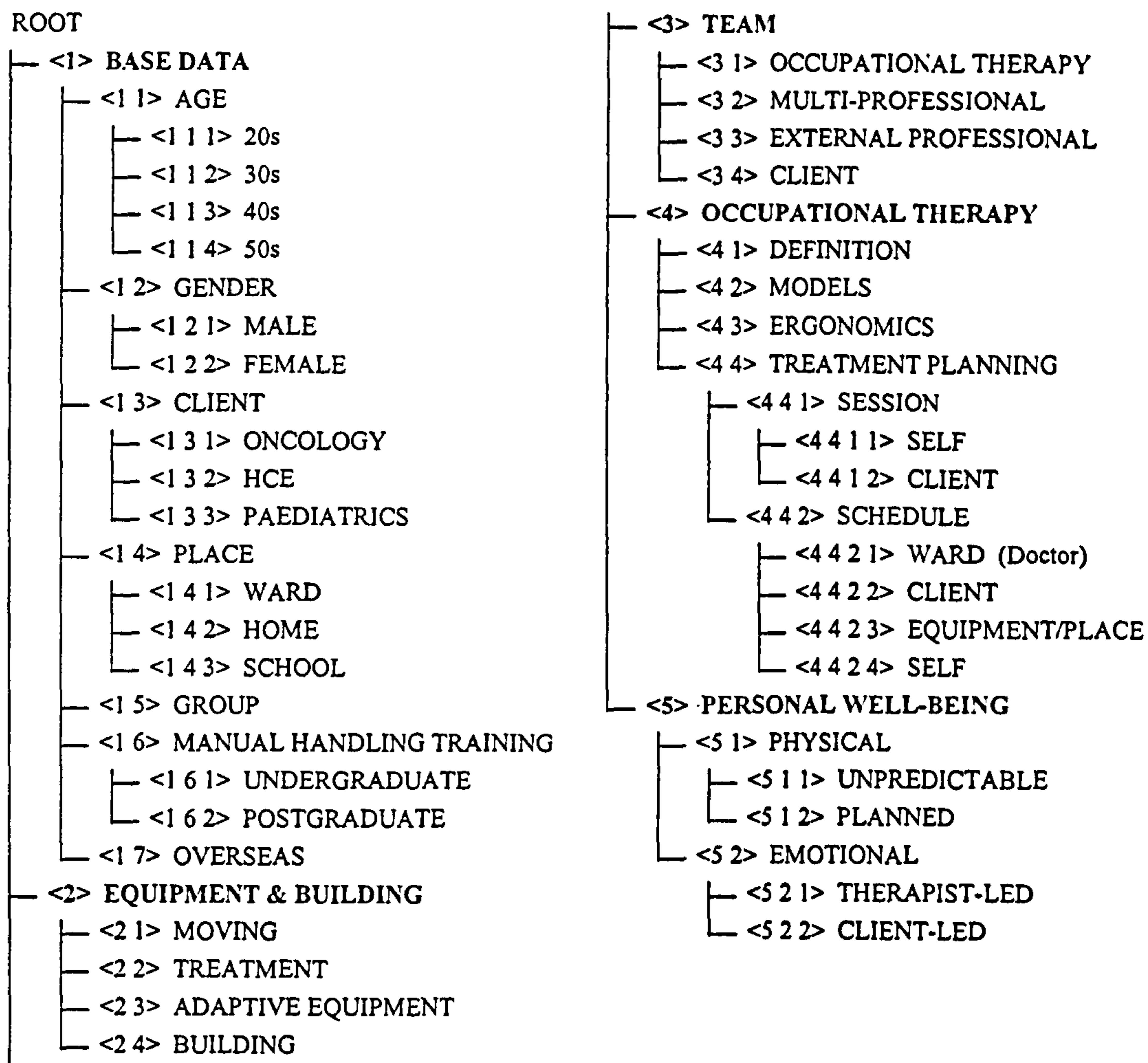
An additional node was added to clients, <4 1 2> to include the additional interviews with OTs working in Health Care of the Elderly (HCE). There were specific references to the use of patient hoists so these data were coded as a separate sub-tree, <5 1 1>. An additional node was also added for the social tree <8>. This allowed for the coding of data referring to the interface and interactions with community support and volunteer help.

Figure 6.8 Hierarchical Tree Five



In order to review the data and coding I used the string search facility in N₄ and searched the data for the topics listed below (search words indicated in bold). This search resulted in the final tree (figure 6.9) which consolidated the coding into the five main trees of base data, equipment and building, team, occupational therapy and personal well-being.

Figure 6.9 Hierarchical Tree Six



1. Gender (sex/ male/ female). A theme emerged from the data and so an additional node was generated in the base data <1 2>.
2. Treatment models (occupation/ ergonomics). To explore how the OTs planned their treatment sessions and whether any theoretical models were used. A new tree was generated, Occupational Therapy <4>, to include this node, <4 2>, as well as the nodes for treatment planning, professional image and ergonomics from the free nodes tree <1> in figure 6.8. The issues of autonomy and OT supervision from the previous tree, organisation <6>, were mostly subsumed into this new tree.

3. **Personal well-being (safety/ injury-musculoskeletal/ strenuous/ treatment handling/ patient safety/ personal contact/ emotional stress/ awkward questions).** A new tree was generated <5> in figure 6.9 to group the issues relating to personal well-being. These were separated into physical and emotional issues and drew together the data from the previous node on posture <2> as well as coping strategies, <7>, and safety <8 5>.
4. **Team.** This new tree <3> brought together the different interfaces for the OTs from the previous nodes about team under organisation <6> and the nodes for patient and colleagues from the social tree <8>.

This structure was used to develop the thematic conceptual matrix (table 6.2) and the explanatory displays (figures 6.10 and 6.11) to give a visual representation of the compressed assembly of information. This was used to present my interpretation at a series of four group interviews, involving an additional 16 occupational therapists, to verify and revise the thematic conceptual matrix and the explanatory display as well as seeking negative examples through member checking.

6.4.1.1 Base Data

The <1> 'Base Data' tree recorded information about the interviewees with respect to, for example, their experience, age, patient speciality and gender. Issues about gender included being a male therapist (with associated sexual stereotyping) and the therapist's relationship with female and male patients. For example, a chaperone was needed for a male therapist with a female patient but not vice versa.

'..cos I think some of the patients relate better to males, or just have different ideas, different ways of doing things. It is a very much a female dominated environment isn't it?'

(Gender <1 2 1>)

'you could have a 21-year-old OT or nurse going on to the ward and ripping the pyjamas off some elderly male whose, y'know, whose body has not been seen by anybody but his wife ... and that, somehow society says is ok'

(Gender <1 2 1>)

Interestingly neither the female nor the male interviewees gave examples of difficulties they had experienced with respect to manual handling issues during

washing and dressing activities. As both these tasks will require patients being fully or partially naked it would seem probable that the issues of dignity and modesty might have been raised. This lack of comment could be due to the interview proforma which did not specifically probe into this area but also possibly due to the fact that OTs facilitate patients carrying out these activities as a self-caring exercise (for both assessment and rehabilitation) in contrast to nursing staff who provide a full washing and dressing service.

6.4.1.2 Equipment and building

The second tree, <2> 'Equipment and building', was used to explore issues involving moving and handling equipment and treatment equipment as well as building design issues. These nodes were similar to those described in a previous study with nursing staff (Hignett and Richardson, 1995) with respect to space and equipment design, usability and availability. So it appears that the amount and design of space and equipment impacts on more than one staff group.

'The major problem I find with washing and dressing is you've got such a confined space, and when the curtain's round you can get trolleys bumping into you, and you're constantly walking around the bed, emptying bowls, trying to find the end of the curtain to get back in ..'

(Building <2 4>)

6.4.1.3 Team

Tree three, <3>, looked at the concept of teams, with the extension of membership from occupational therapy teams to within-hospital teams, external professional teams and patients and their carers.

'Cardiac Rehab, we've got an occupational therapist, a physiotherapist, a cardiac rehab co-ordinator, a pharmacist, a dietician, a nurse ... and an anaesthetist'

(Multi-professional team <3 2>)

This tree was used as the framework for figures 6.10 and 6.11, with the other concepts overlaid. This tree was trying to explore the within-hospital and interagency relationships and found evidence of the small and complex worlds of each professional group. Each group tended to have their own concerns and working relationships, so the perspectives of all the individual professions and agencies

involved seemed to have unique characteristics. Suchman (1994:23) described this as a phenomenon within large organisations as 'multiple social worlds, differentiated by geographical, organisational and professional locations'. This further emphasised the complexity of hospitals with respect to both the organisational and social structure.

6.4.1.4 Occupational Therapy

Tree four, <4> 'Occupational therapy', was used to code references to models of practice, definitions of occupational therapy and treatment planning.

Occupational Therapy is defined by Finlay (1997:3) as 'an holistic, problem solving process which involves the therapeutic use of activities to enable individuals to perform their daily occupations to a satisfying and effective level'. She went on to emphasise the role of the OT within a multi-professional team to provide the skills needed to look at all aspects of a person.

The profession of occupational therapy has been introspective for several decades. There are various models for both theory and practice and, more recently, some which integrate theory and practice. In 1974 Mosey proposed the biopsychosocial model for use in occupational therapy as an alternative to medical and health models. It recognised that people are 'biological, thinking/feeling beings who are members of a wider social community'. A more complex model taught in occupational therapy is the model of human occupation (MOHO) (Kielhofner, 1985). This model used systems theory with the individual conceptualised as an open system who interacts with, and adapts to, their environment.

As I mentioned in chapter five, occupational therapy has been supporting the use of a social model of clinical practice. Levenson and Farrell (1998) identified some of the obstacles that British OTs have faced in expanding their practice. These include the:

- Dominance of the medical model.
- Lack of understanding of the role of professions allied to medicine (including occupational therapy).
- Problems of resources, investment and re-investment training and professional development issues.
- Research and information issues.

They went on to say that even with these difficulties OTs had still moved towards the social model by recognising the need to conceptualise the value of occupation to health. Finlay (1997:17) summarised this move in two essential strands of OT philosophy. The first was around a client-centred perspective, rejecting the mechanistic view of humans. This was positioned within a qualitative (naturalistic) paradigm and rejecting positivist (reductionist) tendencies. The second strand was about the value of occupation and activity as a basic human need.

However when questioned about their use of theoretical models in practice the OTs did not seem to have transferred them from the text book into the hospital.

'as soon as we leave college they seem to go out of the window..'

(Occupational therapy models <4 2>)

Vickridge (1998) suggested that in practice some of hospital occupational therapy practice had disappeared and been replaced with a 'snapshot assessment of patients at the point of discharge to identify and prescribe services and equipment'. Yerxa (1987) also recognised the variable use of the multitude of models which have been produced about the theory of OT.

'I think models get ... bastardised, they're sort of made eclectic and we use, take bits of different, different models and use different ideas'

(Occupational therapy models <4 2>)

The treatment planning code was further expanded to look at planning of both individual sessions and as part of a daily or weekly working schedule. In particular, references to planning the sessions for the OTs needs were sought, both positive and negative:

'the whole thing about sensory integration is that it's child led, you go with whatever they choose, whatever they are doing. So that can dictate my session..'

(Treatment planning of a session for the patient <4 5 1 2>)

However, the OT may also be monitoring his or her own well-being and may modify the treatment accordingly:

'for example, if I have him over the ball and he's doing something that makes it really difficult or I feel, OK I'm going

to be uncomfortable if I keep him in that position then I'll just let go and let the y'know, I won't continue with what I'm doing ... or I will also stop if I'm just feeling tired out now and I have to stop..'

(Treatment planning of session for self <4 5 1 1>)

'since I had my bad back, whenever it was, 5 months ago, ... I've really changed how I do that and limited how often I do that'

(Treatment planning of session for self <4 5 1 1>)

6.4.1.5 Personal well-being

Finally, tree five <5> looked specifically at personal well-being (both physical and emotional) and was used to code for issues around unpredictability of patients or event and planned physical activity. Most of the data for planned physical activity <5 1 2> overlapped with the previous section <4 5> so was included in section 6.4.1.4. I found this a difficult area to code because each situation could present quite a different scenario, with each requiring a on-the-spot decision to be made:

'you're in a position where you've gone out to do a home visit, the patient has assured you that their access is fairly level, it turns out that it isn't level at all ... and you're in the middle of [the town] or, do you just turn round and come home'

(Physical well-being, unpredictability <5 1 1>)

'and me at only 5'1", y'know I do panic sometimes if I've got a really big tall patient that I've got to work with, y'know I sort of fear, falling on me or whatever'

(Physical well-being, unpredictability <5 1 1>)

Emotionally unpredictable patients could also present a problem which resulted in manual handling risks:

'I've worked with people with behavioural problems, which I guess is, at time can be a bit intimidating, and sometimes even frightening'

(Emotional well-being, patient-led <5 2 2>)

There was very little literature specifically about manual handling risks in occupational therapy practice, most of the publications related to nursing staff (Hignett, 1996b).

6.4.2 *Thematic conceptual matrix*

For the second stage of analysis I have used a thematic conceptual matrix (Miles and Huberman, 1994:131) to explore the data with respect to the coping strategies. This was set out as a two-way grid (table 6.2) to look at specific residual problems relating to musculoskeletal risks of:

1. Unpredictability of patients' behaviour (physical and mental) and home visits.
2. Moving equipment (including delivery and fitting).
3. Treatment handling.
4. Owned space.

These were reviewed from the final tree and the data into four levels of:

1. Micro – within OT profession and department (technical).
2. Meso – multi-professional (political).
3. Macro – external professional (political).
4. Patient/carer (cultural).

The matrix was used in conjunction with the explanatory display for the four member checking group interviews. There were changes to my interpretation, and the explanatory display after each interview which will be discussed in the next section.

Table 6.2 Thematic conceptual matrix

Problems	Micro	Meso	Macro	Patients/Carers
	Within OT profession / department (technical)	Multi-professional (political)	External professional (political)	Non-hospital property (cultural)
1. Treatment Handling Unpredictability of: (a) Patient behaviour (physical and mental) (b) Environment	Within profession - guidelines. Plan sessions and schedules for own abilities	Agreement between therapists, professional guidelines	Negotiate standards. Professional support for interagency standards	
2. Inter-professional communication Unpredictability of (a) Patients behaviour (physical and mental) (b) Environment	Assessment (a) Eliminate risks (access visits) (b) Minimise risks	Different models of practice Different professional guidelines Bed pressure (for discharge)	Interagency communication Standards Expectations Joint risk assessment frameworks	
3. OT Department (a) Owned space (b) Moving equipment	(a) Limit activities to suitable and safe space Plan for self as well as patient (b) Appropriate equipment	Wards etc., familiarity with working practices, equipment. Male/female issues Assistance	Agreed standards Pathways, e.g. fitting equipment Compatible equipment Shared Home Loans Store ? Professional guidance for assessment in other properties	

6.4.3 Explanatory Display

The intention of the explanatory displays (figures 6.10 and 6.11) was to give a diagrammatic representation of the themes at explicit stages of a patient's referral pathway in the context of the teams interacting with the OTs, using the framework from tree <3>. This display led to a clear representation of relevant parties in relation to the outstanding risks. Figure 6.10 shows the first explanatory display. The major modification occurred after the first interview. Subsequent changes, following the next three group interviews, were mostly to the grouping of issues and to show additional communication rather than the actual content, so only the final display is shown (figure 6.11). This is intended to show that saturation had been achieved for data collection as no new issues were raised during the final interview.

The final display (6.11) was published in Hignett 2001b and further reported in Therapy Weekly (2001). I have since been contacted by OT managers from other hospitals expressing an interest in using this framework for their own risk assessment process.

The description of the chart will start in the hospital segment, where the patient enters the system, and then follow through the interactions in the segments for the OT department, external contacts and finally the carers.

Figure 6.10 First Explanatory Display

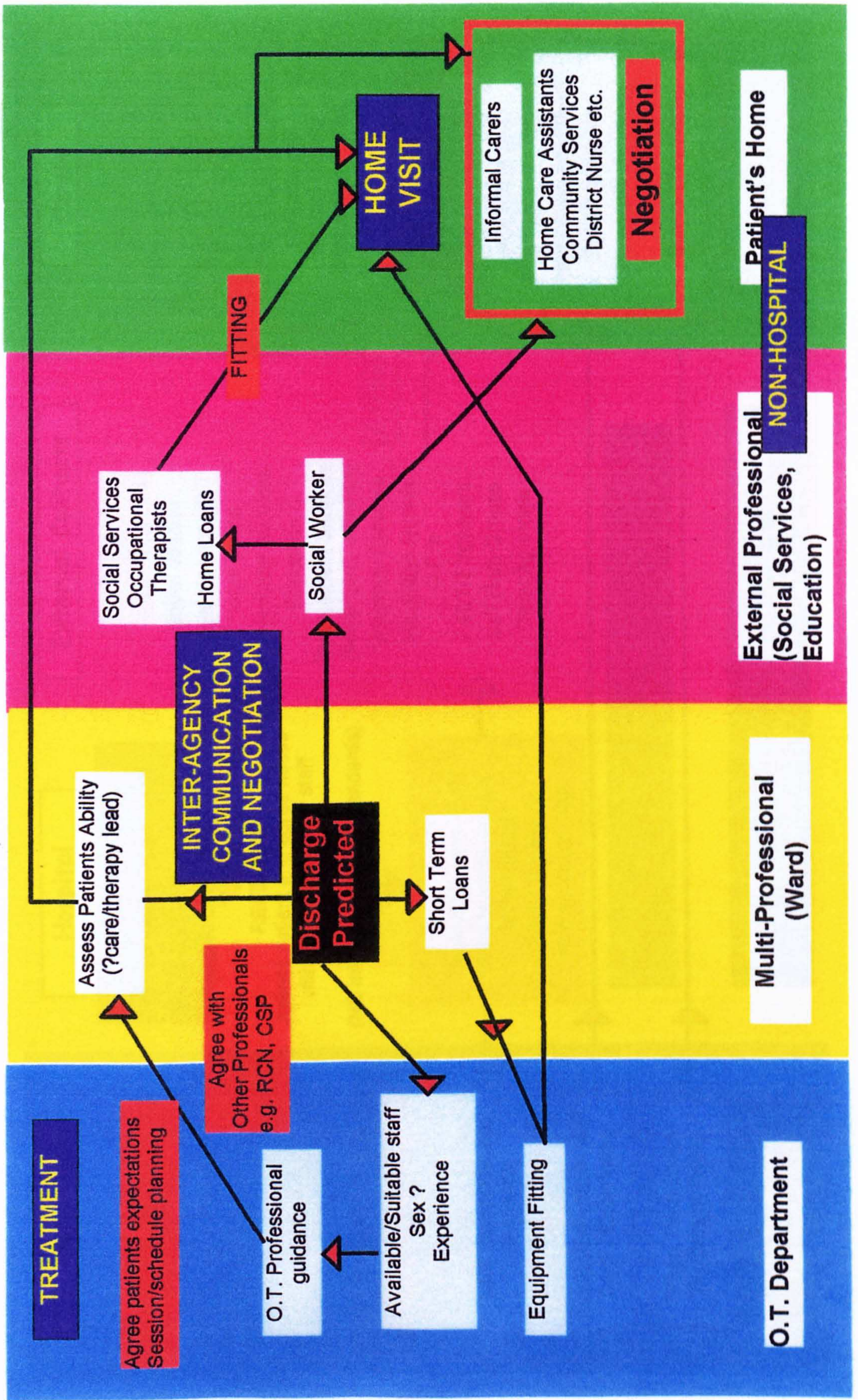
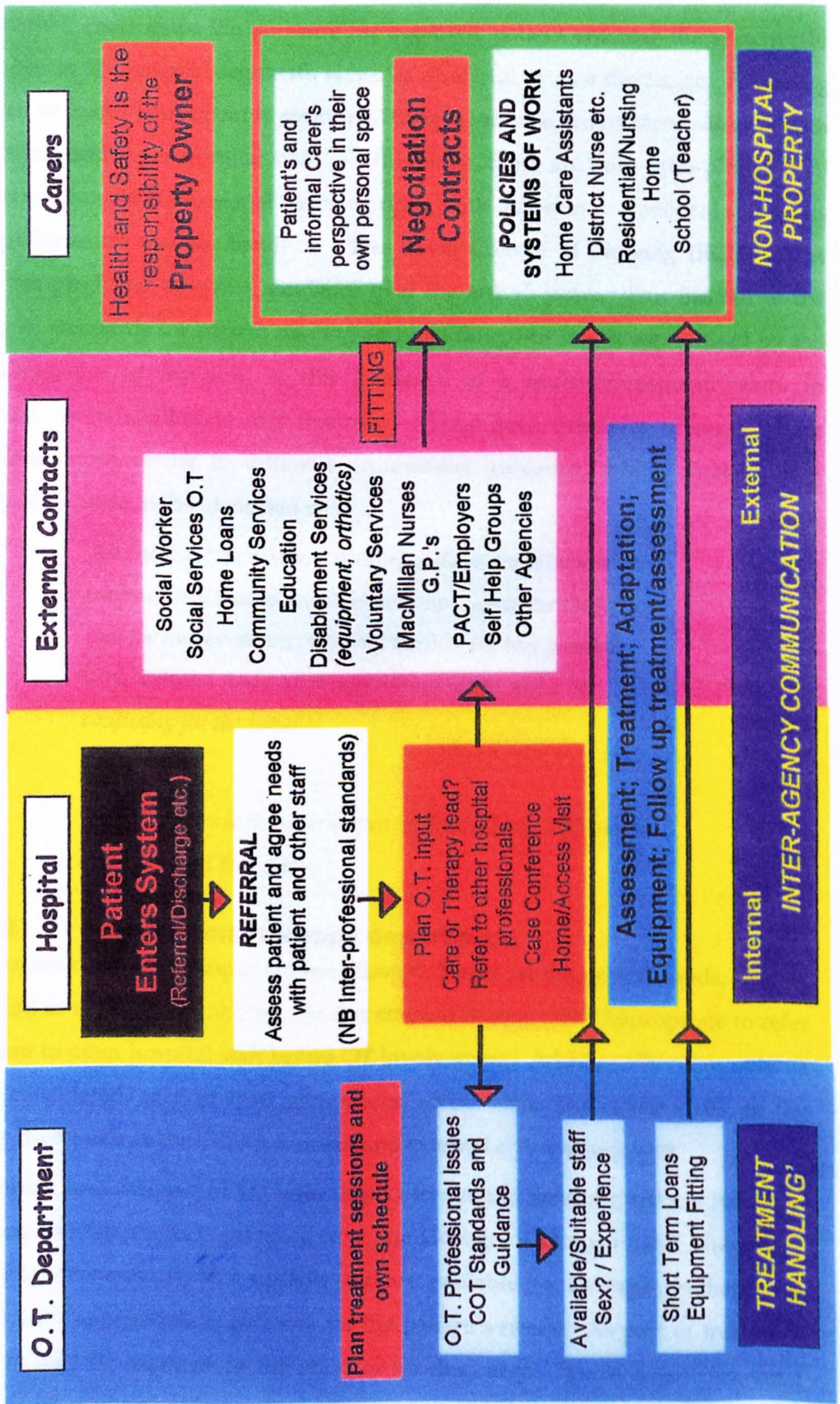


Figure 6.11 Final Explanatory Display



6.4.3.1 Hospital

The context chart maps the pathway for a generic patient entering the system (the black box in the hospital segment), either as a referral or as a discharge. Following referral, an initial assessment is performed to agree service provision needs with both the patient and other hospital staff. At this stage, there are both intra-professional and inter- or multi-professional teams working with differing professional standards and guidance on manual handling. The Royal College of Nursing (RCN/NBPA 1998) has produced extensive guidance over the last 15 years. This has led to the setting of standards for patient moving and handling, but issues were raised by the OTs about the applicability of this guidance to a multi-professional team, in particular for rehabilitation and treatment. They gave examples of cases where difficulties arose owing to different professional guidance, which resulted in a perceived increase in the identified risk:

'we try to get them [the patients] to do as much themselves whereas they tend to put their arms up ... give me the feeling that the nurses are not handling them in the best possible way. Which I find a bit disappointing really, and a bit confusing for the patients'

'social workers have never helped me lifting [wheel]chairs in and out ... [of the car]'

6.4.3.2 Occupational therapy department

The occupational therapy input is then planned, based on the agreed needs. It may be care-led or therapy-led, or both. At this stage, it is sometimes appropriate to refer the patient to other hospital staff before OT involvement. Additionally other options may be considered, such as case conferences, access visits and home visits, so the pathway diverges into the OT department and external contacts segment.

The planning and delivery of OT with respect to manual handling risks is based on professional standards and guidance from the College of Occupational Therapists. This may involve ensuring that suitable staff are available (for example, to chaperone or assist) with appropriate experience for the patient's needs. As part of treatment equipment may be required on the ward or for discharge. It was noted that there seemed to be a geographical pattern for equipment provision, which introduced

complex management problems with respect to equipment provision and fitting where patient crossed regional boundaries (for example, for heart surgery patients). The generic risk of *treatment handling* was allocated to the OT department segment because it was felt that there needed to be locally developed standards which could be used for communication with other professionals and carers, both internal and external to the hospital.

6.4.3.3 External contacts

The external contacts segment attempts to show the range of external contacts that may be involved in meeting a patient's needs, so the generic risk of *inter-agency communication* crosses the hospital and the external contacts segments. In particular, the inter-agency roles in the provision and fitting of equipment were repeatedly identified as a risk.

6.4.3.4 Carers

The carers segment attempts to bring together issues under the generic risk of *non-hospital property* and refers to the responsibility of the property owner to provide a safe working environment. This responsibility is clearly defined under the Occupiers Liability Act 1957 and 1984 (Dimond, 1997:123). The non-hospital premises included private homes, residential and nursing care, clinics, development centres and schools. The complexity of the risks increased with the number of agencies and premises. This confirmed the need for established and communicated criteria to both assess and manage the manual handling risks. There appeared to be considerable areas of mismatch, in particular between social services and the hospital, with anecdotal tales of difficult situations involving access for home visits and equipment fitting. Home visits were carried out for a number of reasons (Whitaker and Hornby, 1986). These included the assessment of a patient's ability to cope at home or for adaptive equipment, as well as the psychological benefits of showing the patient and carer how care would be achieved (or not) in their home environment.

The perspective of the patient and their carers was respected in the use of negotiation by the OTs to look at the options before planning the input of treatment, adaptations and equipment in private accommodation.

6.4.4 *Validity and relevance*

In chapters four and five the truthfulness (internal validity, section 2.3.3.1) of the data collection was discussed. This was enhanced by the separation of the data and indexing systems in NUD*IST which reinforced the distinction between the data and my analysis. It was also intended that by presenting the logic of both the study process (figure 6.1) and the analysis (figures 6.4 - 6.11), an audit trail is presented which contributes to the credibility of the findings.

Negative examples were sought through two routes. Initially by using a sampling strategy that encouraged the inclusion of extreme or disconfirming cases by interviewing, for example, male OTs with respect to the category 'gender'. At a later stage, in the group interviews, the explanatory display was presented to check the interpretation and representation as well as to seek further negative examples. This led to continuing minor modifications to the explanatory display following each of the four interviews until theoretical saturation was achieved.

The non-competing multiple realities of the OTs were highlighted in the initial collaborative process of risk rationalisation. This gives a reflection of the interactive character of the study and of the social context under investigation. An ethical stance of fully informed written consent, with details about the use of the data and the results, gives some evidence that the OTs being studied were treated and represented fairly.

The relevance of the study was established by exposing it to a wider audience in order to consider applications in other settings (Hignett, 2001b, *Therapy Weekly*, 2001). OT managers from other NHS hospitals have expressed an interest in applying this exploratory display to their risk management process.

6.5 *Discussion*

The case study rationalised the 63 risk assessments generated by the OTs into the three generic themes of: treatment handling, inter-agency communication and non-hospital property. Table 6.3 shows how the risks from table 6.1 are found in the three generic risks.

Table 6.3 Generic risks

Generic risks	Group one: general	Group two: paediatric
1. Treatment handling	Patient handling Occupational therapy department: access, room layouts Storage of equipment Changing rooms	Patient handling (treatment in the community) Splinting at school Use of suspended sensory equipment
2. Inter-agency communication	Equipment in the community (delivery and fitting) Short-term equipment loans	Children's centre - moving equipment Splinting at school
3. Non-hospital property	Home visits Getting equipment in and out of cars	Home visits Patient handling (treatment in the community) Children's centre - moving equipment Splinting at school

These three generic risks were then used as the basis for risk management.

6.5.1 Treatment handling

Treatment handling is a term which has been used to try and differentiate the activities of nursing and therapy staff. It is used to refer to manual handling activities involving rehabilitation (Hignett, 1994a) where the patient must be put into potentially dangerous situations in order to learn or relearn skills (e.g. walking). This contrasts with routine handling, or care handling, where the primary task will not be the relearning of motor skills. The patient issues from chapter five are found here, with examples of the intimate nature of the work (the need for chaperones) and patient expectations for the development of agreed care packages.

Treatment handling has been located in the OT department segment. This is the micro level for OTs where they have immediate control of the environment. To address this residual risk, local standards and criteria for practice have been developed. Appendix nine shows an example of the procedure for putting a wheelchair into a car. This has three levels where the patient needs no help, some help and a lot of help. A task-centred approach has been taken in order to offer a full

range of options to the OT so that they can make a context-based decision, which can be adapted to meet individual circumstances and patient needs.

6.5.2 *Inter-agency communication*

The second residual risk, inter-agency communication, represents both the meso and macro levels. Interactions within the hospital are at a meso level, where they have to participate in multi-disciplinary teams. To facilitate joint working and decision making, problem-solving workshops were held with OTs and physiotherapists in the hospital to explore their respective roles for treatment handling issues. The complexity of the inter-professional relationships was found within the hospital when case conferences were held to try and agree the treatment programme and care package for individual patients.

Externally, two actions have been taken forward. The first was to hold a regional workshop on treatment handling in November 1999. This identified a wide range of practices within individual tasks. To address these differences in practice a research project is now being carried out, using systematic review methodology (Hamer and Collinson, 1999), to establish an evidence base for patient handling tasks.

The second action was to explore the possibility of working with home care managers (social services) with respect to the risk assessment process for the provision of services in non-hospital property. An inter-agency county-wide (Nottinghamshire) manual handling group has been set up to try and establish common principles for patient (client/service user) handling tasks. This will draw on the task-centred approach developed within the hospital and results of the systematic review.

6.5.3 *External property*

The risks involved in the provision of a safe working environment by property owners in the carers segment were more complex. Some of these are subject to contracts, for example, education, other NHS trusts and social services. The OT manager has been negotiating within the bounds of the contract to try and address the manual handling risks.

For private accommodation, the level of unpredictability may result in OTs continuing to be exposed to unacceptable risks and this will need to be explored

further. The manual handling risks link in with other risks, e.g. lone workers and security/violence issues, so will need to be addressed in the broader context.

Unfortunately there will always be an element of unpredictability for manual handling activities involving human beings. I think that OTs need to develop further guidance in conjunction with, and supported by, the College of Occupational Therapists (1995) to reflect changes in both professional and manual handling practice.

6.6 Conclusion

The chronology of the case study within the overall thesis has allowed time for the recommendations to be further developed as shown in the discussion. This shows that the solutions were not completely unexpected, however the complex contexts within which the three generic risks are sited was unexpected. This probably contributes to the 80% effort required for implementation within ergonomics projects in the health care industry.

As an example of the use of qualitative methodology in the health care industry, this is a particularly complex example, as OTs work across many sectors. However this case study shows the sensitivity and flexibility of using qualitative methodologies.

Chapter Seven

General Discussion and Conclusions

*He tells her that the Earth is flat –
He knows the facts, and that is that.
In altercations fierce and long
She tries her best to prove him wrong.
But he has learned to argue well.
He calls her arguments unsound
And often asks her not to yell.
She cannot win. He stands his ground.*

The planet goes on being round.

He Tells Her.

Wendy Cope (Goodwin, 2000:68)

7.0 Introduction

My motivation for starting this thesis related to two areas of confusion which I was experiencing in my professional practice. These were identified in the introduction as:

1. How to choose amongst the array of methods and methodologies which could be grouped under the qualitative umbrella.
2. How the definition and scope of practice for ergonomics applied in the health care industry.

My approach to tackling these areas of confusion was shown in the onion model (figure 1.1). I plan to use this model as the framework for the discussion by starting

at the outside layer, the qualitative-quantitative debate, and then moving inwards to the occupational therapy case study at the centre. This will give a summary of the key points of the thesis before I go on to the second stage of the discussion by working outwards through the layers again to look at how the issues can be taken forwards. This will enable me to draw from the detailed case studies on occupational therapy and hospital ergonomics in the inner rings, back through the layers about the ergonomics in practice and the philosophy of ergonomics, and to finish up by placing ergonomics on the qualitative-quantitative continuum.

Finally I shall finish by giving my viewpoint about where this thesis is positioned with respect to current work in ergonomics. My recommendations are both general and personal: how I think qualitative methodologies should be incorporated into ergonomics theory and practice; and how my future work will aim to include the knowledge and experience I have gained by writing this thesis.

7.1 Focussing inwards: A summary

The two areas of confusion were developed into overall aims (each with certain objectives) and addressed in parts one and two respectively:

1. The exploration for, and development of, a theoretical base for the use of qualitative methodology in ergonomics.
2. To explore whether the practice of ergonomics in the health care industry is different to other areas of ergonomics, through the identification of generic characteristics and a specific case study.

Part one aimed to produce a clear picture of the historical qualitative-quantitative debate and from this to locate a relevant philosophical position for ergonomics theory and practice. Alongside this a new model for ergonomics emerged from the literature which included social, philosophical and emotional factors.

Part two moved the thesis on to focus on the health care industry, where the data from the first case study were analysed, to identify the characteristics of hospital ergonomics. These findings were integrated into the discussion for the second case study where common themes around the scale of the complexity of the organisation as well as staff and patient issues, resulted in the conclusion that there are unique cultural and organisational characteristics for the health care industry which must be taken into account in the practice of hospital ergonomics.

7.1.1 Part one: A theoretical foundation for the use of qualitative methodology in ergonomics

The objectives for part one were:

- To produce a clear picture of the qualitative-quantitative debate which has relevance for ergonomics theory and practice.
- To develop a model of ergonomics, including social factors, from the literature.
- To explore the use of qualitative methodology in ergonomics.
- To develop a representation model of the relationship between ergonomics theory and practice.

To link the literature reviews in chapters two and three I searched for examples of the use of qualitative methodologies in both ergonomics and the feeder disciplines of ergonomics: life sciences, organisational management, product and engineering design and psychology. A limiting boundary had to be established for the literature search and so newer disciplines (e.g. human computer interaction) which have developed from ergonomics (in conjunction with other disciplines), have mostly not been included in this thesis. This creates an opportunity for future work to seek examples of the use of qualitative methodologies in other disciplines which have a relationship with ergonomics.

Chapter two set the scene philosophically by establishing that there has been an on-going debate between two poles (represented here as qualitative-quantitative) for over two thousand years. The dichotomy is not resolved in this thesis, but what is achieved here is a proposal for a theoretical foundation for the use of qualitative methodologies in ergonomics practice. One important observation from chapter two is that this debate has been going on in other (older) disciplines (e.g. psychology) for some time and, as ergonomics draws in from feeder disciplines, it would seem appropriate to enter into the discussion at a more mature stage by reviewing the literature and developing a theoretical position to support the practical application of the various methods. The debate is likely to continue as shown by the parallel, and perhaps yet to be discussed, use of the terms of subtle and transcendental realism.

Subtle realism describes the middle ground position coming from a qualitative perspective. This offers the possibility of phenomena existing independently of multiple, non-competing descriptions about them. Transcendental realism gives a

position within the realism school of thought which allows for both the possibility of multiple realities, and a difference in descriptions of reality and reality itself. They seem to represent a similar philosophical position but no literature was found which compared commonalities and contrasted differences in their interpretations. By using this middle ground there is a feeling of non-extremism; that there is no need to sign-up to a particular school of thought (e.g. discourse analysis) in order to carry out systematic qualitative research and produce robust findings.

Chapter two also gave me an opportunity to develop my operational framework for using qualitative methodology in ergonomics. A generic process for doing qualitative research was described (section 2.3), supported by the middle ground philosophical position described in the previous paragraph, which used the three steps of data reduction, data display and conclusion drawing. This pragmatic process was used for both case studies with different aspects being emphasised as appropriate to the intellectual question in the case study and the resources available. For example, a more detailed and systematic sampling strategy was used in the ergonomists case study, and member checking, as a third data collection phase, was used in the Occupational Therapy (OT) case study.

Chapter three took an overview of the development of the discipline of ergonomics, looking at the eight dimensions of: age of the discipline; background; education; major applications; client group; route of involvement; focus; and process. These dimensions gave a framework for both the definition of the discipline, from the International Ergonomics Association (IEA, 2000), and scope of practice of the profession. The scope of practice was further explored in the case study in chapter four, where a lack of unity was identified which could be the result of the differing national patterns of development. For example macro-ergonomics has been developed in the USA to move ergonomics practice from a micro to a macro level, whereas in Europe this was achieved many years earlier with an integration of the sociotechnical systems theory. The use of the qualitative-quantitative continuum to locate the organisational theories (Grint, 1998:114) was the first of several continua which have been used throughout the thesis. These continua are summarised in figure 7.1.

A different view of ergonomics was found to be held by product designers and engineering designers. Some product designers wanted more qualitative input from

ergonomics saying that it was too quantitative, whereas engineering designers felt that ergonomics input was already too qualitative ('woolly') and wanted more quantitative data. This shows the role that ergonomics has as a mediating discipline and profession by taking a cross-border view.

Ergonomics has developed, and continues to develop, a diversity of methods and approaches to tackle the problems found in transferring laboratory-generated theory into practice. The approaches outlined in chapter four are macro-ergonomics, participatory ergonomics, exploratory sequential data analysis (ESDA) and francophone ergonomics. In terms of organisational theories it seems that macro-ergonomics uses systems theory; participatory ergonomics uses a human relations model; ESDA takes an inclusive position by offering the possibility to use more than one tradition; and francophone ergonomics takes a more interactionist position, possibly fitting the category of actor networks by allowing for the existence of multiple networks or representations. These positions are shown on figure 7.1 in the context of a very simplistic representation to summarise many schools of thought, including the perspectives described by the designers, product and engineering, and two extreme positions in psychology. It also shows the relative position of ergonomics with respect to the four levels of sciences as set out by Cameron (2000). She described ergonomics as having incorporated knowledge from the physical, life and human (to some extent) sciences but not yet including input from the more qualitative aspects of the human sciences or spiritual sciences.

Figure 7.1 Ergonomics on the qualitative-quantitative continuum

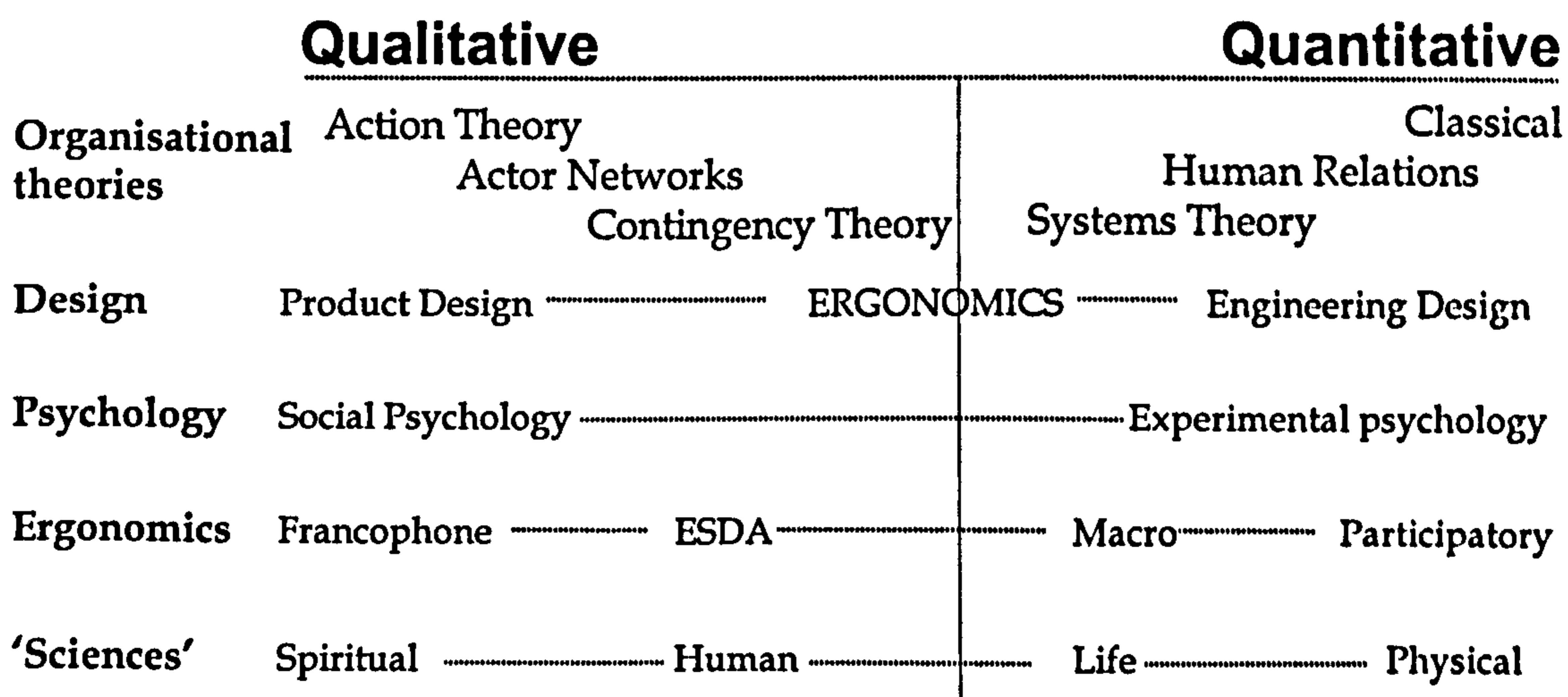


Figure 7.1 uses the continuum for the organisational theories to anchor the qualitative-quantitative positions. Contingency theory is in a middle position incorporating both macro (structural) and micro (interactional) approaches. It allows for the representation of the organisational characteristics to be altered to meet the situational circumstances and may be a good model to use for the informal structure, or culture, of the organisation. Helmreich and Merritt (1998:109) gave a comparative description of four disciplines working in the area of organisational culture, saying that 'business schools tend to define organisational culture as a phenomenon which can be managed and manipulated ... sociologists and anthropologists adopt a more ethnographic approach stressing that each organisation is a unique, historically derived, subjective phenomenon beyond simple manipulation ... and organisational psychologists with an empirical background seek to reduce the phenomenon to its subcomponents'. This creates an interesting position for ergonomics, in drawing from the above feeder disciplines, and, I believe, is part of the reason that ergonomics has been slow to position itself with respect to its philosophy.

The first part of the ergonomists case study was presented in chapter four. It explored: the interface between ergonomics and other disciplines; perceptions of ergonomics (scope and application); and the role of qualitative methodologies in ergonomics. It built on the philosophical position from chapter two, and explored new models of ergonomics. My interpretation resulted in a new representational model (figure 4.9) showing the relationship between ergonomics theory and practice as two environments (internal and external). These are linked via a continuous circle (or iterative loop) passing through both the definitions of ergonomics and the methodologies used (qualitative and quantitative). The model represents the views of all the interviewees by taking an inclusive position. Two levels of data collection were completed: the initial interviews and a limited consultation about the interpretations with four of the interviewees.

I was surprised at the apparent difference in the attitudes of the ergonomics academics and practitioners. The case study found that qualitative methodologies were being used in both internal and external environments, but more for practice than to generate theory. In both groups there was a lack of rigour in the use of qualitative methods. The practitioners mostly worked in the centre of the qualitative-quantitative continuum, and used, invented or stretched methods to achieve solutions by taking an inclusive perspective (*'it is what you do, not the way that you do*

it', summary note from a contact data sheet after interview 1). In contrast the academics seem to be more aware of the qualitative-quantitative debate which resulted in a more exclusive position by tending to use methodologies at the polar extremes of the continuum.

7.1.2 Part two: The characteristics of hospital ergonomics and a practical example

Part two focussed on the health care industry starting with an exploration of the characteristics of hospitals. These were found to include the complexity of the organisation with respect to the multiplicity of management lines and the intimate and emotionally charged climate produced by the nature of the work. The objectives for part two were:

- To explore whether there are characteristics of hospitals (organisational structure, workers, culture) which set the industry apart from other industries.
- To discuss these characteristics in the context of the literature and data from the ergonomists case study.
- To use a practical problem (manual handling risks in occupational therapy) as a case study to show the value of using a qualitative approach to identify new ideas and creative solutions in a complex situation.

Chapter five presented a secondary literature review to look at the use of ergonomics in the health care industry. A ten year hand-search from six sources found that 3% of the papers were about health care workers. This seems low given that the National Health Service (NHS) is the largest civilian employer in Europe and that the health care sector is a major industrial employer in most western countries. Although most of the papers were about nursing staff, the largest staff group, a disproportionate number of papers were about medical staff which probably is an indication of their relative status, or power, in health care. Most papers used quantitative methodology with a high percentage using a descriptive analysis, taking the middle group position in the methodologies continuum.

The data on hospital ergonomics from the case study were categorised and presented in three groups: organisational, staff and patient issues. The organisational issues included both the size and complexity of the National Health Service (NHS). The complexity of the organisational structure related to both the external political

agenda with repeated restructuring (approximately every five years) and the internal management structure. Three hierarchical lines were identified in the internal management structure. There is an administrative line, a professional line (for the individual professional groups) and a clinical management line which is patient-focused and usually led by medical staff.

The literature suggests that health care still has a more traditional organisational structure than some other industries, with classical models of scientific management still being in evidence for both professional and non-professional staff. Another difference found in the case study was the relative effort needed to implement recommendations (80:20) rather than understand or solve problems in comparison with other industries. Two key difficulties were identified in describing hospitals in terms of organisational theories. These were the physical openness of the organisation (with access described as being like 'a railway platform'); and the responsiveness of the service to individual patient needs. An inherent flexibility was needed to respond to individual medical, cultural and social needs. During the 1980s the emphasis was on efficiency, with services being broken down into individual components to allocate costs as part of an internal market. This is currently changing with more of an emphasis on quality and evidenced-based practice.

The high percentage of women workers (over 78% of the workforce in the NHS being female) was not commented on in any detail by the interviewees. In general they felt that information about both female workers as a population group and traditional female employment sectors was very limited. The complexity of the organisation structure laid the foundation for the second of the staff issues, the multiplicity of professions. Two professions (medicine and nursing) were discussed in some detail. Nursing was traced historically back to the military and the church with a residual influence identified on the professional identity and probably contributing to the hierarchical organisational structure. One of the interviewees commented on their surprise at starting work as a hospital ergonomist and finding a 'forelock tugging' culture still in evidence. This historical relationship between medical and nursing staff was also seen with respect to management position (clinically and administratively) in the hospital. Medical staff can have a disproportionately high level of authority with membership of decision-making committees whilst only spending a few hours each week in the hospital. Another difference, which impacts

on the next theme, is the model of care used by each professional group, with nursing moving away from the diagnostic medical model of care.

The patient issues incorporated three dimensions associated with the caring role. These were the type of work, expectations and possible outcomes. The work tends to be dirty and emotional, with a professional subculture to allow the handling of other people's bodies. This subculture was linked to a 'coping' attitude whereby staff put the patients' needs and well-being before their own. The change in patient expectations (from being apologetic through to demanding their rights under the Patients Charter) is mirrored in a changing model of care from paternalistic to partnership and a move towards a more social model with the emphasis on evidenced-based practice for all professional groups

The final chapter, chapter six, gave an example of using a qualitative approach to tackle a complex problem in a hospital. The Occupational Therapy (OT) department had identified numerous manual handling risks and, as they are a complex department with extensive internal and external interactions, it was felt that an in-depth exploration of their problems would be needed before any recommendations could be made. A segmented causal network was used to map the interactions for both the OTs and patients. This enabled the three levels, micro (OT department), meso (hospital) and macro (external contacts, carers), of interactions to be shown in the context of the multiple connections needed to provide a flexible, responsive service which can be adapted to individual patient needs. The 63 risks were rationalised into three generic risks of: treatment handling; inter-agency communication; and non-hospital property. For each risk action plans have been put in place to eliminate, or further the minimisation of, the risk. This includes reviewing OT treatment techniques and writing procedures for residual risks; agreeing common principles for manual handling between professional groups (internal) and external agencies; and finally setting up minimum standards (through contracts and negotiation) for safe working practices in non-hospital properties.

Although the OT study was completed before the ergonomists case study, there are commonalities in the three identified themes from the hospital ergonomics data of organisational issues, staff issues and patient issues. The first of these is the complexity of the organisational structure. The three-tiered reporting lines found in the hospital ergonomics data (chapter five) from the ergonomists case study was also

evident in the OT case study. The OTs have professional management and administrative management, as well as interacting with nursing and medical staff to plan the clinical management of the patient. There is an additional level of organisational complexity for the OTs due to the multiple external inter-agency communications. The second area of staff issues is seen for the internal, within hospital, communications. In particular there was a need to establish agreed principles for manual handling assessment and techniques across the professional groups. The final area (patient issues) is again evident, with the intimate nature of the OT treatment and need for chaperones. The expectations of the patients were more obvious in their own home environments where the OT had to enter into local negotiations to achieve both a safe working environment and the delivery of their service.

7.1.3 *Contrasting parts one and two*

There are differences in the style and layout between parts one and two. The first was the location of the literature review, using a traditional format in part one and a contrasting, more interactive, style in part two. As the literature review for any project is on-going throughout, I found that it was easier to represent this by embedding it as in part two. This increased the focus on specific issues, and also tested the data more critically and stringently against the literature. It also helped to show the gaps in the data collection, and so drove the sampling strategy more overtly. I found embedding the literature in the analysis and discussion more challenging but feel that it has much to offer as an alternative approach for qualitative methodologies.

A second difference was my personal perceived position in the two case studies. For the case study on ergonomists I defined my position as 'studying up' whereby I perceived the interviewees to be more powerful than me (especially the academics). In contrast, in part two, my position was perceived to be 'studying down', as I am the expert ergonomics advisor in the hospital.

The time frame for the two studies was also different and to increase the trustworthiness of this thesis I gave an indication of the chronology as shown in the data collection interview dates. The occupational therapy study was completed first, which allowed more time to extend the data collection with group interviews to examine the findings. The feedback from these sessions, as well as reviewer's

comments from two journal submissions, were incorporated into the chapter. The second journal submission was successful and the case study has now been published (Hignett, 2001b) and reviewed in a national weekly magazine (*Therapy Weekly*, 2001).

Finally my influence on the two case studies has to be recognised. This is indicated by the level of detail in the conceptual frameworks for the two case studies. My past experience as a physiotherapist and 18 years experience in the health care industry resulted in much greater knowledge in the OT than ergonomists case study. I must also acknowledge bias in the analysis and interpretation of the ergonomists case study. I am a practitioner and inevitably I have felt more empathy with the views of the practitioners than the academics. This thesis has been an opportunity for me to learn about qualitative methodologies and put this into practice by carrying out the two case studies.

7.2 Developing new theory: looking outwards

To review the findings of the previous section I shall start at the centre of the onion model and work outwards.

The OT case study resulted in practical solutions which were used to tackle the identified problems. One question must be whether this outcome could have been achieved by other routes using different methods and even different methodologies. A starting point is to consider the design of the case study using quantitative methodology. The manual handling risks had been identified and simple first steps had been taken by the OTs to eliminate and minimise them. At the first brain storming session, in December 1997, the study was still exploratory: there was nothing to test or measure so a quantitative approach would not have offered any new ideas.

Once I had chosen to go down the qualitative route I could then have chosen a particular qualitative methodology. However, as I have indicated, I was uncomfortable with the array of methodologies and felt that a systematic approach to using qualitative methodology was more important than which philosophical school of thought I espoused, so the generic process described in chapter two was used.

The data collection methods were chosen and assessment criteria were put together with information from the risk assessments and my own knowledge. This resulted in

the four key areas for exploration (postural, environments, organisational/cognitive and social). Various methods could have been used to investigate each of these areas (e.g. postural analysis to obtain a risk rating for specific tasks), but I felt that there were wider issues which needed exploring. My own experience as a therapist and the previous exploratory studies (Hignett, 1996a; Hignett and Richardson, 1995) led me to put my efforts into finding out if there were underlying factors which needed addressing in addition to simple issues of space and workplace layout.

One of the operational aspects of using a qualitative approach is the identification of the impact of the researcher. It is probable that someone else (with a different background and experience) would have asked different questions and have brought a different perspective to the exploration of the manual handling risks. A qualitative study has to address these issues to giving details about the context of the study to enable the reader to make up their own minds about whether the findings apply to their situation. Taking a broader perspective, I think that the success of any study (qualitative or quantitative) rests in the hands of the reader of the study: if they are not convinced about the findings or the rigour of the process it is unlikely that they will use the findings in their own work. The OT case study has already convinced a wider audience through the initial paper (Hignett, 2001b) being reported in *Therapy Weekly* (2001) and subsequent inquiries from other OT departments.

The second inner layer of the onion model (figure 1.1) is hospital ergonomics. This layer used the case study data from chapters five and six to look at one industry. My suggestion is that this type of approach would be useful for other large industrial groups, for example the agriculture or construction industries. In agriculture there may be characteristics for the industry relating to working with animals and seasonal outside work. My experience has been that it is a mistake to assume that one is familiar with the culture of an industry even if one has worked in it. I had worked in hospitals for many years, in laboratories and on the wards, however when I came to try and have input as an ergonomist I had to recognise that my knowledge was based on my own personal experience and could not be transferred into, or form the basis for generating, ergonomic advice for other staff groups, without getting a better understanding of their particular circumstances (Hignett, 2001a). My concern, with respect to the wider aspect of ergonomics in practice, is that ergonomists in other industries, even long-established groups in the military and aviation industries, might not be achieving the deeper level of input which can embed ergonomics into

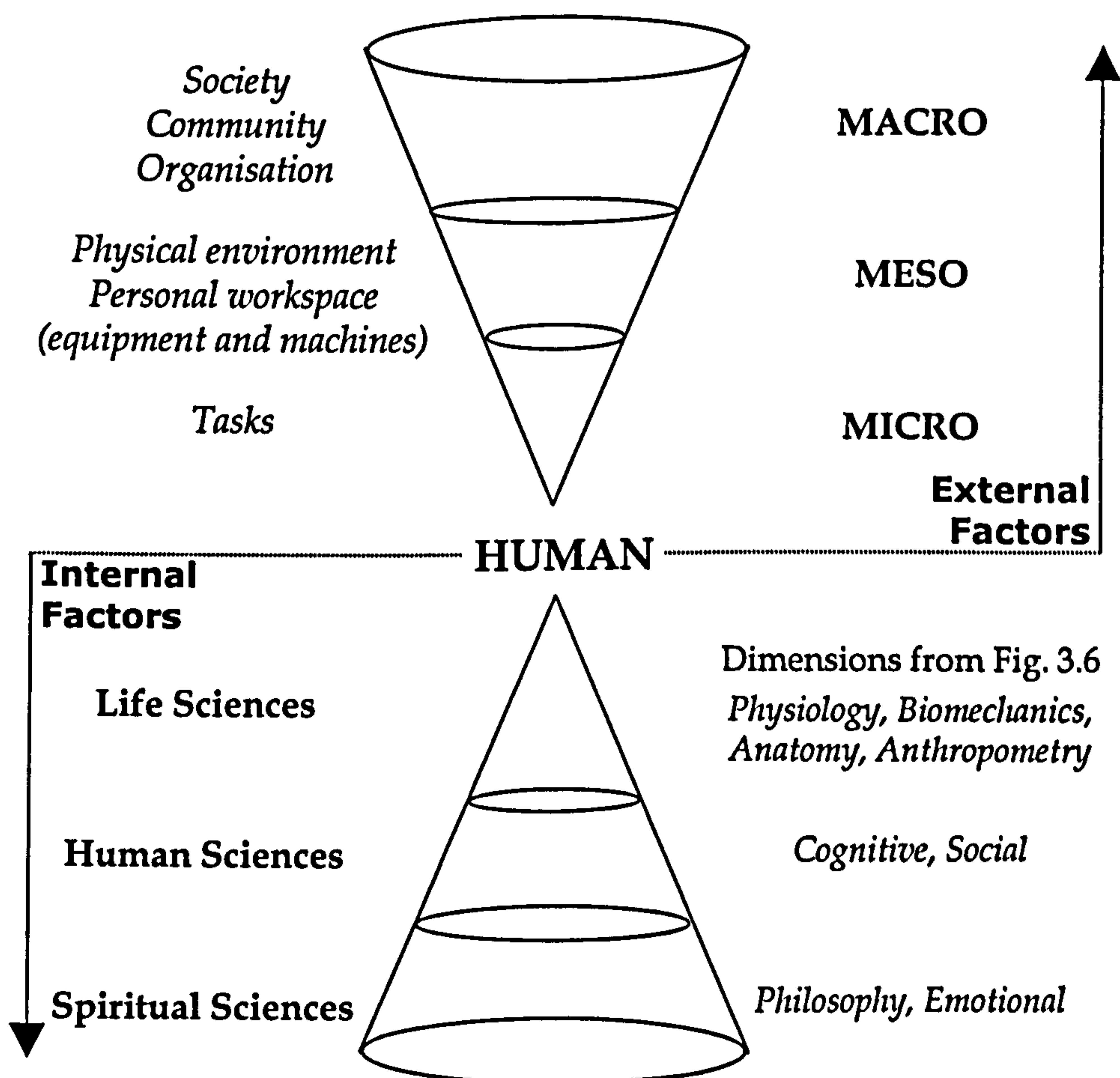
the culture of the organisation. In order to do this they would need to understand the culture and social factors from the perspective of the people they are trying to work with or influence. This means accessing softer information which has proved to be difficult using quantitative methodology. Perhaps, as Walker (1985:18) said, qualitative research does reach 'those parts that other techniques don't'.

Hospital ergonomics is a specific area for ergonomics practice, but only as a defined industry type. It does have unique characteristics, as do other industry types, and includes a wide range of potential areas for ergonomics input (Daniellou, 1997). The IEA has a technical group for hospital ergonomics and my hope is that this group will take the lead in drawing together the different aspects of academic and practical research work to form a cohesive body of information which can be drawn on in the future. To further this goal I am setting up a session at the Ergonomics Society conference in 2002, and hope to run a similar session at the IEA congress in 2003.

To expand the scope of ergonomics practice into the health care industry, the next layer (Ergonomics in Practice, Case Study) explored the relationship between: the definition of ergonomics; the theory (represented by the internal academic environment); methodologies; and methods in practice. The visual representation (figure 4.9) enabled the relationships to be shown from more than one perspective (cyclical as well as the internal/external environment dimensions) with a central position to represent the interactions core forming the basis for the current definition of ergonomics (IEA, 2000). In this model I am trying to take an inclusive position to show my interpretation of the data from the ergonomists case study. I would like to see this model taken forward with the emphasis on the reciprocal relationship between the internal and external environments, which is underpinned by a more inclusive methodological base. The divide between academia and practice in ergonomics is more apparent than real. Most ergonomists employed in academia practice ergonomics through consultancy work or hands-on research. Conversely many practitioners teach and carry out research as part of their practice. This reciprocal relationship strengthens my argument that the academic community, who generate most of the theory for the internal environment, need to support the widening of the philosophy of ergonomics to specifically include teaching qualitative methodologies (with an outline of the underlying philosophy).

The next level is the philosophy of ergonomics. A model was produced from the literature review (figure 3.6) and this has been extended into a dynamic model (figure 7.2) to reflect my current thinking after writing most of this thesis. It still shows the human as a link point (interactions) between internal and external factors. The external dimensions come from both a process model (concentric rings model, Wilson and Corlett, 1995:10) and a triangular model of ergonomics (figure 3.5). The internal factors are from the earlier model (figure 3.6) and Cameron (2000). This model would be better demonstrated as a dynamic three-dimensional model. In order to show the interactions through all the levels the conical rings are capable of moving through the whole vertical range of the model (internal and external). For example a macro level ring (incorporating issues of society, community and organisation) could move right down through the model to interact at the spiritual sciences level. An example of this could be the effect of religious cultural practices on employment conditions, personal protective clothing or working hours.

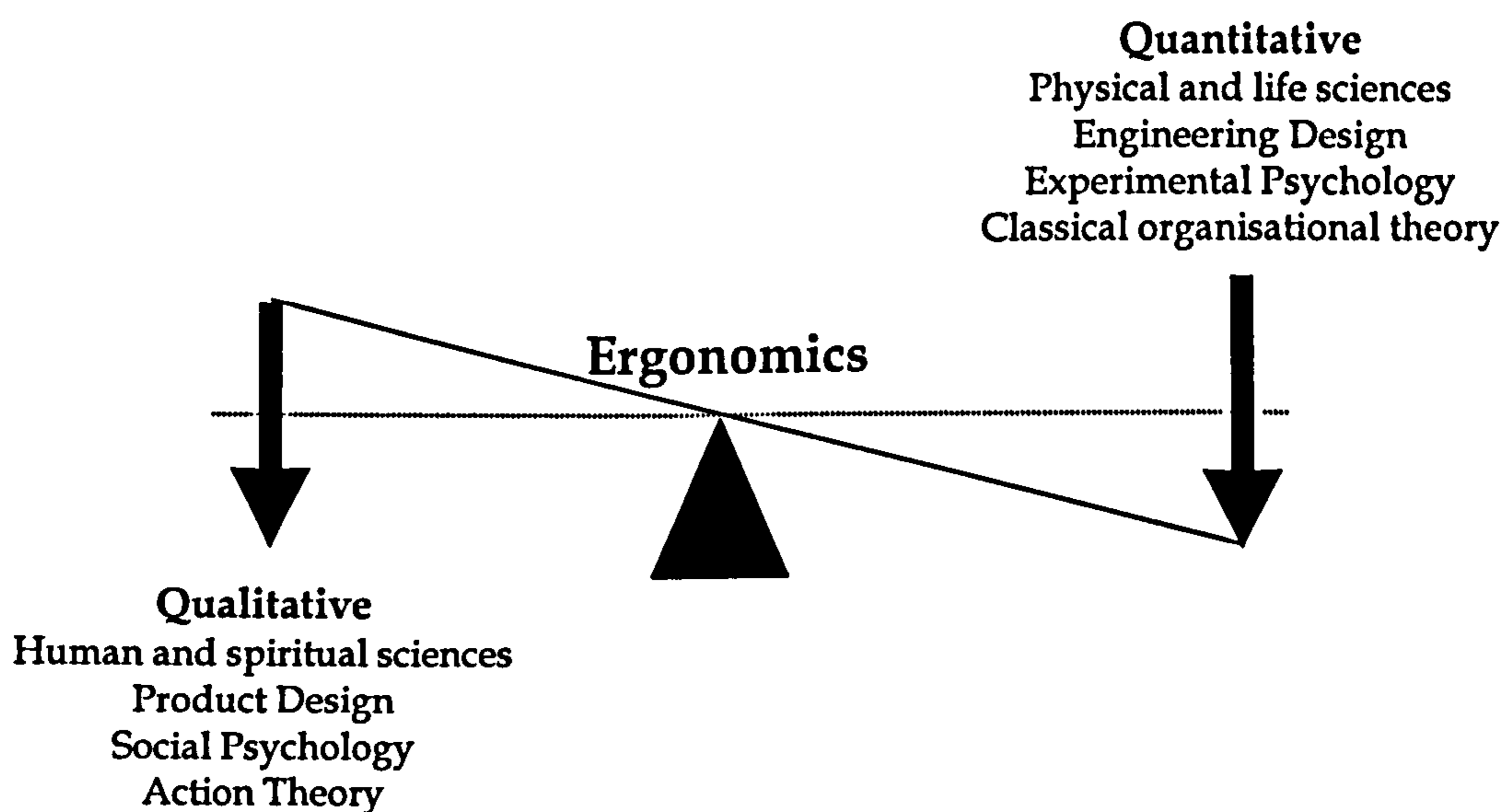
Figure 7.2 Dynamic interactions model for ergonomics



My suggestion is that, by linking this model to the findings of the case study (figure 4.9), there is evidence that there needs to be a paradigm shift in the focus and philosophy of ergonomics. This will see ergonomics, as a discipline and profession, moving towards a more inclusive position by drawing in from the human and spiritual sciences more overtly. It became apparent during the case study that some view ergonomics as a facilitating or mediating discipline which uses research and knowledge from a wide, and growing, number of disciplines. The methods and methodologies which explore why people act in their social contexts need to become part of the ergonomics tool box as well as how change can be achieved with respect to physical and organisational structure.

The final layer takes me back to the qualitative-quantitative continuum. This has been used as a framework throughout this thesis and is summarised in figure 7.1. If this is seen in terms of a see-saw (figure 7.3), ergonomics is currently more at the quantitative end but there are influences tipping the balance back towards the qualitative side. Before a balance point (dotted line) can be achieved there will need to be a much greater exploration of the use of qualitative methodologies in ergonomics and this thesis makes an initial contribution to this exploration. This may include research using particular schools of thought under the qualitative umbrella as well as taking the more pragmatic approach, as advocated in this thesis, of using a generic process supported by the middle ground philosophy.

Figure 7.3 Positioning Ergonomics



The development of the clear picture of the qualitative-quantitative debate has enabled me to clarify my position on this continuum. Having looked at the extreme poles, and definitions from qualitative and quantitative methodologies, I want to use both approaches within my practice but in a systematic way to generate robust recommendations and solutions. For most projects in practice I would expect to find that the central position was appropriate for the resources available and constraints imposed by local conditions. In the case study work of this thesis the position is closer to the qualitative pole. A higher level of analysis has been used than just purely descriptive, and a theoretical model has been drawn out within a body of philosophical thought (methodologies in ergonomics).

I am advocating a middle ground both for the choice of methodologies in ergonomics and, indeed, for ergonomics itself. As ergonomics is defined, by some, as a mediating, or cross-boundary, discipline this middle philosophical ground seems to be appropriate as an ontological position. Ergonomics is a practical discipline so the adoption of the middle ground for practice seems appropriate, however this does not exclude the use of methodologies at the epistemological poles for detailed investigation of intellectual questions; as Tudor Hart said (1994:60): 'practice without theory is blind, theory without practice is sterile'.

7.3 General conclusions and recommendations

There have been an increasing number of theoretical and practical papers about qualitative methodologies at ergonomics conferences in the last four years as shown in chapter four so this thesis is timely in addressing a current issue.

7.3.1 Conclusions

1. Evidence has been presented from both the literature and the case study on ergonomists to support the use of qualitative methodologies in ergonomics practice.
2. A generic process for carrying out qualitative research in ergonomics has been described which is supported by a middle ground philosophical position with respect to the qualitative-quantitative continuum.
3. A new model of ergonomics (figure 7.2) has been developed that includes an holistic representation of a human (including social, emotional and

philosophical dimensions) with an interactions interface at all levels (micro, meso and macro). This will be written up as a paper and submitted to an ergonomics journal in order to present it to the wider ergonomics community for discussion and further development.

4. Ergonomics has been positioned on the qualitative-quantitative continuum (figure 7.3) showing the past, current and future influences.
5. Hospital ergonomics is currently a field with a limited research base in ergonomics in terms of the focus (mostly musculoskeletal) and size. There is evidence to show that it has specific cultural and organisational characteristics.
6. A qualitative approach has been used successfully to address the complex manual handling problems in occupational therapy. The results from this study have been published nationally and have been successful in convincing other OT departments that this is an appropriate way to tackle their manual handling problems.

7.3.2 Recommendations

1. The internal environment of ergonomics needs to support the paradigm change, which is on-going, with respect to the scope of methodologies used. This needs to be presented in a robust and systematic way to ensure that future ergonomists have the option of using qualitative methods in research and practice. My recommendation is that the emphasis is placed on teaching and using a generic approach, as described in chapter two, rather than going into detail for specific schools of philosophical thought.
2. The use of a qualitative approach to identify the characteristics of hospital ergonomics has proved to be very useful and I recommend that it is repeated for ergonomics projects in other industries to extend the systematic use of qualitative methodologies in ergonomics. I hope that funding bodies will recognise the need to commission real world research by academics and practitioners using qualitative approaches.
3. More research needs to be carried out to increase the research base in hospital ergonomics. Both qualitative and quantitative methodologies should be used as appropriate to the intellectual question being explored.

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Contact Summary Form

Contact Type

Visit

Phone

Written by

Site

Contact Date

Today's Date

1. What were the main issues or themes that struck you in this contact ?

2. Summarise the information you got (or failed to get) on each of the target questions

Question

Information

3. Anything else that struck you as salient, interesting, illuminating or important in this contact?

4. What new (or remaining) target questions do you have in considering the next contact with this site?

Qualitative Research in Hospital Ergonomics

Summary of research intentions

This case study is being carried out as part of a theoretical exploration into the role of qualitative research in hospital ergonomics. It is proposed that models of ergonomics practice have failed, for the most part, to draw upon social science theory and alternative methodologies that could enhance the effectiveness and scope of ergonomics practice. One such methodology has been coined 'qualitative methodology', which, for the purpose of this research, is considered to be a non-positivist perspective drawing on the 'structure - action' debate which has been on-going in sociology, education, nursing studies and psychology in the last 100 years.

Participation in the research

- If you agree to participate in this research, you will be interviewed and audio-taped.
- Your participation is voluntary and you may elect to terminate the interview at any time, for any reason.
- You will receive a transcript of your interview and I shall be grateful for notification about corrections or if there is any information in the transcript that you would like to remain confidential.
- All the data collected (audio-tape, field notes etc.) shall remain the property of the researcher.
- After participating in this research, if you have any additional questions or concerns, or you would like to obtain the research results, please contact Sue Hignett, Ergonomics and Back Care Advisory Department, Nottingham City Hospital NHS Trust, Hucknall Road, Nottingham, NG5 1PB.

Usage

- The data and analysis from this interview will be used as part of the research towards the degree of Doctor of Philosophy in Ergonomics, University of Nottingham.

Confidentiality

- All references to interviewees for any subsequent quotes are anonymous.
- Research materials (data from tapes and transcripts) are kept in a secure location, accessible only to the researcher.
- Data will be reviewed by the researcher; supervisor (Professor John. R. Wilson, Professor of Occupational Ergonomics, University of Nottingham); and possibly internal and external examiners appointed by the University of Nottingham.

Consent Form for Participants

Name

.....

(please print)

(Date)

I fully and freely consent to participate in the case study entitled:

Qualitative Research in Hospital Ergonomics

Signature

.....

Please provide your full name and mailing address.

Version 1 (6 Sept '98): 4	Version 2 & 3 (26 Nov '98), (8 Dec '98)	Version 4 (22 March '99): 2 Amended with input from the first 4 interviews	Version 5 (25 May '99): 7 Amended with input from the first 6 interviews	Version 6 (13 Sept '99): 3 Amended with input from the first 13 interviews. Also Nvivo analysis of first 9 interviews	Version 7 (6 Feb 2000): 5 Amended with input from the first 16 interviews and after 1 st session with JRW
1.	What is the model of ergonomics that you currently work to? E.g. scope and practise	What is your view or understanding of ergonomics?	What is your impression of ergonomics?		What model of ergonomics do you use?
2. Do you think that social factors have an impact on ergonomics - or vice versa (ergonomics on social factors?)		Is ergonomics a social science, or do you think it should be?	Do you think that social factors have an impact on ergonomics - or vice versa (ergonomics on social factors?) or for ergonomists especially	Do you think that social factors have an impact on ergonomics - or vice versa (ergonomics on social factors?) or for ergonomists especially	What impact do you think that social factors have on ergonomics - or vice versa (ergonomics on social factors?) or for ergonomists especially
3. What does the Sociotechnical approach mean to you?	What does the Sociotechnical approach mean to you?				
4. If we want to empower workers with ergonomics (e.g. via a participatory project) how do ergonomists find out how to speak the lingo? Is this science?	What do you understand by participatory ergonomics? How do ergonomists 'speak the lingo'?				
5. How does your work in ergonomics (past and current) reflect your own beliefs and philosophy?	How does your work or perspective in ergonomics (past and current) reflect your own beliefs and philosophy?	What is your relationship to the research that you do?	How does your work or perspective in ergonomics (past and current) reflect your own beliefs and philosophy?		

<p>6. Do you think ergonomics methods and methodologies explore WHY people do things rather than WHAT OR HOW they do?</p>	<p>In HTA describe 3 positions on the roles of qualitative and quantitative research. The second is to investigate WHY (how does this come to happen). Please expand on this.</p>	<p>Do you think ergonomics methods and methodologies explore WHY people do things, rather than WHAT, WHEN, HOW, WHERE AND WHO?</p>	<p>Do you think ergonomics methods and methodologies explore WHY people do things, rather than WHAT, WHEN, HOW, WHERE AND WHO?</p>	<p>Do you think ergonomics methods and methodologies explore WHY people do things, rather than WHAT, WHEN, HOW, WHERE AND WHO?</p>	<p>Do you think ergonomics methods and methodologies explore WHY people do things, rather than WHAT, WHEN, HOW, WHERE AND WHO?</p>
<p>How/why did you get into this area of work/practice?</p> <p>Do you think ergonomics methods and methodologies explore WHY people do things rather than WHAT, WHEN, HOW, WHERE AND WHO?</p>	<p>How is the science/technology divide managed in ergonomics?</p> <p>Are you aware of the structure/action debate in psychology?</p>	<p>Do you have experience of working with ergonomists or ergonomics departments?</p> <p>or (for ergonomists)?</p> <p>Which academic disciplines do you think have to should have a close relationship with ergonomics?</p>	<p>Do you think ergonomics methods and methodologies explore WHY people do things, rather than WHAT, WHEN, HOW, WHERE AND WHO?</p>	<p>Do you think ergonomics methods and methodologies explore WHY people do things, rather than WHAT, WHEN, HOW, WHERE AND WHO?</p>	<p>Do you think ergonomics methods and methodologies explore WHY people do things, rather than WHAT, WHEN, HOW, WHERE AND WHO?</p>
<p>7.</p>	<p>What is your impression of QUALITATIVE METHODOLOGY and how would you say it differs from quantitative?</p>	<p>What is your impression of qualitative methodology and how would you say it differs from quantitative?</p>	<p>What is your impression of qualitative methodology and how would you say it differs from quantitative?</p>	<p>What is your impression of qualitative methodology and how would you say it differs from quantitative?</p>	<p>What is your impression of qualitative methodology and how would you say it differs from quantitative?</p>
<p>8. What is your impression of QUALITATIVE METHODOLOGY and how would you say it differs from quantitative?</p>	<p>Can the two approaches be combined are the philosophical differences irreconcilable?</p>	<p>Can qualitative and quantitative be combined or are the philosophical differences too great?</p>	<p>Can qualitative and quantitative be combined or are the philosophical differences too great?</p>	<p>Can qualitative and quantitative be combined or are the philosophical differences too great?</p>	<p>Can qualitative and quantitative be combined or are the philosophical differences too great?</p>
<p>9. Can the two approaches be combined are the philosophical differences irreconcilable?</p>	<p>Can qualitative and quantitative be combined or are the philosophical differences too great?</p>	<p>Can qualitative and quantitative be combined or are the philosophical differences too great?</p>	<p>Can qualitative and quantitative be combined or are the philosophical differences too great?</p>	<p>Can qualitative and quantitative be combined or are the philosophical differences too great?</p>	<p>Can qualitative and quantitative be combined or are the philosophical differences too great?</p>

10.	Can human sciences be investigated using the same principles and philosophies natural sciences?	Is it valid or useful to do any experimental (laboratory based) research at a whole body level with humans?			
11.		Have you done any research on/with hospital workers?	Have you done any research on/with hospital workers?	I have you done any research on/with hospital workers?	Please describe your own research on/with hospital workers?
12.		Do you know of any practical applications of hospital ergonomics?	Do you know of any practical applications of hospital ergonomics?	Do you know of any practical applications of hospital ergonomics?	Please describe practical applications of hospital ergonomics?
13.		How do hospital workers differ from other industries?	Do hospital workers differ from other industries?	Do hospital workers differ from other industries?	How do hospital workers differ from other industries?
14.		How has, or could, hospital culture be researched?	Is hospital research different from research in other industries?	Is hospital research different from research in other industries?	Is hospital research different from research in other industries?
15.			Can qualitative approaches be used to give predictable information e.g. for product design? How can qualitative approaches be used in product design?		
16.				Characteristics of hospitals?	What do you think are the characteristics of hospitals?

Q.S.R. NUD.IST Power version, revision 4.0.

Licensee: Sue Hignett.

PROJECT: ergonom2, User Sue Hignett, 18:13, 10 May, 2001.

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Selected nodes coding none of document Interviewee no. 17:

- (1 1) /Doing Ergonomics/Where?
- (1 2) /Doing Ergonomics/Design
- (1 3) /Doing Ergonomics/Change
- (2 1) /QUALITATIVE/Philosophy
- (2 3) /QUALITATIVE/Process

Margin coding keys for selected nodes in document Interviewee no. 17:

- A: (1 4) /Doing Ergonomics/Definition of Ergonomics
- B: (2 2) /QUALITATIVE/Context
- C: (2 4) /QUALITATIVE/Data Types
- D: (3 1) /HOSPITAL/Women
- E: (3 2) /HOSPITAL/Complex
- F: (3 3) /HOSPITAL/Body

+++ ON-LINE DOCUMENT: Interviewee no. 17

+++ Document Header:

*Interview with Interviewee no. 17, Ergonomics Practitioner
 *9 February 2000

+++ Retrieval for this document: 785 units out of 785, = 100%

++ Text units 1-785:

	1
	2
*Sue.	3
All I really, I mean I've got three areas that I'm covering, within my	
Ph.D. One is the	4
philosophy of ergonomics, so I might just touch on that with you, and	
what your model of	5
ergonomics is and that sort of thing.	6
*Interviewee.	7
right	8
*Sue.	9
Another one is qualitative methodology, but I can't say it at the moment,	
so y'know, we might	10
not bother with that bit, but I don't know whether you've done much	
thinking about that, or it's	11
something that you feel you've used or anything, but we might touch on	
that. But the biggy is	12
hospital ergonomics	13
*Interviewee.	14
Right	15
*Sue.	16

because you've worked in hospitals and other industries, so that really	
your bit of knowledge	17
that I want to tap into the most	18
*Interviewee.	19
Ok	20
*Sue.	21
So what sort of work have you, ergonomics work, have you done in	
hospitals, real	22
ergonomics work?	23
*Interviewee.	24
Ok, I have done some risk assessment, in it's broadest sense, so risk	
assessment/audit, so	25
large hospital, umm a sort of quick and dirty what they wanted was	
everything done, so it was	26
a case of going in with a risk assessment methodology that was very, very	
simple and just	27
going through departments very quickly to get some sort of over view with	
a view to then	28
finding	29
*Sue.	30
Yep	31
*Interviewee.	32
Where it needed a more in-depth umm, look at. So we basically used a	
TILE assessment,	33
maybe a little bit of photography and measurement where it was really	
needed	34
*Sue.	35
What do you mean by a TILE assessment?	36
*Interviewee.	37
TILE assessment. A very basic task, individual, load, environment, as in	
the, what are they	38
called, Health and Safety Executive	39
*Sue.	40
They're the ones (laughs)	41
*Interviewee.	42
They're the ones, yes, they recommend it (laughs)	43
*Sue.	44
Ok, now I know what you mean TILE, very good	45
*Interviewee.	46
So we used that basic, a check list is a better way of putting it, we	
basically just used a check	47
list, everything went down ok, or we looked at things more in-depth.	
Umm, other sort of	48
hospital ergonomics, umm, actually most of it really has been sort of on	
that risk assessment	49
front. I have to say most of my sort of work in hospitals came in the	
days of sort being a, a	50
baby back care advisor and being forced into doing lots of training	51
*Sue.	52
Ok	53

*Interviewee.	54	
Which I quickly realised was not a good idea. And I haven't really been		
in hospitals per see,	55	
very much since then	56	
*Sue.	57	
But you've done what you would call more ergonomics in Royal Mail?	58	
*Interviewee.	59	
Yes, much more proper ergonomics in industry, I've acted as a back care		
advisor in hospitals	60	
and done bits of risk assessments since, but much more proper ergonomics		
within an industry	61	
environment	62	
*Sue.	63	E
So what's the difference	64	E
*Interviewee.	65	E
The difference is, in part, the kind of thing you're asked to do, and the		E
kind of, umm, the	66	E
knowledge that other people've got to ask you to do it, I suppose, is one		E
way of putting it. Or	67	E
the insight they've got, so within industry there's much more, or within		E
Royal Mail, lets sort of	68	E
narrow that down, that's my main experience, there's much more insight		E
into, 'if we get this bit	69	E
right, we get the productivity and the efficiency up, and the whole place		E
works better. So what	70	E
we want is for you ergonomists to come in and have a look either at the		E
system that we're	71	E
working under, or the design of our equipment, umm the processes that		E
we're working to and	72	E
tell us if there's any way we can make them more efficient, or change		E
them, or, or change the	73	E
physical work space in any way'	74	E
*Sue.	75	E
So why doesn't that happen in the hospital?	76	E
*Interviewee.	77	E
Why doesn't that happen in the hospital? Umm, my problem with answering		
*Interviewee		
that question is	78	E
that as I've become more and more experienced, I've worked less and less		E
in hospitals	79	E
*Sue.	80	E
Ok	81	E
*Interviewee.	82	E
Umm, but my understanding is that people, that as far as ergonomics goes		E
people think of it	83	E
synonymously with manual handling	84	E
*Sue.	85	E
Ok	86	E
*Interviewee.	87	E
and also manual handling still is seen as that nurse/physio kind of thing		E

that isn't necessarily	88	E
very high on the agenda unless you happen to be a nurse with a bad back, or somebody	89	E
worrying about litigation	90	E
*Sue.	91	E
Ok	92	E
*Interviewee.	93	E
And having had to worry about litigation. Umm, it just doesn't seem to be, doesn't seem to	94	E
be something that is integral to the smooth running of the hospital as in the efficiency and	95	E
productivity, it's much more of a taking care of staff is the wrong way of putting it isn't it,	96	E
because if you say it's taking care of staff, then you're, because that's what somewhere like	97	DE
Royal Mail would do, it's take care of their staff, and they see taking care of the staff	98	DE
synonymous with efficiency. Makes them sound fantastic, and they're not, but that's, that's	99	DE
generally the way it's thought of. Whereas in a hospital I don't think it happens quite like that	100	DE
*Sue.	101	E
Why?	102	E
*Interviewee.	103	E
Why? Big pause there. Why doesn't it happen like that?	104	E
*Sue.	105	E
What's different? We can come back to it	106	E
*Interviewee.	107	E
Yeah, it's just, y'know I suppose I land up being a bit repetitive but it's the structure and	108	E
culture of the organisation isn't' it. And when I say the culture, I mean it's a caring profession.	109	EF
Caring is seen as the primary function, manual handling which is seen as synonymous with	110	EF
ergonomics is, is the way, is one of the ways in which we care, therefore to see that more as	111	EF
a, as something that should be efficient and effective and productive, I think is not necessarily	112	EF
the way, the way people think	113	EF
*Sue.	114	E
Ok. The links haven't been made yet?	115	E
*Interviewee.	116	E
Yes, yes perhaps that rings. Yes I mean maybe the links never will be made, but yeah it's	117	E
probably	118	E
*Sue.	119	E
Do you think?	120	E
*Interviewee.	121	E
I don't know, I would hope so because it seems fairly obvious that it, it should be. That if you	122	E

get that right the whole place will be much better run	123	E
*Sue	124	E F
yeah. I mean the hospitals've been one of the, health care's been one of		E F
the last groups to	125	E F
actually introduce occupational health for staff so you'd expect them to		E F
be behind on most	126	E F
other things as well	127	E F
*Interviewee	128	E F
yes, yes that makes sense. But I think it's, I think it's even more		E F
fundamental than that, I	129	E F
think it's the fact that the product that the hospital has, as a		E F
business, is caring for patients,	130	E F
and caring for patients isn't seen as a 'product'. So whereas, whereas		E F
in industry or in	131	E F
commerce you're producing something which you're selling or a service		E F
that you're providing,	132	E F
it's not quite seen as that. I think there's a whole, there's a general		E F
public view point that the	133	E F
health service is every bodies right, which yes ok it should be, but it's		E F
not, it's a, it's something	134	E F
that one should have rather than something that is a service that's being		E F
provided and, no	135	E F
that doesn't sound right either does it. It's something that is expected		E F
so you don't	136	E F
necessarily have to, what I'm saying isn't quite coming out right	137	E F
*Sue.	138	E
I think what you're saying is that it's not being run as a business?		E
Because we're not looking	139	E
at productivity	140	E
*Interviewee.	141	E
Yes but we're trying to run it as a business, though, there have been		E
those moves to run it.	142	E
*Sue.	143	E
Is that doable?	144	E
*Interviewee.	145	E
Well no clearly it's not because it hasn't necessarily, I mean putting in		E
market forces hasn't	146	E
necessarily been the answer, which I suppose is why it's faltering	147	E
*Sue.	148	E
But the market forces haven't been real have they? Because at the end of		E
the day you're	149	E
working on a 12 month budget and they you get bailed out	150	E
*Interviewee.	151	E
No the market forces haven't been real	152	E
*Sue.	153	E
Whereas Royal Mail now is real, if it doesn't	154	E
*Interviewee.	155	E
Yes but that, that's only just happened as well	156	E
*Sue.	157	E
Ok	158	E

sometimes I, I perceive, sometimes they're sort of, I don't quite know	194	F
*Sue.	195	F
Describe some examples if that	196	F
*Interviewee..	197	F
I just. Because the thing I've sort of started out saying was thing		F
image of somebody being	198	F
extremely caring and putting themselves sort , basically their their		F
whole reason for their job is	199	F
the welfare and the well-being of their patient, which is actually, I		F
suppose in a way, the way it	200	F
should, the perceived way it should be, but actually I think there's a		F
lot of non absolute caring	201	F
and a lot of being pissed off, fed up, feeling not particularly well		F
thought of and I think a lot of	202	F
that contributes to the sort of need to get the job done quickly and		F
underneath	203	F
*Sue.	204	F
But don't you find that in Royal Mail as well thought?	205	F
*Interviewee.	206	F
Oh hugely, yeah, but there's not, there's not the umm, there's not the		F
emotional aspect	207	F
attached to the job at all	208	F
*Sue.	209	F
What do you mean by that?	210	F
*Interviewee.	211	F
The patient. There's somebody else's life on the end of it	212	F
*Sue.	213	F
Right, and that makes a difference both to the caring side and to the		F
pissed off side?	214	F
*Interviewee.	215	F
I think it probably does yeah, because there's a different focus for it,		F
isn't there	216	F
*Sue.	217	
Right	218	
*Interviewee.	219	D
Yeah I think it is and I think the other very, very important thing,		D
which is probably sort of the	220	D
largest point actually is that male-female difference there. Because		D
there is a very male	221	D
orientation in the Post Office, but that goes along with the caring, and		D
the female role and	222	D
being a caring professional	223	D
*Sue.	224	D
What difference does it actually make. I mean for the doing of		D
ergonomics, what difference	225	D
does sex, gender make?	226	D
*Interviewee.	227	D
Ok the difference it makes is primarily cultural, and maybe I'm wrong in		D
putting it down to	228	D
being a sort of male-female thing, but in a largely male popu, sort of		D

environment, you land up	229	D
with, there is very big sort of macho culture, so sometimes that's very		D
difficult to get through.	230	D
And a lot of times when you're making, when you're making recommendations		
D		
and you're	231	D
suggesting changes you've gotta be very diplomatic in how you put that,		D
because you can't	232	D
make people look foolish. Y'know you can't say we're gonna reduce the		D
weight of your bag	233	D
because you're not strong enough to carry it. Ok you might just make the		D
same	234	D
recommendation, but you have to be careful in how you put it, whereas I		D
think that's very	235	D
different with nursing staff. Because in a largely female population		D
there is, they're also more	236	D
caring of each other	237	D
*Sue.	238	D
Oh, ok that's interesting	239	D
*Interviewee.	240	D
Which I think is, at least I think, I think they are, I mean that's a		D
very sweeping statement isn't	241	D
it, but there seems to be, perhaps, obviously depending on where you work		
and the culture of	242	
the individual place there's, perhaps a little more worrying about each		
other, whereas the last	243	
thing that happens in Royal Mail is people bailing each other out and		
covering each other's	244	
backs	245	
*Sue.	246	
Oh right	247	
*Interviewee.	248	
But then again that depends on the individual place and the leadership in		
that place	249	
*Sue.	250	
Right, yeah, yeah	251	
*Interviewee.	252	
So what works for one office won't necessarily work for another in terms		
of the processes	253	
that they're using.	254	
*Sue.	255	E
Right. Somebody, somebody threw in an interesting comment between the		E
difference	256	E
between hospitals and other industries was that, they said that the		E
effort shifted from 80% of	257	E
understanding the problem, of the work that you did, was not about		E
understanding the	258	E
problem, they sort of suggested that umm, a lot of the issues that a		E
hospital culture would be	259	E
quite sophisticated at having already discussed a lot of the issues		E

because I suppose you're	260	E
dealing, as we sort of said, y'know a large percentage are gonna have		E
tertiary umm	261	E
education, and have degrees and y'know a lot of the complex discussions		E
may already have	262	E
taken place, and they said the effort shifted to 80% to actually trying		E
to make anything happen	263	E
*Interviewee.	264	E
Within a hospital?	265	E
*Sue.	266	E
Yeah, it wasn't trying to find the solution it was actually trying to		E
make the jolly thing happen.	267	E
*Interviewee.	268	E
That's very interesting, I think that, that probably works, but then I		E
think it depends at what	269	E
level you're operating	270	E
*Sue.	271	E
Ok	272	E
*Interviewee.	273	E
Because does that mean therefore that all, all the vast majority of the		E
nursing staff actually	274	E
understand the problem, because to my mind the vast majority of the		E
nursing staff are actually	275	E
auxiliaries	276	E
*Sue.	277	E
Right	278	E
*Interviewee.	279	E
Who don't necessarily have a grasp of, of exactly what the issues are	280	E
*Sue.	281	E
Yeah, yeah	282	E
*Interviewee.	283	E
Which in a way is very similar to, to within the post service because		E
they have got a large	284	E
number of employees who they've got to make, who are the people doing the		E
job and that's,	285	E
that's actually quite similar, because in actual fact their greatest		E
resource is their people	286	E
*Sue.	287	E
Yes	288	E
*Interviewee	289	E
because most of the work happens via people	290	E
*Sue.	291	E
Yeap	292	E
*Interviewee.	293	E
And it's the same in the health service. Umm the vast majority of those		E
people don't	294	E
necessarily understand the problem. Y'know you can go and y'know it		E
depends how much	295	E
information you're going to give them, but y'know your average nursing		E
auxiliary isn't going to	296	E

understand the anatomy of the back and sort of the biomechanics involved	E
in the sort of	297 E
moving and handling patients	298 E
*Sue.	299 E
No	300 E
*Interviewee.	301 E
Umm, they might know that, yes, their back aches if they go home at the	E
end of a heavy	302 E
week, or the end of a heavy day but I think the trying to make it happen	E
thing is actually a very	303 E
significant point because you are, you are trying to change culture,	E
break down barriers,	304 E
change the way things are done, but I think for the majority of people	E
that perhaps don't	305 E
understand, or who don't have clear grasp of the issues, trying to get	E
things done is	306 E
dependent on their manager, so you're one level up aren't you in terms of	E
who needs to	307 E
understand it	308 E
*Sue.	309 E
Yeah	310 E
*Interviewee.	311 E
So if they've got good leaders, y'know depending on how far up the	E
pyramid you're going, if	312 E
they've got good leadership at ward level, the changes will probably	E
happen, I think	313 E
*Sue.	314
Another thing that somebody suggested was umm, there's a lack of a single	
hierarchy, in fact	315
that was something that we were talking about with Joe earlier, that	
y'know there needs to be	316
this central, and this is what happens, and this multi-professional set	
up in a hospital perhaps	317
compared with something like the Royal Mail. I mean did you find in the	
Royal Mail that if	318
somebody made a decision that it happened?	319
*Interviewee.	320
No, I think Royal Mail is maybe slightly different to lots of areas of	
industry because they	321
have, they have got this sort of., things are, things are spread out, so	
they've got a central	322
place where decisions, so they've got strategic headquarters where	
decisions are made and	323
things are passed down. But then each, they've got nine divisions	E
throughout the country and	324 E
each division actually has it's own little hierarchy happening within it	E
and then each delivery	325 E
office, or each mail centre within each division will have it's own	E
little hierarchy. So actually	326 E
it's probably very much more like a directorate/ward system	327 E

*Sue.	328	E
Oh, ok	329	E
*Interviewee.	330	E
Y'know where there's still, there's still a balance of power	331	E
*Sue.	332	E
Yes	333	E
*Interviewee.	334	E
Sort of, y'know you've got bit stemming out each bit, so the balance of	335	E
power actually shifts a	336	E
bit	337	E
*Sue	338	E
Interesting	339	E
*Interviewee	340	E
all the way down, and y'know, someone's got to interpret what's been said	341	E
from the top and	342	E
someone else will interpret it at their level, and there's a lot of	343	E
layers for it to go down	344	E
*Sue	345	E
but would you have, like, like the medical staff culture versus the	346	E
nursing staff culture versus	347	E
the	348	E
*Interviewee	349	E
no. not, I don't so anyway, no, no, there's a management and workers,	350	E
them and us	351	E
*Sue	352	E
ok	353	E
*Interviewee	354	E
but I think that's quite different because there is, there's the medical	355	E
staff, the nursing staff,	356	E
the PAMs, y'know, everybody's got their own sort of slightly different	357	E
agenda	358	E
*Sue	359	E
and, I mean, even within the medical staff, they've got how ever many	360	E
colleges	361	E
*Interviewee	362	E
exactly. So no, it's not the same in that way. So there's not all those	363	E
things sort of pulling	364	E
*Sue	365	E
in different ways	366	E
*Interviewee	367	E
in different directions, no	368	E
*Sue	369	E
ok. I think we're sort of covered all that bit, we might come back to it	370	E
again. What about	371	E
general ergonomics, general ergonomics. What sort of model of ergonomics	372	E
do you, if you	373	E
had to describe ergonomics or teach it, how do you do that? How do you	374	E
describe it to other	375	E
people?	376	E
*Interviewee	377	A

I think it depends who I'm describing it to. Umm, if I'm describing it to somebody who doesn't know what it is then it usually tends to be a sort of, probably a sort of vague, y'know	366	A
something along the lines of umm, fit, adapting environments to fit people rather than the other way round, and sort of using, using elements of, of design and organisational things in order to make workplaces safer and more efficient. Umm it tends to be sort of more like that	367	A
really. The other people that I would tend to be in a position to describe ergonomics to would be perhaps people like, like the post office staff, who again would tend to get a very sort of, actually I'm trying to make things more efficient for you, and this is about making you able to do you job better and stay in good health and fitness while you're doing it. So for instance, y'know if I was gonna, I suppose it's, if I was gonna be following someone on their delivery because I was going to be, umm, weighing their mail bag or looking at how far their walked, people have a very great fear of being timed and monitored, and they have a big fear of, as they call them time and motion studies, so to dispel the fear for that there would be a lot of talk, well y'know this is, this is for you, the solutions we're looking for, y'know we're actually trying to, trying to get your mail bag better designed so that you can carry it better. this is why we're monitoring your heart rate, we're not just checking that you're working hard enough or, so those sort of explanations happen a lot	368	A
*Sue	369	A
yeah, yeah. What about if you're umm, if you were teaching it to under or post grads?	370	A
*Interviewee	371	A
umm, teaching ergonomics to physiotherapy students, a big sell sort of is the idea of that this is important for you because it's, y'know as a physiotherapist you spend a lot of your life attacking a problem	372	A
*Sue	373	A
yeah	374	A
*Interviewee	375	A
from one end. Y'know someone comes to you with a problem, you hopefully cure it and send them back, and what's the point in sending them back if you're sending them to the problem that they had in the first place. So a big drive for the explanation is,	376	A
	377	A
	378	A
	379	A
	380	A
	381	A
	382	A
	383	A
	384	A
	385	A
	386	A
	387	A
	388	A
	389	A
	390	A
	391	A
	392	A
	393	A

this is the other side of	394
the equation, if you get both sides right you actually come through with somebody who is	395
going to be better long term, and more productive and efficient in their job and hopefully just	396
generally, in the long term, so it's the, the sort of, if you get the design right, and the	397
ergonomics right you're not going to be sending that person that you've just, y'know you've	398
just cured their back problem or hopefully made their back pain go away, if you send them	399
back to the problem that started it in the first place, they'll just get it back	400
*Sue	401
do you think ergonomists pick up on social issues?	402
*Interviewee	403
ergonomists?	404
*Sue	405
yeah	406
*Interviewee	407
umm,	408
*Sue	409
it's like when you were saying the difference between men and women	410
*Interviewee	411
I think, well in my experience within Royal Mail, yes. But then they're very particular social	412
issues and they're a group of people who only work in that area	413
*Sue	414
ok	415
*Interviewee	416
but yes, there's definitely an awareness that this is level that you have to explain things to	417
people, or this is the level that this is important to these people. So this is how it's got to be	418
put across, or if we breeze in and do it like this, that's going to make this group of people	419
suspicious, angry. There's a very, within Royal Mail, and this, again this might not be typical	420
of all areas of industry, there's a very strong Union culture, so a lot of what the ergonomists	421
do there is, is sort of tied up with keeping the Unions happy and keeping the client happy.	422
*Sue	423
ok	424
*Interviewee	425
but keeping the Union happy then also keeps the client happy, so there's a lot of sort of	426
putting the same thing in a slightly different way for different parties of people	427
*Sue	428

right, yes	429
*Interviewee	430
so yes, I think they are aware of, I mean maybe that's not quite what you meant by social	431
issues, but on that level, yes they are aware of them, in my experience	432
*Sue	433
yeah. I mean one of my things, is always how much, how much ergonomics picks up on	434
peoples social lives, the things they're bringing into work with them	435
*Interviewee	436
yes	437
*Sue	438
I mean I suppose I think that particularly for hospital because so many women working in	439
hospitals have got umm, childcare, parent care, whatever	440
*Interviewee	441
actually if, actually in that case, probably not. And the reason I say not is because one of the,	442
one of the big driving forces is, let's get as much out of people as we possibly can, umm and	443
that sort of, and I mean everybody means that in the nicest possible way. It's not sort of, lets	444
sort of kill these people off and get as much work out of them as possible. But it's lets get	445
them to be as efficient as possible, and a lot of what we're asked to , as ergonomists, ignores	446
that fact the people do a huge amount of overtime, or perhaps people do unofficial overtime,	447
or moonlight, but there are a lot of cases where people are actually topping up their income	448
substantially by working a day in the weekend or a couple of nights a week. And I think that's	449
almost quite similar to nursing as well, but I think, I think that whilst people sort of say they're	450
aware of it in nursing, y'know I don't know quite how that comes into play to doing anything	451
about it	452
*Sue	453
I must say with the working time directive that having a massive impact on that side of things.	454
That's changing things a lot and you've probably find there's a knock on in Royal Mail as well	455
I would imagine	456
*Interviewee	457
yeah, you still can't stop people doing something actually outside of work that work doesn't	458
have control of, can you	459
*Sue	460
no. but we've had to drop having a nursing bank because you can't offer who are already	461

employed with us full-time, extra hours on the bank, so we've had to	
nursing bank and they	462
now have to come back to us through an agency so it's not our	
responsibility any more!	463
*Interviewee	464
yep, but then it still happens through the agency	465
*Sue	466
exactly!	467
*Interviewee	468
so yes, people are aware of it, but y'know you find a way back don't you.	
Because basically	469
the driving force for the employee is the extra money	470
*Sue	471
that's right	472
*Interviewee	473
and you're not gonna stop that	474
*Sue	475
so how does an ergonomist take that on board?	476
*Interviewee	477
well I think the only way is to be aware of it,. What more can you do,	
you've got to be aware	478
of it and somehow factor it into, y'know the fact is if you're going to	
make a workplace safer by	479
designing out problems or looking at work processes, the thing that	
you've got to , you've got	480
to take into account, the lowest common denominator, and the chances are	
that the lowest	481
common denominator probably takes into account somebody who is working	
extra shifts. Of	482
there comes a point where y'know if you're covering y'know your 5th to	
95th percentile, that's	483
if you've talking in terms of how fatigued somebody is, or how, how much	
somebody's been	484
working extra, then perhaps that when you need to start working on an	
individual level,	485
there's got to be a point where people've got to help themselves to a	
certain extent	486
*Sue	487
yes, I'd agree with that	488
*Interviewee	489
so you go for you're lowest common denominator as far as you possibly	
can, in that you make	490
the work place as safe as you can, it's kind of like designing for	
disabled people isn't it, it's like	491
if you get, if you get a room or if you get kitchen utensils that will	
fit somebody with	492
rheumatoid arthritis the chances are it's going to be more beneficial for	
somebody who	493
doesn't have rheumatoid arthritis as well	494
*Sue	495

yes	496
*Interviewee	497
so you design to make the work as easy as you can for everybody	498
*Sue	499
I mean that our philosophy in the hospital, that we design our tasks for the pregnant woman	500
*Interviewee	501
exactly, so you go for the lowest common denominator, now if you're got to factor into that an	502
immense amount of fatigue, there comes a point where there, y'know if the individual is that	503
fatigued you perhaps have to address things, I mean that's. that's the sort of health care thing	504
isn't it	505
*Sue	506
yes we're into occupational health, we're into management	507
*Interviewee	508
exactly you start to get to individual levels rather than populations (tape turned)	509
*Sue	510
right I was gonna, something that people throw up about, when I start saying about social	511
factors, and they say 'yes participatory ergonomics, we actually find out why people do things	512
because we participate, and they get involved'.	513
*Interviewee	514
yeah, I think that's, that's a sort of, that level of participatory ergonomics, I suppose if you're	515
gonna sort of hang a label on it. I would assume that that happens to a certain level with	516
whatever ergonomics you're doing. Is that it's got to be user-centred, in inverted commas,	517
and of course you have to find out what people are doing. I mean I would not even hang that	518
on a, saying that, y'know put that on a peg to say that's a, that's being aware of social issues,	519
that is, that's ergonomics surely. That's what, that's what you should be doing is finding out,	520
if, if the solution you come up with doesn't mean anything to the people who're going to be	521
living with the solution then what's the point in coming up with it?	522
*Sue	523
so is there any value in laboratory work?	524
*Interviewee	525
of course there's value in laboratory work, but it's got to be in tandem hasn't it. I mean there's	526
got to be some value in it because you can go into a laboratory and you can perhaps quantify	527
things in a different way but I don't think there's any value, sweeping statement coming up, I	528

just don't' think there's any value in laboratory work unless its based on whatever you've	529	
found in real life. It's got to be real-life based, and most of the ergonomics that happen within	530	
Royal Mail would be of the, the sort of actually going out there, talking to people, finding out	531	
what the problem is, and doing things where it actually happens. Yes then bring things back	532	
to the la, the ra the laboratory from the point of	533	
*Sue	534	
have another drink!	535	
*Interviewee	536	
thank you. From the point of view of perhaps that would be where your mock up would come,	537	
so what you might do is to go out there and look at what the problems are, look at where	538	
people are reaching too far, bending too far, filming what happens in real life, then come back	539	
make the adjustments that you think would solve that problem and then bearing in mind that	540	
actually you've gotta provide a solution for a wider population of people than maybe you've	541	
had time to see, a lot of times coming back to the laboratory is more about, umm, being able	542	
to do something in the time frame that you've got. So for instance you might make up a mock	543	
up and say, right we'll pull in ten different people, y'know 2 very short, 2 in the middle, 2 very	544	
tall, whatever and so, and see how this works for them. But that's on the basis of having	545	
decided that from looking in real life at what's happening with the real workers. So you can	546	
do your mock up stage before you've actually spent a lot of money and put something in that	547	
is actually gonna be more fixed in the work place	548	
*Sue	549	B
so that sort of brings me onto the last bit. Yep, what's your impression of qualitative	550	B
methodology? When I turn to you and say I'm doing qualitative		B
methodology, what do you	551	B
think I'm doing	552	B
*Interviewee	553	B
well I think you're' doing something, what I understand it to be is that it is something that	554	B
would be largely field based, as in you would be taking things for real life and from real	555	B
people, actually doing the job, but I would assume that you'll still be measuring it in a sort of	556	B
scientific way, because I think often that's one of things that people, people think that that sort	557	B

of qualitative-quantitative distinction sometimes is the sort of, people		B
will assume is the	558	B
difference between anecdotal; and scientific, which I think it's not.		B
Umm, don't know how	559	B
much more you want me to sort of go in, I mean, basically I assume it's		B
something that has a	560	B
lot of external validity, but that is still measured sufficiently	561	B
*Sue	562	
would you feel comfortable, would you know how to set up a qualitative		
project and then do	563	
it?	564	
*Interviewee	565	
no, I don't, I'm not 100% sure, but to be particularly, to be totally		
stringent about it, no. I	566	
would feel comfortable to set up something that I would assume to be a		
field ergonomics	567	
study, but that coming from someone who's worked in that sort of		
consultancy quick-and-dirty,	568	
find-the-results environment for the past few years, umm,	569	
*Sue	570	
that's not from a research perspective?	571	
*Interviewee	572	
not from a research, I mean I would be very happy to set up a		
questionnaire or a survey of	573	
something that would be, as I understand it, a text book qualitative, so		
it wouldn't be in a lab	574	
and be, have statistics applied to it, but I think	575	
*Sue	576	
but for actually addressing philosophical questions?	577	
*Interviewee	578	
no I would say that's beyond my knowledge at the moment	579	
*Sue	580	
I mean that's the reason I gave you the paper because one of the things		
that, I spent years	581	
learning about this, I streamed off into science when I was 16 and did		
'A' levels in science,	582	
first degree in science and only started getting into qualitative when I		
started my research in	583	
Cambridge, and realised that I wasn't going to actually be able ask the		
questions I wanted if I	584	
stuck to the methods I knew, and um, I've been floundering around and		
finding my way	585	
through it ever since. And one of the biggies has been, for me, the		
enlightenment that there	586	
is a totally new world of philosophical thought about knowledge out there		
and this scientific	587	
way of looking at things, and I mean you went straight into it saying		
about measuring,	588	
*Interviewee	589	
yes because that's my	590	

*Sue	591	
exactly that's your background	592	
*Interviewee	593	
exactly	594	
*Sue	595	
exactly the same as mine is, umm, and, and we're sort of working within a philosophy that we	596	
don't' even know we're working within, I think	597	
*Interviewee	598	
yeah, which is very interesting,. So yeah, I mean I guess in light of that the answer is	599	
absolutely no, which, which	600	
*Sue	601	
but you've got the basics I mean you've got the essence, you've got the essence	602	
*Interviewee	603	
but not the tools	604	
*Sue	605	
exactly, that is exactly it and you are exactly the same as academics that I've talked whether,	606	
Loughborough were particularly very, very useful for me to talk to. And umm, I talked to 3	607	
people there and they were in exactly the same position, they know about it, they know its	608	
useful, they know they want to do it, they've even got people within Human Sciences, some	609	
social psychologists who're doing it but they don't feel comfortable because they haven't'	610	
absorbed the back ground and they've got all this masses years of background in, in I'm not	611	
going to call it science, I'm going to call it in a positivist, which is the umm, quantitative	612	
background and that's what you're comfortable in, because you know it	613	
*Interviewee	614	C
the thing is you understand, of my understanding is that you're being qualitative if you're	615	C
producing something along the lines of a survey or questionnaire	616	C
*Sue	617	C
not necessarily. I mean they are tools that you can collect qualitative data	618	C
*Interviewee	619	C
or an interview	620	C
*Sue	621	C
yeah but you can do it in quant way as well, I could be interviewing and giving you fixed	622	C
choices	623	C
*Interviewee	624	C
yes, that's true	625	C
*Sue	626	
and I could analyse that quantitatively, I start messing around with		

numbers, it's what do we	627
mean by it	628
*Interviewee	629
so how do you analyse it?	630
*Sue	631
what I would do with this, is umm, I type it up obviously, I send you a copy of the transcript	632
and you can edit it and correct it, and um then I would go through and try and theme up where	633
my questions are and what sort of things you were coming out with. I then go through it and	634
actually try and tree it up, umm. Yeah, I'll got through and actually try and get it into the	635
various categories, subcategories, try and make sense of it, try and draw some sort of	636
interpretation. What I'm not going to be able to do with this stuff is bring it back to you with	637
my interpretation, because I can't get a group of you together, so what in fact I'm doing is	638
taking it back to things like the IEA, I'm doing a paper at the IEA. I might take it back to	639
Loughborough, Murray and Ken Eason have said they might be interested if I wanted to come	640
back and do little workshop with them. I do try and get John Wilson to do some analysis with	641
me, and he's done one session with me on models of ergonomics and I'm going to get him to	642
do another 2 on qualitative and on hospitals as well, and it's all about looking at different	643
concepts of what validity and reliability actually mean, I mean you're right about external	644
validity, face validity yes there's more realism in it. But only if it means something to you, if	645
my interpretation doesn't mean anything to you, then no it hasn't got any. So it's it's looking	646
at umm different understandings of what knowledge it, knowledge doesn't have to be in	647
numbers, and do stats apply to it, knowledge can be in, does this mean anything to you, is	648
this something you take away and apply in what you do. Does this have a real feeling to you?	649
And one of the other big differences between quant and qual., I think anyway, is the nature	650
that you do it. When you do a quant project you tend to collect the data, go away analyse it	651
and come up with something. When you do a qual project, you collect the data, you do away	652
analyse it, you come back and collect a bit more and change your hypothesis and it's the total	653
thing is interactive, flowing as you go along. So it's a moving target	654

*Interviewee	655	
so kind of the difference between it being an applied science or a craft, so that sort of art	656	
*Sue	657	
yeah. It's trying to move towards that. Y'see that's one of the interesting points for physio, is	658	
it an art or a science? Because the intuitive side of y'know you can feel things, you know	659	
what's happening, experience	660	
*Interviewee	661	
huge amount of that	662	
*Sue	663	
that's an art	664	
*Interviewee	665	
but in all of medicine	666	
*Sue	667	
exactly	668	
*Interviewee	669	
mm	670	
*Sue	671	
but if you go down the line of saying we have to quantify you're probably doomed to failure, so	672	
unless you actually absorb this. And this quant-qual debate has been going on in one format	673	
or another for at least 2000 years, Greek philosophers, the threads are all there.	674	
*Interviewee	675	
do you think that perhaps ergonomists do it without even realising, because, is it this, there's	676	
this side of things that people coin as quick-and-dirty, there's the sort of, 'you're not doing	677	
your full research project, and writing it up all beautifully and presenting your paper, what	678	
you're doing is getting a result for a client, or for whoever	679	
*Sue	680	
you've got your academics and your practitioners	681	
*Interviewee	682	
yeah, but there's also, I think there's perhaps even a little bit more to it than, because	683	
there is the side of things that perhaps is pulling the information out, perhaps more in the way	684	
that your talking, now you've explained that more fully, more in the way.		C
So carrying out a	685	C
work shop with a group of people, sort of getting them to think about things, getting ideas from	686	C
them and actually you're pulling their concept of it or their level of knowledge in order to	687	C
present it back to them. but actually what you do, is you land up calling that, you call it a	688	C
workshop or you call it a bit of quick-and-dirty research, but you've		C

pulled something out of it	689	C
that's very valuable	690	C
*Sue	691	C
so why are you giving it second rate status?	692	C
*Interviewee	693	C
because you don't understand exactly the value of, or what to call if		C
even, you don't have a	694	C
label for it. And perhaps there are tools that people are using	695	C
*Sue	696	
because you've not been taught, I mean I've gone on sessions on learning		
how to do focus	697	
groups, and now I tend to call them group interviews, rather than focus		
groups because there	698	
are certain, I mean there is this wealth of literature within sociology		
and social sciences that I	699	
don't think ergonomists with their background in engineering and		
psychology are drawing on,	700	
and therefore people are going out into this applied discipline without		
human interaction tools	701	
*Interviewee	702	
interesting	703	
*Sue	704	
which is a simplistic way of me saying that, I couldn't have said that 12		
months ago, but I do	705	
very strongly feel that nowadays. They don't go out with interview		
techniques, how to	706	
manage the data, I mean one of the things I've always complained like mad		
to John Wilson	707	
about, is that he's this advocate of participatory ergonomics, they end		
up with a lot of data,	708	
interview data, what do they do with it? And there are ways of doing		
robust analysis	709	
*Interviewee	710	
right but I mean surely if you, if you do have the interviews, or you		
have the workshops of the	711	
focus groups, you do actually have a way of pulling that information out	712	
*Sue	713	
yeah. But why reinvent the wheel and be learning each time, be learning		
from scratch, why	714	
don't we actually teach people the tools that are out there and have been		
discussed about for	715	
decades and other people are doing it	716	
*Interviewee	717	C
yes its quite funny you saying that because I've used workshops and focus		C
groups, but not	718	C
actually had a name to call things, and you land up pulling the		C
information out in a very	719	C
haphazard way,	720	C
*Sue	721	
and yet, now I'm doing this literature search and I've been going on		

modules at the university	722
and what not, it's there, so why on earth as ergonomists, as applied scientists, and it doesn't	723
mean it's not a science, if you look at science in the broadest sense of being a search for	724
knowledge, rather than being a counting numbers, then science is a search for knowledge	725
*Interviewee	726
that's very interesting because my understanding, unless I'm looking at it too simplistically is	727
that a lot of that kind of, the stuff that you're describing, y'know the different ways of getting at	728
the data is the stuff you do when you're a practitioner, rather than a scientists and therefore it	729
has second rate status	730
*Sue	731
yeah, but is not the way it should be. My paper to the IEA in the summer is does the	732
discipline of ergonomics support the profession/ and I'm not the only one asking that	733
question by a long way and my, one of, my thesis is that qualitative methodology is very	734
valuable approach and provides a rang of tools which the discipline should be using in order	735
to support the profession wants to use them and they are using them but they don't' know	736
what they're doing with them.	737
*Interviewee	738
yeah, that's very interesting and I would actually say, having had this discussion now that	739
you're absolutely right, because, because I know that I've done it. I've run workshops and	740
focus groups with post man and pulled out information and haven't really , haven't' really	741
known, as you say, how to pull the information out particularly well. I've known that its very	742
valuable information and I've landed up presenting it in what I consider to be a fairly	743
haphazard way, and trying desperately to find ways of quantifying it, and then you find you	744
can't so you write you land up writing these huge paragraphs within a report that then you cut	745
out again because they don't necessarily mean anything but somehow you just incorporate it	746
into the. So it goes into your background knowledge for coming up with the answer but very	747
often what goes to the client is the stuff you can put in a table, or the stuff that you can write	748
up very easily	749
*Sue	750

The numbers	751
*Interviewee	752
yeah, yeah, and sadly the fact that you've done all that, which is probably the biggest bulk of the work and where you've got the feel for it, goes into the background, but it definitely happens	753 754 755
*Sue	756
but its tools isn't it, it's knowing how to do it. But the tools are there and they are becoming more and more accepted and more and more rigorous, and even the medical profession,	757 758
there've been articles in the BMJ about using qualitative methodology, umm y'know they're becoming more and more accepted	759 760
*Interviewee	761
yeah the tools are there and I could probably think of several things that I would do in a workshop or a focus group to get information out of people, umm, and then the difficulty would be in how to present that, so you'd end up having a very, very long winded report. Y'know just things like giving everybody,	762 763 764 765 766
*Sue	767
and I think you tend it miss it out because you feel vulnerable because you haven't got the years of background knowledge and experience in, I mean if you're like me from sort of 16 through to 35 I suppose, 20 odd years of, of doing quantitative methodology. I mean	768
*Interviewee	769
when you cant' percentage it and average it and all the rest of it	770
*Sue	771
no, so does it have any value? Can I defend it?	772
*Interviewee	773
yeah, but having said that,. It's used a lot, I've used that sort of stuff a huge amount and it's quite interesting that you're only now pulling it out of me at this stage of the interview than at the beginning, so it just shows how hung up I am	774
*Sue	775
no. no, I didn't push you at the beginning, I intentionally didn't push you at the beginning	776
*Interviewee	777
but that just shows where that is in my hierarchy of thought doesn't it	778
*Sue	779
that's why I didn't' push you	780
*Interviewee	781
interesting, very interesting	782
*Sue	783
shall we stop there?	784
	785

Development of interview proforma (July 1997)

PHYSICAL

1. Work site. (Static) Horizontal work area, working height, viewing, leg space, seat, hand tools. *Include. Space (building design)*
2. General Physical Activity. Light, medium or heavy work, rest breaks, autonomy of worker.
3. Lifting. Height, holding distance, weight.
4. Work posture and movement. (Dynamic). Movement of body required by the work.

ENVIRONMENTAL

5. Lighting. Evaluated according to type of work.
6. Thermal. Temperature, humidity, air velocity, thermal radiation, work load and clothing used.
7. Noise. Assessed according to type of work done.
8. Accident risk. Hazard analysis, possibility of accident occurring and severity.

**COGNITIVE/ORGANISATIONAL/
PSYCHOSOCIAL**

9. Job Content. Number and quality of individual tasks included in the work.
10. Job Restrictiveness. Limitation to move and choose when and how the work is done. *Work schedule*
11. Worker communication. Opportunities for interacting with colleagues.
12. Decision making. Difficulty of decision making, availability of information, risks involved in decision making. *Management pressure*
13. Repetitiveness of work. Average length of repeated work cycle
14. Attentiveness. Attention and observation required by instruments, machines, displays, controls, processes etc.

OTHER ISSUES

Equipment. Suitability, usability and availability

Patient. Dignity, privacy

PROFESSIONAL ISSUES.

Therapeutic relationship of mutual co-operation

Generalist, integrated view of client

Acknowledge the subjective perspective of the client

Ability to manipulate physical and psychosocial environments to maximise function and social integration

Unpredictable, uncontrolled social multidisciplinary groups

If client disagrees, management gives clear advice

Professional staff involved with individual clients should be competent to instruct those clients/carers in safe handling practice

Specialist skills of OT's, knowledge of MH equipment, ergonomic approach to work

Competent to evaluation and assess the relevance of particular products to individual clients and carers

Written handling assessment - especially own homes

My thoughts

Female work force

Inter-relationship in multidisciplinary team - status

Choice of treatment techniques / equipment. ?Fashion, clinical outcomes measures

OT professional values

Facilitate learning of skills essential for daily living

Reactive (therapeutic) or proactive roles (health promotion, how?)

Functional capacity - physical, mental (restore and/or reinforce)

Discussion Guide. 1 August '97

Prompts

<p>Postural</p>	<p>Access to patients Static postures Space, arranging space Physical activities - dynamic, equipment Autonomy, rest breaks, job rotation</p>
<p>Environments</p>	<p>Hospital School Home - cleanliness Equipment, choice of, design, knowledge about</p>
<p>Organisational/ cognitive</p>	<p>Team, relationships, Scope within job, decision making Management support Choice of treatment techniques Psychology in OT - content, knowledge, application</p>
<p>Social</p>	<p>Female work force, team (? female as carer, maternal) Patients, relatives Home. work Rehab (knowledge) Social integration</p>

Interview prompt. 20 August 1998.

After coding interviews 1-6 and analysis of contact summary sheets

<p>1. Do you plan a session/visit in advance? Are you able to stick to that plan? What factor might lead to the plan being changed?</p>	<p><i>Personal factors (your safety, current health etc.) Patient participation, co-operation Unpredictability - patient /home</i></p>
<p>2. Are there any particular treatment approaches which influence your practice at the moment?</p>	<p><i>Other influences including legislation Relatives, carers, other professionals</i></p>
<p>3. Can you explain to me what 'occupation' mean in occupational therapy?</p>	<p><i>When is occupation related to employment or activities for daily living/quality of life</i></p>
<p>4. Can you think of any occasions when you have been in a work situation and concerned about your safety with respect to musculoskeletal injury? What risks have you taken to continue treating a patient? Would you take those risks again?</p>	<p><i>Not what you think you should have done, but what you actually did Unpredictable occurrences Look for planning, task analysis, risk assessment</i></p>
<p>5. Have you had any aches or pains recently that have affected you at work or affected your ability to work?</p>	<p><i>Look for changes in work patterns</i></p>
<p>6. Are there any things that you currently do at work which you find physically difficult? Did you, or have you, done anything to decrease the effort/discomfort?</p>	<p><i>Strenuous or prolonged static Rest breaks, planning work schedule, job rotation, decrease repetition</i></p>
<p>7. How do you assess the safety of a patient? Physically - e.g. with stairs In equipment - e.g. hoist</p>	<p><i>Any standards, rules etc. COT, MHO regulations</i></p>
<p>8. Have carers created any awkward situations or asked any awkward questions with respect to your advice about physical well-being of the patient?</p>	
<p>9. Do you think the close personal contact you have with some of your clients changes the nature of the professional relationship compared, for example with a SALT?</p>	<p><i>Dressing, washing</i></p>

Appendix Seven

<p>10. Have you had occasions when you have found the work emotionally stressful? How do you cope with this? - at the time - afterwards</p>	<p><i>Amount of work</i> <i>Patients or relatives getting upset</i> <i>To supervisions sessions, work planning, autonomy</i></p>
<p>11. Do you work as part of a multi-disciplinary team? Who is in that team? How do you see your role in the team? How do you think the other team members see your role? How do you think patients and carers see your role in the team?</p>	<p><i>NCH and outside</i></p>
<p>12. Have you heard of the term 'Therapeutic or treatment handling'? What does this mean to you? How does this affect carers who may be looking after the patient on discharge?</p>	<p><i>COT</i></p>
<p>13. How do you use ergonomic concepts or information in your work? Can you think of any examples?</p>	<p><i>Design of products</i> <i>Modification of equipment to patients</i> <i>Kitchen layout etc.</i></p>
<p>14. OT's are mostly female, do you think being female makes any difference to your work? Can you think of any situations in your experience when a male occupational therapist might have been more appropriate?</p>	<p><i>Over 80% of the hospital staff are female</i></p>

Additional questions from Contact Summary sheets

1. Effect of clinical governance on technique choice - any changes in the last 12 months?
2. Any effect of the MHO regulations in the last 12 months (have had 2 x large group sessions with me)
3. Furniture movement - Home Loans/ social Workers?

Observations

1. First contact for ward patient
2. Main Stream School
3. Social services Occupational Therapy - perhaps after team visit
4. Ask if there are any other non-UK Occupational Therapists that I could talk to

QSR NUD*IST - OT trees

File Edit Project Documents IndexSystem Windows Help

Node Explorer: Index Tree

- Index Tree Root [52]
- + 1 Base Data
- + 2 Equipment and Building
- + 3 Team
- + 4 Occupational Therapy
- + 5 Personal Well-being

Node: (4)
/Occupational Therapy

Coding Status:
No coding

Definition:

Make Report Memo Browse Properties

Document Explorer

Document:

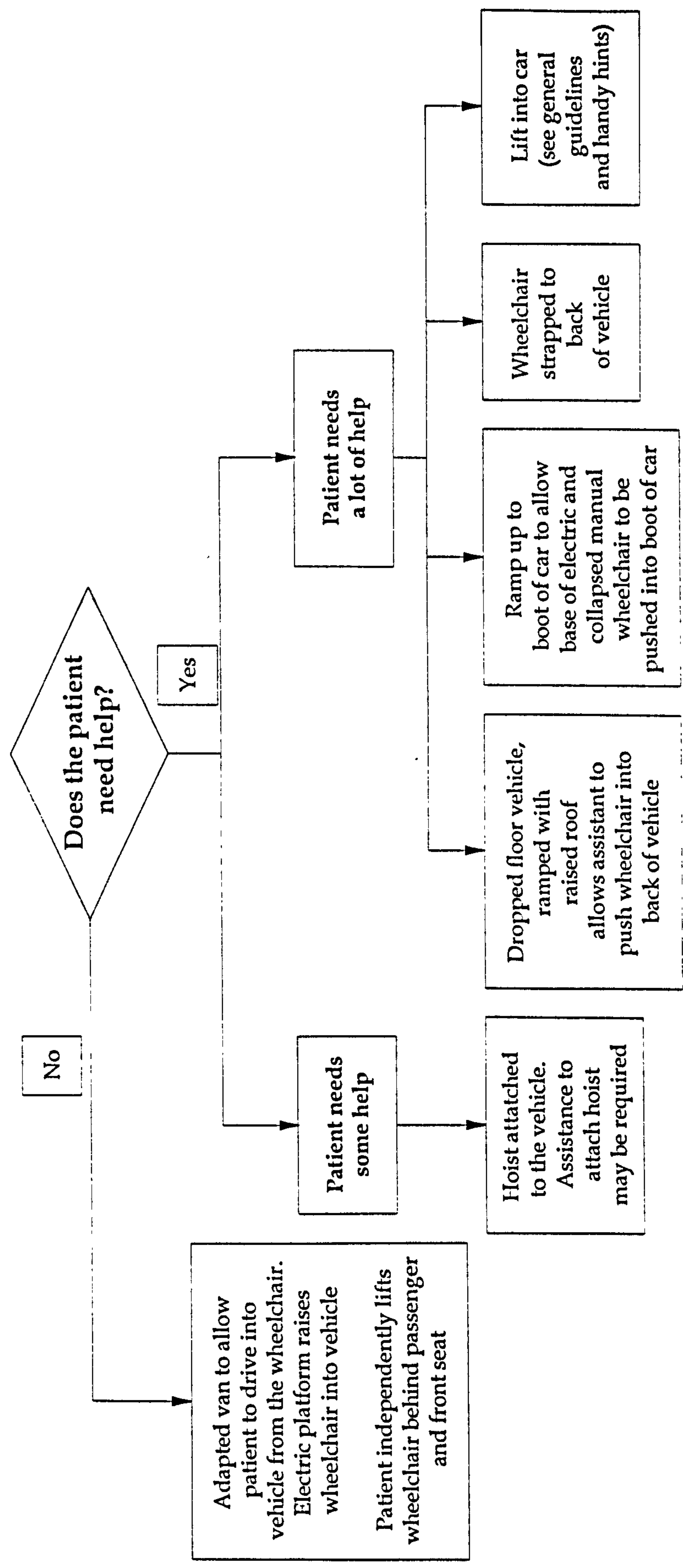
Header:
Select Import... or Add External... from the documents menu to add more documents to your project.

Memo Browse Properties Close

Tree Display at <Root>

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graph TD; Root["<Root>"] --> Node1["1: Base Da"]; Root --> Node2["2: Equipme"]; Root --> Node3["3: Team"]; Root --> Node4["4: Occupat"]; Root --> Node5["5: Persona"]; Node1 --> Arrow1[▼]; Node2 --> Arrow2[▼]; Node3 --> Arrow3[▼]; Node4 --> Arrow4[▼]; Node5 --> Arrow5[▼];
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Putting a wheelchair into the car



Putting a wheelchair into back of a car

Putting a wheelchair into a car can place an individual at risk.

These guidelines provide advice for those patients requiring no help, some help and a lot of help.

<p>General guidance</p>	<ul style="list-style-type: none"> • The method chosen depends upon the patient's ability and the weight of the chair • Manual wheelchairs can be stored in the boot or behind the front seat • Lifting independently behind driver/passenger seat requires front castors to be lifted into floor and the rest of the chair pulled in. The chair remains whole. • Lifting by assistant; manually lifting should be avoided where possible • The wheelchair should be rested on the sill and rolled into the boot • The heaviest part should be on the assistants dominant side • The assistant should hold the seat frame to stop the wheelchair from unfolding • Electric wheelchairs should be dismantled and not lifted
<p>Handy hints</p>	<ul style="list-style-type: none"> • Where possible remove all detachable parts, to reduce the weight to be lifted and allow it to be lifted close to the body • A two door car is better for storing a chair behind the front seat
<p>Equipment</p>	<p>Ramps. Adapted vehicles</p>