KNOWLEDGE CREATION AND LEARNING THROUGH CONVERSATION

A Longitudinal Case Study of a Design Project

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Abstract

This research set out to establish a link between knowledge creation and learning. This was achieved by developing links between types of knowledge and learning styles using insights from experiential learning theory.

Recently, the concepts of individuality-relationality, linear and cyclical time and status and solidarity have been included in experiential learning theory. These concepts move the focus away from the individual and towards interactive, conversational learning. . This is one of the first pieces of research to operationalise and explore these concepts empirically.

A coding frame and analytical tools were developed to measure learning styles used in task-focused conversations among a team working on the design of a goods lift.

Learning styles were used flexibly by participants and with great social skill. The qualitative analysis demonstrated the flexibility with which the participants used different styles of learning: sometimes they worked together using the same styles, and on other occasions they took up contrasting positions.

Patterns in the use of these conversational learning styles were examined to see if, and when, cycles of knowledge creation took place. The results showed that learning styles were determined more by the nature of the immediate task than by the stage of the project or by individual predisposition to use a particular learning style.

There has been a burgeoning discussion about the respective roles of tacit and explicit knowledge in organisations in recent years. However, this research suggests that processes reflection and activity have an equal and complementary role. Reflection and action define the means and rate at which experience and knowledge are transformed into something new. Thus, the tacit-explicit dimension does not stand alone: it can only be understood in combination with the action-reflection dimension.

Keywords: experiential learning, learning style, innovation, tacit knowledge, conversation, epistemology.

For Anna, Freddie and Alice. Thank you.

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Chapter One

Introduction

1. Developments in Ideas About Knowledge and Learning

The ideal type of knowledge has long been seen as based on logical argument with an emphasis on universal principles and internal consistency. The ideal form for that knowledge has been numerical, or at the least, it should be amenable to codification and abstraction in books or equations. However, these conceptions of knowledge, based on the use of knowledge in science, have been extended in recent years (Polanyi, 1967; Kolb, 1984; Blackler, 1995; Nonaka and Takeuchi, 1995).

Appreciation for the role of tacit knowledge has been growing since the Second World War (Pepper, 1942). Michael Polanyi's (1967) seminal work 'The Tacit Dimension' argued for the recognition of hunches and intuition in developing scientific ideas; summed up in his phrase 'we know more than we can tell' (p.4). Kolb (1984) argues too that there has been a recent exploration of tacit knowledge and the processes that underlie it, and, further, that experience and cognitive processes play a large role in determining the form and nature of knowledge. Cohen et al. (1999), who posit a cognitive model for innovative organisations, would agree: 'It would be too strong to say that cognitive science is converging on a new theory of learning. Nonetheless, there is a convergence on the basic attributes of a model of successful learning' (p.28).

Scarbrough (2003) takes up the argument that there has been an important change in the debate about definitions of knowledge and its role for businesses:

> 'Recent contributions to that debate ... have highlighted a shift away from the conventional science model as the basis for grasping the role of knowledge ... towards perspectives which collectively provide a very different account of its formation and production. By highlighting the socially situated nature of learning and the importance of

> tacit knowledge, these perspectives emphasize the production of knowledge in the context of its use.'

Scarbrough highlights three additions to the debate about knowledge: the socially situated nature of learning, the importance of tacit knowledge and the connection of knowledge to its application. The move away from traditional views of knowledge has also been noted by Hislop et al. (2000) who argue that 'The main limitation of such conceptions of knowledge is [that] they did not accurately reflect the processes of knowing, learning and working typical in organizations' (p.55).

The establishment of the link between knowledge and learning is fruitful: it focuses attention on the processes of knowledge creation (Nonaka and Takeuchi, 1995; Kolb, 1984). Also, the literature on learning draws on fundamental issues about communication and mutual understanding that can be linked to the interactive and intersubjective nature of knowing. Increasing efforts are being made to bridge the gap between individual and social explanations for how we come to know (Resnick, 1991; Weick 1993; Vygotsky, 1978). As Resnick (1991) has argued:

> 'We seem to be in the middle of multiple efforts to merge the social and cognitive, treating them as essential aspects of one another rather than as dimly sketched background or context for a dominantly cognitive or dominantly social science.' (p.3)

This research aims to contribute to that effort by examining how it is that conversation can create knowledge. It argues that knowledge is inextricably linked to language and consequently to the communication that takes place in social interaction. Using audio recordings of a group working on a task it investigates how conversation leads to knowledge creation. Blackler (1995) has argued that language is the medium through which we come to know about the world: this research uses features and styles of speech to gain insights into the thinking taking place during communication, and thus to gain access to knowledge creation.

2. Broad Aims of This Research

This research recognises the need to study these issues further. It explores how experience becomes knowledge through learning in a group context. In order to give full weight to tacit knowledge, the intersubjective nature of knowing, and the way knowledge is bound up with the context of its development, it focuses on a group of people working together. It explores the processes of 'knowing, working and learning' by studying a team working on a project to incorporate a goods lift and goods area into their offices and manufacturing facility. The group studied met regularly over a period of six months as they learned what they needed to do and created plans for the design of the lift. Thus, the design process was an example of group learning and demonstrated the use and creation of knowledge in a work environment.

Boden (1994) has argued that there is a 'new and rather insistent emphasis on the need to study organizations as they happen' (p.10) and that to a large extent organisations are constituted through 'talk'. Thus, the conversation that took place in the meetings was recorded, transcribed and coded in order to capture the moment by moment development of the design. The methods used to observe and analyse that process were designed to be sensitive to the role of tacit and practical knowledge; and also allowed the examination of the socially situated nature of learning. It was not enough to treat knowledge as a resource to be gained or transferred: the analysis of conversation was used to examine 'the mechanisms and processes by which knowledge is created' (Nonaka and Takeuchi, 1995, p.7).

More specifically, this research explores these questions:

- Tacit knowledge, by its nature, is difficult to codify and measure. This research investigates whether we can get a better sense of how it is used by observing people interacting with each other; and specifically, by examining their conversation whilst they are engaged in a task.

- The value of tacit knowledge is being increasingly recognised. However, discussion of the role of tacit knowledge often provides a stereotypical view of explicit knowledge: explicit knowledge is sometimes portrayed as only incidental to processes of knowledge creation. This research asks whether conversations that create knowledge should emphasise the equal role of tacit and explicit knowledge. Indeed, it suggests that they stand in a dialectical relationship to each other.

- The fact that practical, applied knowledge exists and is useful is often acknowledged or taken as a given (Fleck, 1998). However, in this research practical, active knowlege and its corollary, reflective knowledge, have a central role in knowledge creation. It argues that tacit and explicit knowledge can be divided into active and reflective components. Furthermore, it suggests that knowledge creation may only take place when knowledge is transformed by action and reflection. It asks whether the conversational processes that create knowledge should emphasise the equal role of practical, applied knowledge and refined, universal knowledge.

- Using a four-fold typology of knowledge, this research investigates the assertion that particular types of knowledge tend to be used at particular stages of the knowledge-creation process. Furthermore, this research asks whether knowledge about a task, such as a project design, develops in a 'naturally-occurring' knowledge cycle and investigates the circumstances where this cycle might be strongest.

- Knowledge is also socially-situated and closely connected to the context of its use. This raises issues about the nature of interaction in knowledge-creation and issues of status and solidarity. Within the context of this case study, this research explores these issues using the concepts of informality and formality. More specifically, it asks whether a greater emphasis on solidarity and informality is more appropriate at the initiation of a project and an emphasis on status and formality is more appropriate during implementation.

- Knowledge and learning are often portrayed as the properties of either individuals or groups and organisations: that is, either individuals or groups have knowledge or learn. This research investigates whether knowledge-creation processes can be seen as simultaneously individual and social, and examines which concepts best describe the balance between individuality and relationality.

3. Plan of Thesis

The review of the literature is divided into three chapters. Chapter 2 discusses different conceptions of knowledge and learning. As we have seen, knowledge is often thought of as data or information that can be codified and stored in objects. This view is expanded to include tacit knowledge that cannot be codified easily and is more difficult to communicate. The link with learning is made by seeing knowledge acquisition as a process of knowledge creation as well as knowledge transfer. Thus, knowledge also becomes the product of learning. Finally in this chapter, conversation is examined as one of the key means by which knowledge is created, communicated and used.

Chapter 3 has three main sections. The first section examines Kolb's theory of experiential learning (Kolb, 1984; Kolb, 1995; Kolb et al., 2002) and argues that fundamental psychological processes of gaining experience find form in tacit and explicit knowledge. The middle section looks at the transformation of experience through reflection and action; an area that is less often discussed in relation to knowledge but is crucial to transforming experience. The last section focuses on how the combination of grasping experience and transforming it produces four styles of learning and four kinds of knowledge. It looks at how we can observe these styles through the study of conversation. Kolb (1995) is most widely known for his work in developing the Learning Style Inventory (LSI) which is essentially a questionnaire tool for assessing learning style. There are some critics of the psychometric properties of the LSI (and some severe ones at that, e.g. Freedman and Stumpf, 1980, 1981) and these are discussed in Chapter 5. However, the LSI is used here merely to augment indepth research into the use of learning

styles in conversation. The insights from Kolb's experiential learning theory (1984) are used to operationalise the concept of learning style in the form of a coding frame for conversation. The intention was to break through the standardised and individualistic nature of a test and examine the particular and social nature of learning styles in action.

Chapter 4 examines the evidence for patterns in the use of learning styles in conversation and generates research questions about their use. The challenge of this chapter was to try to integrate many differing ideas using the framework laid out in the previous chapter. Essentially, this chapter looks at what we might expect to see using the theory and methodology outlined in Chapter 3. This integration was essential so that the insights of these different ideas could be sensibly incorporated into a coding frame for the study of knowledge creation in conversation.

Three dialectics raised by Kolb et al. (2002) are explored: linear and cyclical time, status and solidarity, and individuality and relationality. The first of these examines how greater learning and knowledge-creation develop linearly through repeated cycles of learning, and argues for a link between learning style cycles and knowledge-creation. The section on status and solidarity examines the need within a work group of a balance between hierarchy and heterarchy and relates this to issues of formality and informality. Finally, the section on individuality and relationality raises the issue of individual and group knowledge: knowledge and learning are often seen as either the properties of individuals or of a group or organisation. This section examines work on intersubjective understandings of knowledge and learning. The focus throughout is on linking knowledge-creation with features of conversational interaction that can be measured.

Chapter 5 describes the actions taken to collect, prepare and analyse the data used in this research. It discusses different research methods associated with the analysis of speech and locates this research broadly within content analysis and case study research. The data collection and analysis focus on a small group of people meeting to work on a project over several months. The research focuses both on the broader level and the detail of their discussions; it is a case study but a data set of 2,815 turns at speaking was created;

quantitative data was used as well as close textual analysis and a high level of interpretation by the researcher. The implications for the validity and reliability of the research are discussed.

Chapter 6 serves as an introduction to the case study and the participants. It is a fairly straightforward description of the participants' employer, the culture of the organisation and the relationships of the participants to the organisation and to each other. It also describes the nature of the project studied for this research.

The results are divided in two chapters. Chapter 7 uses quantitative data generated from the coding of individual turns at speaking during the project meetings. Firstly, evidence is presented about whether learning style was a property of individuals or a property of the interaction they were engaged in. These analyses focus on the degree to which project team members used the same learning style consistently. This is followed by analysis of the learning styles used by the group as a whole. It explores the idea that the learning style of an individual, while engaged in discussion, may be dependent on the learning style of the people they are talking with and the subject of that discussion. These analyses also examine the evidence for learning cycles during the project and the situations in which cycles seemed most clear.

Chapter 8 focuses on three subjects discussed during the project. The focus on particular subjects allowed an assessment of the relationship between learning style and knowledge and, in particular, the circumstances where there seemed to be a strong or weak learning cycle. The quantitative analyses of these subjects were extended. This involved a close examination and interpretation of the interaction recorded in the transcripts to explore the issues of linear and cyclical time, status and solidarity and individuality and relationality raised earlier.

Chapter 9 draws the two results chapters together and discusses the main findings in relation to the research questions and what the literature said about them. Again, it is ordered by the themes identified by Kolb et al. (2002): that is, individuality and relationality, linear time and cyclical time, and status and solidarity. Various ideas for further research are outlined that build on the evidence produced by this research. The final section of this chapter addresses the

strengths and limitations of the methods developed to study conversational learning. It also considers the opportunities for their use in further research.

Chapter Two

Nature of Knowledge and Learning

1. Introduction

This research explores the boundaries between knowledge and learning through a focus on learning in conversation where knowledge is a principal factor in, and product of, that conversation. This first chapter explores definitions for the concepts of knowledge and learning and focuses on the link between these two concepts. It examines the nature of knowledge and tackles the stereotypical view of knowledge as data or information that can be stored in artefacts and easily transferred between people. This idea of knowledge is expanded to include tacit knowledge and knowledge as the product of learning. Finally, conversation is examined as one of the key means by which knowledge is created, communicated and used.

2. Nature of Knowledge

Knowledge is often conceived as value-added information (Mingers, 1995, Spender, 1996; Hedlund, 1994; Myers, 1996). Davenport et al. (1998) define knowledge as 'information combined with experience, context, interpretation, and reflection. It is a high-value form of information that is ready to apply to decisions and actions ... both [information and knowledge] are more valuable and involve more human participation than the raw data' (p.43). Nonaka and Takeuchi (1995) say that knowledge is redefined in the light of new information. Often, however, little is said about how processing or combination transforms information into knowledge, or how information acquires meaning (Gourlay, 2000).

Fleck (1998) describes the different forms of knowledge that can be found in organisations and shows some of the various forms that knowledge can take. Knowledge can be embodied in

theories as formal knowledge; it can be found in the use of tools; in verbal interaction as informal knowledge; in context as contingent knowledge; in people as tacit knowledge and in communities' cultures. Each of these locations implies a different form of knowledge.

Sparrow (1998, p.24) says that knowledge is one of those words that we use frequently and loosely and he wants to broaden the concept of knowledge. For example, if someone makes a decision they could argue that the decision was made on the basis of factual knowledge and logical argument. Someone else might argue that it was based on opinion and belief. Thus knowledge should include opinion as well. Also, if someone is able to do a task we might say that it is because they *know* how to do it. Thus, knowledge also needs to encompass skill. And, as with skills, we might perform a task without much conscious effort. Perhaps knowledge also needs to include an unconscious knowing as well as the conscious marshalling of facts.

Nonaka and Takeuchi (1995) argue that Wittgenstein came to see knowledge as embodied in 'knowingness' as well as an objective picture of reality. They reproduce his argument that:

> 'The grammar of the word 'knows' is evidently closely related to that of 'can,' 'is able to.' But [it is] also closely related to that of 'understands.' But there is also *this* use of the word 'to know': we say 'Now I know!' - similarly 'Now I can do it!' and 'Now I understand!' ' (Wittgenstein, 1958, p.150, cited in Nonaka and Takeuchi, 1995, p.27)

One of the key distinctions made here is between explicit and tacit knowledge. Jary and Jary (1991) define tacit knowledge as 'any knowledge which the social actor possesses but may not be able to articulate which enables him or her to perform competently within a general or specific social context' (p.677). Nonaka and Takeuchi (1995) argue that explicit knowledge comes from articulating experience and codifying it. Explicit knowledge is formal and systematic and can be expressed in data, scientific formulae, codified procedures, universal principles or computer code. Tacit knowledge is also based on experience but it is not easily expressible or codifiable. It is highly personal, hard to formalise and difficult to communicate. It is made up of subjective insights, intuitions and hunches. It is rooted in an individual's action and concrete experience, as well as in the ideals, values and emotions that he or she embraces.

Sparrow (1998, Chapter 6) views knowledge from the perspective of cognitive psychology. He discusses different types of knowledge and relates them to the cognitive structures that lie behind them. For Sparrow, tacitness and explicitness lie on a continuum described by the level of consciousness used to process our experience. There are five kinds of mental material: semantic understanding is the most conscious kind and is what we commonly think of as explicit knowledge. Episodic memories are on the borderline between explicit and tacit but still largely conscious. Skills and expertise are consciously acquired, but practised subconsciously. Tacit feel is unconsciously acquired and practised and some interpretations are made unconsciously.

Sparrow discusses 'tacit feel' as a basis for decisions which is based on something feeling or looking 'right'. It is a 'deep sense of the basics of something' (1998, p.29). And whereas some expertise relies on conscious reasoning and verbal knowledge 'some of the expertise that people have does not appear ever to have been verbal knowledge (that is, reflected on during skill acquisition). This kind of mental material is the product of pure experiential learning' (ibid.).

This unconscious grasping of experience is very real and is used in our interactions with the world. It is close to Polanyi's idea that all knowledge is fundamentally tacit. In his philosophical treatment of knowledge Polanyi (1967) argued that we can only understand the world because 'We know more than we can tell' (p.4).

One area where the distinction between tacit and explicit knowledge is widely used is in knowledge management. Some approaches contend that the tacit dimension of knowledge is qualitatively different to the explicit dimension (e.g. Bohm, 2000; Blackler, 1995; von Krogh and Roos, 1996; Brown and Duguid, 1991). Other authors sometimes treat tacit knowledge as a resource just waiting to be codified (e.g. Truch 2001; Davenport et al., 1998). Similarly, Winter (1987) defines tacit knowledge and explicit knowledge as 'articulable' and 'articulated' knowledge respectively, using the idea that knowledge that is verbalised is more likely to be explicit.

This split can be illustrated by Julian Orr's (1990) ethnographic study of repair technicians. Using participant observation he studied how technicians maintained, diagnosed and repaired photocopiers. His work illustrates how tacit knowledge enabled technicians to make sense of their machines, customers and each other.

There is a key conversation, which Orr reproduces verbatim, that shows how technicians come to make sense of the problems before them. Two technicians were discussing a particularly tricky problem that both had experienced with the same machine. They were trouble-shooting and working out what was causing this difficult-to-solve problem. Orr describes how in this account the technicians were expecting to learn from each other's experience. Each person's comments served to prompt the other's memory. Where understanding was particularly elusive, one technician started to recount a story using 'I' rather than a generalised 'you' (that is, 'one') to improve the other's understanding. The storyteller added more detail about the context: the machine, the problem, the place and the time. The storyteller also described the course of events in more detail.

During trouble-shooting the technicians used their tacit skills to select bits of knowledge from their experience that were related to what the other had said. Because the problem before them was ill-defined, because their theoretical understanding of the machine had not made a solution readily apparent, and because their experiences were different, they approached the problem in a tentative, explorative way. Each technician's comments were engaged by the other person and prompted further memory searching and pattern-matching. This kind of problem-solving is characteristic of processes where tacit knowledge is being used. This is in contrast to problem-solving that looks for definitive, logical, single solutions to problems that are relatively well-defined using explicit knowledge.

Initially, the cause of the problem was not understood explicitly or tacitly. The problem-solving skills that the technicians employed were held tacitly and it would have been very difficult for them to have made them explicit. Likewise, the loosely-held structure of the technicians' experience, which together they used to navigate their way to a solution would have been

largely inarticulable. However, the large store of experiences and knowledge about the machines was accessible and, indeed, certain experiences and 'facts' were communicated to the other person.

This example helps us understand what is meant by tacit knowledge. There is a confusion in the literature on knowledge about what tacit means. A distinction that is useful here is between codifiable and non-codifiable tacit knowledge. The technicians' skill in choosing the relevant pieces of information in trouble-shooting sessions was non-codifiable knowledge. However, the great majority of the knowledge that the technicians had was codifiable but not codified. Orr makes this point when describing how documentation provided by the machines' designers addressed common problems that quickly become routine for experienced technicians. Such codified knowledge simply could not encompass the range and depth of knowledge needed to maintain and repair these machines. The technicians codified some codifiable knowledge from their uncodified experience.

The technicians also had a lot of codifiable knowledge about common problems or aspects of the machines they worked with but it was only spoken of, or codified, from time to time. They did not have the inclination, the energy or the time to put it all into words. There was much to do and not all that was codifiable was interesting.

Put simply, tacit can mean 'quiet'. The literature on knowledge frequently combines two notions of 'quietness'. Firstly, knowledge can be quiet in that it cannot be verbalised or consciously manipulated (non-codifiable knowledge). Secondly, knowledge can be quiet in that it could be verbalised but it simply is not said or written down (non-codified knowledge).

In addition, knowledge that is codified also has a significance that it is commonly ignored. Much of the knowledge that is codified in interactions with other people contains specific cues and allusions about context that enables it to be used and understood in a tacit way. This is another way of saying that people shape the codification of their knowledge to suit a particular audience.

People's stories are doubly-situated. For the photocopier repair technicians, their later recounting of their problem-solving stories were situated:

> 'first in the context of their origin and then in that of their telling and possible application, and the comparison of the two situations had much to do with degree of usefulness.' (Orr, 1990, p.174)

That is, the usefulness commonly attributed to knowledge that has been codified depends on showing the receiver that the knowledge is true and interesting and adapting the presentation of the knowledge to the receiver's model of understanding. The usefulness of knowledge also depends on the skill of the receiver. All these requirements for usefulness have tacit elements that determine the codification of knowledge.

We can experience our environment tacitly, but we can also tacitly attend to our memory, to all the details of the world that we know: whether we have verbalised or codified them or not. This highlights the role of the wealth of articulable but not articulated knowledge that we have and also our largely unconscious skills for accessing that knowledge.

Vincenti (1984) says that Polanyi used 'tacit' to describe 'the unspoken element indispensable to all knowing' and that 'the fact that tacit knowledge is inexpressible does not mean that it is any the less knowledge' (p 575). Orr (1990) agrees, saying that tacit knowledge provides 'the ability to do things without being able to explain them completely and also the inability to learn to do them from a theoretical understanding of the task' (p.170).

The inclusion of tacit knowledge allows analysis of knowledge using additional concepts such as motivation, truth, ideals, values and emotions. For example, Nonaka and Takeuchi (1995) argue that:

> Polanyi contends that human beings create knowledge by involving themselves with objects, that is, through self-involvement and commitment, or what Polanyi called 'indwelling' ... [and] while traditional epistemology emphasizes the absolute, static, and nonhuman nature of knowledge, typically expressed in propositions and formal logic, we consider knowledge a dynamic human process of justifying personal belief toward the 'truth'.' (pp.58-60)

The study of tacit knowledge is also broadened by the inclusion of ideas about language, interaction and sociability. Blackler (1995) argues that 'Rather than regarding knowledge as

something that people have, it is suggested that knowing is better regarded as something that they do' (p.1023).

Vincenti (1984) illustrates this in his study of the development of flush-riveting techniques in the aircraft industry in the 1930s and 1940s. Three separate systems for flush-riveting were developed by three different manufacturers with each manufacturer claiming that their system was equal or better to the others. The scientific knowledge for understanding the strengths of these systems was not available so each set of engineers obtained mastery of this technique from their first-hand knowledge. Production engineers would modify the use of their own techniques and tools based on judgement formed from experience and this differed from company to company. The knowledge that they had was context-specific and based on experience and trial and error rather than scientific formulae and codified knowledge. Much of the knowledge was uncodified and held informally and the expertise was uncodifiable. The eventual codification, which reduced the need for so many expert engineers and allowed the methods to be standardised between companies, took a sustained effort and a massive programme of testing over several years.

3. Experiential Learning Theory

David Kolb's (1984) experiential learning theory is an integrated and broad-reaching theory of learning with consequences for the study of knowledge, knowledge in social interaction and the nature of knowing. In this theory the link between learning and knowledge is explicit. As Kolb says, 'Learning is the process whereby knowledge is created through the transformation of experience' (p.38). Knowledge is a product of learning.

He combines philosophical understanding of knowledge with the psychology and physiology of learning. He synthesises three main bodies of work to develop a model of learning (see Figure 2.1): John Dewey's (1938) work on experiential learning in higher education, Kurt

Lewin's (1951) work in training and organisational development and Jean Piaget's (1970) work on cognitive development.

Figure 2.1: Experiential Learning

(Kolb, 1984, p.21, Figure 2.1)

The learning process begins with here-and-now experience followed by collection of data and observations about that experience. These observations are analysed and then used to initiate or modify an action which leads to further experiences. As Kolb says:

> 'Immediate concrete experience is the basis for observation and reflection. These observations are assimilated into a 'theory' from which new implications for action can be deduced. These implications or hypotheses then serve as guides in acting to create new experiences.' (1984, p.21)

Kolb proposes two dialectically opposed modes of adaptation to the world. The poles of one dimension correspond to the learning modes of concrete experience and abstract conceptualisation, and the poles of the other dimension correspond to active experimentation and reflective observation (see Figure 2.2).

Figure 2.2 The Structural Dimensions Underlying the Process of Experiential Learning and the Resulting Basic Knowledge Forms

(Kolb, 1984, p.42, Figure 3.1)

The first dimension is 'prehension' defined as 'grasping or taking hold of experience in the world' (p.41). This underlies the abstract/concrete dialectic. Underlying concrete experience is 'apprehension' which is defined as grasping experience through reliance on the tangible, felt qualities of immediate experience. Abstract conceptualisation is represented by 'comprehension' which is grasping experience through reliance on conceptual interpretation and symbolic representation.

The second dimension is 'transformation', where experiences grasped through prehension are dialectically transformed. Kolb (1984) argues that 'Knowledge results from the combination of grasping experience and transforming it' (p.41). Experience is transformed either by internal reflection, called 'intention', or by active manipulation of the external world, called 'extension'.

His research on styles of learning also provides a way to categorise peoples' learning orientations that does not limit individuals' choices of action. A person's learning style may indicate the types of knowledge they are most comfortable dealing with. This has implications for the study of knowledge and for the study of social learning, such as in an organisational

context. For example, Kolb (1984) found that people with different learning styles tend to work in different functional areas in a large American industrial organisation (see Figure 2.3). Their learning styles were measured using the Learning Style Inventory (also used in this research). The results showed that the engineers were predominantly convergent because of their active orientation and their role in using explicit knowledge. The research staff were assimilative because of their highly abstract and logical orientation towards knowledge and because this was combined with reflection to produce coherent theories and models.

Figure 2.3 Average LSI Scores on Active/Reflective (AE-RO) and Abstract/Concrete (AC-CE) by Organisational Function

(Kolb, 1984, p.91, Figure 4.6)

There has been some work on the validity of the instrument Kolb has devised to measure learning styles (Sims et al., 1986; Freedman and Stumpf, 1980; Cornwell et al., 1991; Wilcoxson and Prosser, 1996; Yahya, 1998; & Loo, 1999) which is discussed in Chapter 5. The LSI was completed by the participants in the research and used to assess relatively stable preferences to use a particular learning style. However, the principal research instrument used in this research was the coding frame developed to measure learning styles by analysing conversation (see Table 5.2 in Section 4.1.1 of Chapter 5). For this, I returned to the theory and research that comprised Kolb's treatise on experiential learning theory. These ideas on learning

styles are important because, although there are fundamental regularities in the way we think and learn, individually people tend to use just one or two styles. Kolb's theory suggests how it is plausible to link predispositions to think, learn and act in certain ways to the kinds of knowledge people feel most comfortable using, and are most likely to create. Table 2.1 identifies some of the principal characteristics of the knowledge associated with Kolb's learning styles. These ideas are explored and developed further in Chapter 3.

Table 2.1 Characteristics of Four Types of Knowledge Associated with Learning Styles

Accommodative Knowledge	**Divergent Knowledge**
Accommodative knowledge is tacit knowledge transformed by active experimentation. It is knowledge produced by action. Feedback. Common-sense. Self-evident facts. Learning by doing. Apprenticeship. Stories that create feeling or contain a moral. Post-action sense-making.	Divergent knowledge is tacit knowledge transformed by reflective observation. It is rooted in concrete experiences and perception. Motivation, values and ideals. It is embodied knowledge. It is ambiguous but flexible. Hypotheses, hunches and intuition. Metaphorical.
Convergent Knowledge	**Assimilative Knowledge**
Convergent knowledge is explicit knowledge transformed by active experimentation. It is rooted in abstract conceptualisation but it is practical. Decisions. Technical and operational knowledge. Emphasis on action and practical plans. Extending knowledge into the world.	Assimilative knowledge is explicit knowledge transformed by reflective observation. It is rooted in introspection and intention. It is scientific, coherent. Theory and universal principles. It is often mathematical and quantitative. Long-lasting. Logical argument. Refined and internally consistent. Permanence. Elegant plans.

His distinction between apprehension and comprehension is crucial to the distinction between tacit and explicit knowledge. He uses this to lead into a distinction between personal and social knowledge. However, as we will see in Chapter 4, his notion of transactions between personal and social knowledge does not explicitly address the complexity of social interaction in knowledge-creation. However, his recent work (Kolb et al., 2002) has attempted to remedy this. Indeed, the research presented here can be seen as a practical operationalisation and exploration of the themes that Kolb et al. have signposted in a theoretical way.

He proposes several characteristics for experiential learning:

- Learning is best conceived as a process, not in terms of outcomes.
- Learning is a continuous process grounded in experience. All learning is relearning.
- The process of learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world.
- Learning is a holistic process of adaptation to the world. It involves the integrated functioning of the total organism: thinking, feeling, perceiving and behaving. It continues throughout life.
- Learning involves transaction between the person and the environment.
- Learning is the process of creating knowledge. (1984, pp.25-38)

Kolb's (1984) theory provides a balance over the four poles of learning that others have not. For example, he argues that research on decision-making has emphasised more abstract and active factors such as the rational and considered evaluation of clearly constructed solutions (i.e. convergence). Whereas, research on creativity has tended to focus on more concrete and reflective factors such as tolerance for ambiguity, metaphorical thinking and flexibility (i.e. divergence) (p.32). Kolb also suggests that, more generally, there has been a dramatic change since the Second World War where people are beginning to see that processes of apprehension have an equal role to processes of comprehension.

4. Organisational Knowledge-Creation

The organisational knowledge-creation theory of Nonaka and Takeuchi (1995) is centred around knowledge and how it is used in innovation. It is powerful in two ways: firstly, it proposes a link between kinds of knowledge and stages in the innovation process; secondly, it describes how knowledge is created through social practice, rather than by individuals working in isolation.

Nonaka and Takeuchi (1995) argue that if an organisation is good at creating knowledge the organisation is more likely to be successful. They argue against the idea that simple possession of knowledge is all that matters. Rather, they argue that the process of creating knowledge means that people will know 'more' and be in a better position to use that knowledge.

They rarely describe knowledge-creation as learning. In fact, they criticise organisational learning writers from being bound by an approach extrapolating from individual learning (1995, p.45). However, they are aware of the affinities. I will argue that, with some modifications, the generation and development of knowledge that they describe fits the process of experiential learning described by Kolb (1984). That is, each of their 'modes of knowledge conversion', which corresponds to a stage in the innovation process, also corresponds to one of Kolb's 'learning modes'.

The principal reason for this fit is Nonaka and Takeuchi's argument for the importance of tacit knowledge. For them, the interaction between tacit and explicit knowledge is the key to successful knowledge-creation. Organisational knowledge-creation must use tacit knowledge to be successful. They relate stages of the innovation process to these types of knowledge and the conversion from one type to another.

However, there are some problems in integrating the work of Nonaka and Takeuchi with Kolb's experiential learning theory (this is discussed further in Section 4 of Chapter 4). There are distinct areas of overlap in relation to tacit and explicit types of learning. However, Nonaka and Takeuchi's discussion of their model only implicitly acknowledges elements that resolve the active-reflective dialectic raised by Kolb. Instead, they turn to the individual-social dimension as the force driving the knowledge-creation process. This is a problem in their theory that has, possibly, led to a misplaced emphasis in their five stages of the innovation process.

Their model of the organisational knowledge-creation process does add a social dimension to knowledge-creation. Their experience of knowledge-creation in companies shows how knowledge is used and created by people working in groups. This is useful in the way that they

show how the kinds of interaction and conversations that people have are intimately related to the way they use knowledge.

Nonaka and Takeuchi say that many successful Japanese companies are not particularly efficient, entrepreneurial or liberated. They identify what they think does make them successful: manufacturing excellence, cheap capital, close relationships with customers and suppliers, lifetime employment, seniority systems and human resource practices. But most of all, they say, they are good at organisational knowledge-creation. They define this as:

> '... the capability of a company as a whole to create new knowledge, disseminate it throughout the organization and embody it in products, services and systems.' (p.3)

They do note that knowledge external to the organisation is brought in and incorporated into the organisation's knowledge, but the conversion into something new, and the creation of something new, occur within the organisation.

Nonaka and Takeuchi argue that there is something distinctive about the Japanese approach to knowledge-creation. Japanese companies are used to people knowing about the world in a tacit, difficult to express way. They are also good at tapping into that knowledge and using it.

The Western approach, they say, views the organisation as a machine for information-processing (e.g. Simon, 1973). Knowledge is predominantly explicit. It is formal and systematic. It is disembodied and expressed in words and numbers, hard data and scientific formulae. It is codified into procedures, universal principles, into computer code or a chemical formula.

Nonaka and Takeuchi use Michael Polanyi's (1967) distinction between tacit and explicit knowledge (see Table 2.2). As we have seen before, Polanyi argues that tacit knowing can be a rich source of understanding of the world and that 'we know more than we can tell' (p.4).

Table 2.2: Two Types of Knowledge

Tacit Knowledge (Subjective)		Explicit Knowledge (Objective)	
Knowledge of experience	(body)	Knowledge of rationality	(mind)
Simultaneous knowledge	(here and now)	Sequential knowledge	(there and then)
Analogue knowledge	(practice)	Digital knowledge	(theory)

(Nonaka and Takeuchi, 1995, p.61, Table 3-1)

Nonaka and Takeuchi also suggest that there are two types of tacit knowledge: technical knowledge, for example in the form of expertise, and cognitive knowledge, for example, mental models, beliefs and perceptions. This echoes the distinction made earlier between tacit knowledge that is unarticulated and tacit knowledge that is unarticulable.

The distinctions that Nonaka and Takeuchi make between tacit and explicit knowledge mirror those that Kolb makes between apprehension and comprehension-based knowledge. See Table 2.3 which summarises their overlapping definitions of knowledge.

Table 2.3 Similarities Between Tacit and Explicit Knowledge, and Apprehension and Comprehension-Based Knowledge

Kolb (1984)	Nonaka and Takeuchi (1995)
Apprehension-Based Knowledge Tangible, felt qualities of immediate experience. Non-verbal, non-rational, intuitive. Here and now.	**Tacit Knowledge** Not easily visible or expressible. Personal, hard to formalise. Subjective insights, intuitions and hunches. Rooted in action and concrete experience. Ideals, values and emotions.
Comprehension-Based Knowledge Conceptual interpretation and symbolic representation. Speech and writing, analysis, rational, logical, linear.	**Explicit Knowledge** Information processing. Formal and systematic. Disembodied. Expressed in words and numbers, hard data and scientific formulae. Procedures, universal principles.

5. Knowledge, Language and Interaction

This section illustrates how knowledge is inextricably linked to language and consequently to the communication that takes place in social interaction. It argues that conversation, which is inherently social, is a very real expression of knowledge and knowing. It argues that conversation is one of the ways by which we come to know of things and about things. The link between knowledge and conversation is used in later chapters to underpin the argument that we can examine knowledge creation by studying conversations as knowledge-creating processes.

We have already seen that knowledge, and the thinking and learning processes that come with it, relies on direct, sensory experience and intuitions as well as abstracted, codified experience. Knowledge has a tacit dimension which is essential to understanding the way we make sense of the world. It is difficult to codify tacit knowledge and this makes it difficult to measure. Sparrow (1998) has studied the range of mental material that we use and hold and the techniques that can be used to elicit that material. We may only be dimly aware ourselves of mental material such as unconscious representations and tacit feel. This can make it difficult for others to observe it. In contrast, semantic and episodic mental material is much more conscious and is more easily codified and observed.

A focus on interaction allows the researcher to observe features of that interaction that point to the use of more tacit mental material. For example, by examining interaction we can observe two people searching tacitly for a solution to a difficult problem without knowing what that tacit knowledge might be. As Orr (1990) observed, 'The technicians, then, are piecing together an understanding from bits of experience, their own or others, in the absence of definitive information' (p.172). The use of tacit knowledge can be observed by watching people interacting with each other, or in the case of skills, by observing people performing that skill.

Language is a very useful tool for assessing what kinds of mental material people are using or developing. There are certain features of speech that can be used to indicate the use of tacit

knowledge. Of course, episodic mental material may be recounted as a story in writing or more commonly in speech. And semantic material can often be written down as well as being verbalised.

Sampson (1991) argues that some thinking is actually a special form of conversation involving 'one person taking the role of the other person and imaginatively carrying on a conversation' (p.22). When people communicate with each other we can see some of that thinking taking place.

Many writers stress the importance of language to knowledge. Halliday (1993) suggests that experience becomes knowledge through the use of language. Similarly, Vygotsky (1978) called language 'the tool of tools' in relation to learning. Blackler (1995) argues that language is the medium through which we come to know about the world whilst Ash (2002) makes the point that language mediates activity and thus connects humans not only with the world of objects but also with other people.

One of the defining features of interaction between people is the use of conversation. Thoughts are verbalised in the form of language. Conversation is also inherently social. Sparrow (1998) argues that communication in conversation means that people verbalise their perceptions and co-construct the notion in another person's mind, with that other person. 'It is a rapid, dynamic process. Its success depends on the shared language of the parties, and their abilities flexibly to adjust the expression of its message, as 'confusion' is sensed' (p.51). Ash (2002) agrees when she says that 'Conversations are co-constructed' (p.7). Mingers (1995) emphasises how tacit knowledge can be accessed in conversation when he says that 'the initial perception of a sign, and comprehension of its meaning (connotation) if it is linguistic, quickly brings in context, knowledge, and intention to create the complex, individual meaning (import) for a particular person' (p.298).

Many writers marvel at our ability to have conversations. For example, Goffman (1981) said that 'Every adult is wonderfully accomplished in producing all of these effects, and wonderfully perceptive in catching their significance when performed by accessible others' (p.2). Boden (1994) said that 'Meanings, most importantly, do not occur as isolated cognitive phenomena in the heads of atomised individuals; they are constructed *interactively* and under quite pressing conditions of time and space' (p.18).

Clark and Brennan (1991) argue that conversation has particular cognitive features in addition to the individual thought processes. Conversation functions under a principle, not of least effort for individual speakers, but of least collaborative effort. The language tools used to generate 'common ground' change according to the content, purpose and medium of communication. Costs of grounding vary. For example, there are higher costs for conversation in groups. 'For whatever we say, our goal is to reach the grounding criterion: that we and our addressees mutually believe that they have understood what we meant well enough for current purposes' (p.148).

Conversation is a principal constituent of organisation and organisations. For example, Boden (1994) says that 'everyday interaction in organizations is taken to be a *constituent* feature of the setting of which it is a part, which is to say it is a primary mover in making organizations happen. ... Through the timing, placing, pacing, and patterning of verbal interaction, organizational members actually constitute the organization as a real and practical place' (p.15). Conversation and knowledge are essentially linked and are key parts of organisation.

6. Conversation as Experiential Learning.

Recently, Kolb has begun to apply the insights of experiential learning theory to the nature of conversation. Kolb et al. (2002) argue that 'Learners move through the cycle of experiencing, reflecting, abstracting and acting, as they construct meaning from their experience in conversations' (p.3). In part, this is a response to critics such as Kayes (2002) who argue that

experiential learning theory is still too focused on the individual and is less useful for an analysis of how knowledge is socially constructed.

Kolb et al. (2002) have extended experiential learning theory by focusing on conversation as an essential element in the creation and use of knowledge and in learning. They identify five themes which I use to organise my discussion of the literature:

- Apprehension and comprehension
- Intention/reflection and extension/action
- Linear time and cyclical time
- Status and solidarity
- Individuality and relationality.

They actually treat these themes as dialectics. That is, apprehension is opposite to comprehension but we cannot be apprehensive without also being comprehensive. Comprehension is implied in apprehensive processes. They argue that good conversation is characterised by a balance in the operation of each of these dialectics.

The apprehension-comprehension dimension most closely relates to the distinction between tacit and explicit knowing. In order to proceed successfully, they argue, conversation should neither be entirely intuitive and based only on personal experience, nor should it be entirely rational and logical and based only on established facts and theories.

The reflection-action dimension relates to how people transform their experiences through either thoughtfulness or activity. They argue that conversation should transform knowledge through careful observation and refinement and also be able to put knowledge into action.

One of the key concepts in experiential learning theory is 'learning style'. Learning styles are formed by the combination of the learning modes. Different kinds of knowledge and kinds of knowing are associated with learning styles. The following chapters draw on the literature that

describes how the learning styles operate and focuses on how they can be seen in conversation.

The linear time and cyclical time dimension to conversational learning effectively argues that people need to find a balance between conversations being too linear or discursive and being too circular or recursive. Kolb et al. argue that discourse tends to dominate and that people shy away from cycles, feedback or recurring discussions. A mixture of the two, they say, 'will largely determine the depth and quality of learning generated in conversations' (2002, p.11). This raises the concept of development: as people develop through learning, so knowledge develops.

The last two dimensions show that Kolb et al. (2002) have responded to criticisms that their theory is too individualistic by including overtly group-based concepts. They argue that conversation should not be dominated by a rigid hierarchy or pathological heterarchy. There should be a mixture of status and solidarity. They also argue for a balance in conversation between people acting as individuals and as members of a group. They suggest that the 'individual maintains a sense of self while at the same time is aware of, and open to influence of others' (p.4).

Table 2.4 shows a summary of these themes and the literature which seems to capture these themes.

Table 2.4 **Summary of Literature and Keywords Associated with Kolb et al.'s (2002) Dialectics of Conversational Learning**

7. Summary

This chapter has examined a range of definitions of knowledge and highlighted the relationship between knowledge and learning. It also outlined some of the main themes discussed in the literature, most notably that:

- Knowledge is more than information written in books or data held as numbers. Knowledge also includes opinion and belief, intuitions and emotion. Knowledge includes expertise, skill and unconscious representations.

- Knowledge is both explicit and tacit. Tacit knowledge includes uncodified and uncodifiable knowledge.

- Knowledge is also knowing: it is embodied in people who know something, or knowing how to do something.

- Knowledge is produced by learning through grasping experience and the transformation of that experience by action and reflection.

- Language is an essential part of knowledge, as is conversation and interaction between people. Language can be used discursively or recursively.

- Knowledge is held and produced by groups as well as individuals. The tacit and social dimensions to knowledge open the study of knowledge to issues of status and solidarity and of individuality and relationality.

Chapter Three

Understanding Knowledge and Learning Using Learning Styles

1. Introduction

This chapter examines knowledge and learning using the basic learning processes identified by Kolb (1984) in his theory of experiential learning. His argument, which is subscribed to here, is that these processes are so fundamental to the way we adapt to the world that they find expression in psychological types, world hypotheses, different academic disciplines and careers. We will examine the expression of these processes in types of knowledge and learning styles used in conversation.

Learning styles are often discussed as though they are relatively stable properties or traits of individuals (Riding, 2000). A rather extreme example is provided by Jackson and Lawty-Jones (1996) who concluded from their study comparing the Eysenck Personality Questionnaire (Eysenck and Eysenck, 1975) and Honey and Mumford's Learning Style Questionnaire (Honey and Mumford, 1992) that:

> 'Furnham (Personality and Individual Differences, 13, 429-438, 1992) was therefore correct to suggest that learning style is a sub-set of personality and need not be measured independently, unless it is learning style that is of interest in its own right. Those components of personality that were unrelated to learning style appear to have been already identified as having a biological basis.' (p.293)

In this description, learning style falls simply into the category of an individually-stable 'personality' and everything else in that category can be explained by biology. Often, it seems, learning style is treated as a measurable fixed quality that can be used to explain individuals' academic attainment or their ability to perform a particular task.

Valley (1997) provides a more helpful definition of 'learning style', which is subscribed to here. It also echoes the link between learning and knowledge. Learning style is:

> 'the preference that an individual may have for processing information in a particular way when carrying out a learning activity.' (p.43)

The term 'learning style' is used widely in education and training research to refer to a range of concepts from cognitive style to preferences for particular learning methods (Riding and Cheema, 1991). Even this approach has its problems: Curry (1983) identified at least 21 different models of learning style. Indeed, there have been strong criticisms about the over-broad use of 'learning style' in educational research (Reynolds, 1997). Sadler-Smith (2001a) echoes this when she says there is:

> 'a general problem in a literature in which 'learning style' is used as a portmanteau term for a range of individual difference constructs encompassing, among other things, learning preferences, learning strategies, approaches to studying and cognitive style.' (p.292)

Curry (1983) integrated these ideas when she argued for an 'onion' model made up of the central personality dimensions, cognitive style, learning style and learning preferences. Each item, respectively, signals greater situational variation.

Still, some authors have attempted to replace what Sadler-Smith (2001a, p.291) termed the 'somewhat meaningless and potentially redundant' term of learning style with that of 'cognitive style' (Sadler-Smith, 2001a, 2001b; Riding, 1991; Riding and Cheema, 1991). Messick (1984) defined cognitive style as consistent individual differences in preferred ways of organising and processing information and experience. In contrast to learning style, cognitive style is seen specifically as the bridge between the stable personality and the more immediate cognitive processing of information (Sternberg and Grigorenko, 1997).

Reynolds (1997) argues further that management development has dealt with this confusion expediently by by-passing discussions of it and adopting as almost unquestioned orthodoxy two approaches to learning style which have a high face validity: Kolb's (1984) Learning Styles Inventory (LSI) and Honey and Mumford's (1982) Learning Styles Questionnaire (LSQ). Reynolds acknowledges that these instruments and the ideas behind them are appealing but found conflicting empirical and theoretical evidence about their use (see also Sims et al, 1986 and a discussion of methodological issues about the LSI in Section 3.3 of Chapter 5). Still

others have supported the use of the LSI (Loo, 1999; Willcoxson and Prosser, 1996; Yahya, 1998).

However, Reynolds points to an old distinction in learning research that helps to transcend this debate: that of the difference between rote learning and learning to gain a deeper understanding (Craik and Lockhart, 1972). This distinction has been developed into an understanding of learning preferences in relation to cognition, processing of information and learning strategies. Indeed, in a review of research on study approach and style, Tickle (2001) argues that 'the consensus achieved in this relatively new and flourishing area is remarkable' (p.955).

She describes work done in the 1970's to examine how students learned. For instance, Pask and Scott (1972) set up a free learning experiment where students were required to show evidence of learning in an active and meaningful way. They "taught back" to the experimenter whatever they had learned. Feedback was given and the performance repeated. Pask identified two types of learner: the 'serialist' who worked one step at a time and the 'holist' who from the word 'go', was concerned to build up a broad understanding of what they had learnt.

Subsequently teaching strategies were developed to reflect each of the two groups and subjects were assigned to either a matching teaching strategy or a mismatching one. The findings were decisive: the mismatched groups experienced difficulties (see Hayes and Allinson, 1996, for a review). Pask (1976) was able to build on the identification of the working strategies to propose two associated, underlying learning styles - operation and comprehension. Comprehension learning tends towards an holistic way of working, by building an overview. Operation learning tends towards a serial way of working: the learning of local rules and isolated details which, without disruption, could lead to a logical body of knowledge. Note that Pask's term 'comprehension' in fact corresponds to Kolb's term apprehension described in the following sections.

Now, it has been noted that Kolb's (1984) abstract conceptualisation/concrete experience axis is very similar to this analytic-holistic dimension (Miller, 1991). Entwistle and Ramsden (1983), Ramsden (1988) and Pask (1976) have also found relationships between holism, divergent thinking and the arts that echo Kolb's (1984) findings. At the same time, one of the principal dimensions behind Riding's (1991) Cognitive Style Analysis (CSA) is a holist-analytical dimension relating to retaining an overall view of information or organising information into its component parts (Riding, 1991; Riding and Cheema, 1991). Similarly, the discussion in the following sections shows that the other cognitive style dimension of 'verbaliser-imager', describing the representation of information as language or images during thinking, can be seen as an interpretation of Kolb's action-reflection dimension. Thus, it is difficult to separate cognitive from learning styles (Sadler-Smith, 2001b).

As indicated at the beginning of this chapter, however, one mistake that all authors must avoid is using learning styles to pigeonhole people: rather, learning styles should be used 'as signposts for characterising individual propensities' (Messick, 1984, p.61). The problem is that, as researchers starting from a psychological view, such as Sadler-Smith, urge us to be careful, they themselves assert the 'individual' nature of learning styles. They remove the possibility that styles are in fact also socially and contextually determined.

One benefit of educational research, as opposed to psychological learning research, is that there is often an acknowledgement of the context in which that learning takes place. For example, Entwistle (1984) has argued that 'it is now widely recognized that learning theories must be derived from ecological settings'. This raises issues, discussed in the next chapter, about variability in the use of learning styles. For instance, Talbot (1983, 1985) has found situational variability in individuals' use of learning style. I argue that learning styles are used flexibly by individuals, not only in response to the context of their learning, but also in relation to the subject matter, their relationship with others around them and their position in the learning cycle.

This chapter has three main sections that focus on Kolb's (1984) experiential learning theory and the possibility for measuring the relationship between learning styles and knowledge. The first section (Section 2) examines the evidence for the key processes of gaining experience, apprehension and comprehension, which find form in tacit and explicit knowledge. Section 3 looks at the transformation of that experience through reflection and action. The last section (Section 4) focuses on how grasping experience and transforming it produces four styles of learning and looks at how we can operationalise the idea of a 'conversational learning style' and observe these styles in social interaction.

2. Apprehension and Comprehension

The apprehension-comprehension dimension (Kolb, 1984; Kolb et al., 2002), which most closely relates to the distinction between tacit and explicit knowledge, describes one element of these fundamental cognitive processes. This section explores the cognitive processing behind this dimension and some of the ways it is expressed in philosophy before examining how apprehensive and comprehensive processes might be observed.

2.1. Cognitive Psychology and Apprehension and Comprehension

Kolb (1984) argues that the differences between apprehensive and comprehensive knowing are based in the cognitive functioning of the brain. The specialised functions of the left and right hand hemispheres of the brain mirror the differences between apprehension and comprehension. In the 1960s, Roger Sperry and others studied the behaviour of people whose hemispheres had been split to reduce their epileptic seizures (Sperry, Gazzaniga and Bogen, 1969). They found that the two hemispheres of the brain work in different modes of consciousness. The left hemisphere, which controls the right hand and right field of vision, works comprehensively. It is abstract, symbolic, analytical and verbal. It processes in a linear, step-by-step way using symbols and concepts and it is more logical. In contrast, they found that

the right hemisphere, works apprehensively. It is concrete, imagistic, emotional and non-verbal. It is intuitive and aware of things that cannot always be put into words.

Their findings posited an essential role for less conscious processes in the brain. Until their research, verbal reasoning and analytic ability were considered to have a privileged status. The right hemisphere was thought only to transmit perceptual information to the executive left hemisphere. However, their research led to the idea that the right hemisphere was superior to the left in performing some tasks such as visual-spatial ability and non-verbal reasoning.

Comprehensive knowledge produced by left-mode thinking is more commonly located in speech and writing, in codified procedures and rules, in theories and coherent plans (Edwards, 1979). Left-mode thinking is also associated with our ability to reason. Reasoning as a type of thinking is more able to examine how things differ, 'separation thinking', and for placing things on a continuum or scale, 'location thinking' (Sparrow, 1998). Thus, reasoning is demonstrated by verbal and written communication, by using categories and placing things on a scale, and by the use of logic. The use of quantitative information and calculation is also sign of comprehension.

Apprehensive knowledge is produced by right-mode thinking and is more spatial and expressed in pictures and images and in non-verbal forms of communication (Edwards, 1979). Right-mode thinking is associated with 'casual musing', which Sparrow (1998) calls 'autistic thinking'. It occurs when someone is relaxed and it is more likely to throw up subconscious, tacit connections than propositional thinking. Like Edwards, Sparrow also argues that 'Autistic thinking may be operating largely on imagistic thoughts' (p.119). Examples might include the seemingly random connections made in brainstorming or creativity exercises or the search for clues in past experiences in problem-solving.

Tacit knowledge is gained by our 'implicit learning capability'. This is a largely subconscious, slow, experiential process (Sparrow, 1998, pp.200-213). Hintzman (1990) says that conscious learning encodes 'attentively selected contingencies'. In comprehensive thinking, as in science, we may attempt to incorporate these connections in a complex and formalised theory which

attempts to explain each and every case. However, Hintzman argues that tacit learning stores a large array of connections between things. In this kind of apprehensive thinking we subconsciously look for patterns so that we can feel comfortable with new experiences. Our ability to learn implicitly is limited in the way it can hold and process logic and rules but by learning implicitly we are able to make many simple associations without seeming to think about it.

Chmiel and Wall (1994) specify some of the limitations of this implicit ability. They say that there must be a close relationship in time between cause and effect and that we must not be too conscious of this relationship. They say that simple relationships showing low complexity may lead to conscious processing. More complex connections may lead to implicit learning and high complexity to neither. As soon as more conscious learning is cued, our ability to feel our way through complexity is reduced.

Implicit learning may be so basic that tacit feel is, in part, a store of 'prototypes' (Rosch, 1973). Here concepts are stored as a single concept that best represents a category, like an ideal type. Thus, concepts are related by their closeness to the prototype. For example, how well does a penguin fit the prototype of a bird? It would be difficult to define all birds by the characteristics of a prototype bird but many can be defined by their closeness. Thus, tacit feel may exist in the form of abstract but unsubstantiated prototypical or even stereotypical representations.

Sparrow (1998) also describes propositional and imagistic forms of thought which align well with this distinction between comprehensive and apprehensive knowledge:

> 'mental material can be configured in particular ways to make the processing of it easier. For example, sometimes we may think, as it were, verbally and work something out. Some other times we may picture what happens in particular situations. Putting information together in our minds as propositions and images affects how we go on to use the mental material in our decisions.' (p.31)

Fischer and Geiselman (1992) describe propositional forms of thought as 'concept code' and imagistic forms of thought as 'image code'. They argue that 'it is considerably more difficult to access the image code than the concept code. In addition, it is more difficult to describe verbally the contents of the image code than the concept code' (p.94). This is related to the way we

remember and the way we use knowledge. Image codes of events are detailed, less processed and more faithful to our sense experience. Propositional codes of events are more interpretative and selective and constructed from our sense experience.

Thus, according to cognitive psychology, the division of knowledge into two components, tacit and explicit, reflects divisions in the functioning of the brain. It reflects different cognitive abilities to process and interpret our perceptions and experiences. The crucial point here is that tacit knowledge tends to be formed from direct experience and is stored unconsciously as a large array of simple connections. It is difficult to describe many of these connections at once. On the other hand, explicit knowledge tends to be processed more consciously and can be stored as a smaller array of more logical connections. It is easier to put into words and communicate.

Orr's (1990) study of photocopier repair technicians, discussed in Chapter 2, illustrated how the technicians' explicit knowledge was insufficient to solve a difficult problem. When they turned instead to their stock of tacit knowledge to find a solution, they used a different kind of thinking and communication because the knowledge they were using was less coherent, logical and less-readily accessible.

2.2. Philosophical Approaches to Apprehension and Comprehension

There are some philosophical debates which coincide with the psychological distinction between apprehension and comprehension. Indeed, the eminent neuroscientist Vilayanur Ramachandran has recently argued that research on the workings of the brain has implications for philosophical notions of the 'self' and 'knowing' (Ramachandran, 2003). These issues are touched on here, not to resolve these debates, but rather to illustrate the connections between tacit and explicit knowledge and different ideas about what knowledge is.

The philosophical distinction between apprehensive and comprehensive forms of knowing is described by William James (1890). For James, apprehensive knowledge is 'knowledge of acquaintance' and comprehensive knowledge is 'knowledge about'.

Knowledge of acquaintance is closer to our sense experiences. By changing our situation our perceptions change and so our knowledge of acquaintance changes. It is rooted in particular contexts and in particular times and places. On the other hand, knowledge about something is more of a record of experience and may persist even when our situation changes. Because of its persistence knowledge about something can be related to other experiences or concepts that we have. James contends that 'we can relapse at will into a mere condition of acquaintance with an object by scattering our attention and staring at it in a vacuous trance-like way. We can ascend to knowledge *about* it by rallying our wits and proceeding to notice and analyze and think' (1890, pp.221-222).

This separation of experience from our senses and the recreation of it in the form of ideas puts knowledge held in the form of hypotheses and theories in the realm of comprehension. As James argues:

> 'Through feelings we become acquainted with things, but only by our thoughts do we know about them. Feelings are the germ and starting points of cognition, thoughts the developed tree ...' (1890, p.222).

This is reinforced in Nightingale's (1998) cognitive model of innovation when he says that perceptions are 'hypotheses in waiting'. Kolb (1984) relates this to how we can attribute causality to events we experience:

> 'All we learn through apprehension is that event B follows event A. There is nothing in the sense impression to indicate that A causes B. This judgement of causality is based on inferences from our comprehension of A and B.' (p.102)

This distinction is taken up in epistemology and the study of how we can know about the world. The apprehension-comprehension dimension partly coincides with Descarte's split between mind and body, object and subject. As Piaget (1978) puts it:

> 'Objects are known only through the subject, while the subject can know himself or herself only by acting on objects materially and mentally.' (p.651)

Kolb (1984) argues that the emphasis on apprehensive and comprehensive processes can be seen in the distinctions between the rationalist philosophy of the sixteenth and seventeenth centuries and the empiricist philosophy of the eighteenth-century. The rationalist approach to

knowledge, with its emphasis on logic, thinking activity and introspection could be characterised by abstract conceptualisation and comprehension. Empiricist philosophy focused on knowledge gained by the accumulation of careful observation of the world, could be seen as the grasping of reality by apprehension. However, as they have developed, with much synthesising of the two perspectives, both have tended towards analysis and rationalism which implies comprehension. Indeed, Kolb (1984, pp.112-116) puts both scientific empiricism and positivism on the comprehensive side of the apprehension-comprehension dialectic. Scientific empiricism, represented by natural laws and applied sciences, relates to experience grasped by comprehension and transformed by active experimentation. Positivism, represented by physical sciences and maths, relates to comprehended experience transformed by reflective observation.

Kolb (1984) draws on the work of Stephen Pepper (1942) who said that 'common sense continually demands the responsible criticism of refined knowledge, and refined knowledge sooner or later requires the security of common-sense support' (p.46). The apprehensive side of philosophy is taken up by 'contextualism' (better known as 'pragmatism') and 'organicism' (better known as 'absolute idealism'). Kolb uses Pepper to argue that this philosophy of apprehension has only developed more recently. Kolb also uses Dewey's (1958) argument that the intellectualism of science created an unnatural separation of direct experience from what we understood as nature. Thus nature became empty and dead and people were separated from their own hopes and dreams, anger and sadness. Kolb argues that the response has been a growth in the philosophical inquiry of apprehensive knowledge. Apprehensive knowledge is stronger in the field of human values and practical affairs. This is seen in the growth of work on business, politics and social work (contextualism) and in the humanities, arts and social sciences (organicism).

These philosophical debates are relevant because they highlight the kind of thinking associated with apprehensive and comprehensive learning processes and consequently the use of tacit and explicit knowledge. For instance, objective and universal theories, that apply irrespective of time and place, can be seen as explicit knowledge. Likewise, insights based around subjective

experience can be seen as tacit knowledge. These debates also highlight the more recent emphasis on the useful role that experience and tacit understanding play in our interactions with the world.

2.3. Observing Apprehension and Comprehension in Conversation

This section builds on the discussions of the previous two sections by examining how we might observe apprehensive and comprehensive processes. In particular, it focuses on how we might observe these processes by examining the language used by individuals in conversation with each other. Observation of these processes in action would imply that individuals were using or creating either tacit or explicit knowledge.

We have already seen several features of the use, or creation, of explicit knowledge. For instance, the use of objectivity, logic, reasoning and analytic abilities are likely to operate on explicit knowledge such as quantitative data or codes, plans and procedures. Similarly, the use of scientific or mathematical methods and theories, and hypotheses or the positing of causal relationships, implies the use of explicit knowledge.

We have also seen several features of the use, or creation, of tacit knowledge. For instance, the use of subjective, personal experiences and a focus on being faithful to sense experiences are likely to implicate the use of tacit knowledge. Similarly, the use of hunches and intuition, off-the-wall suggestions, and creative solutions to a problem, or the use of pictures or images, are likely to stem from tacit knowledge.

In addition, however, Kolb (1984) discusses the role of 'appreciation' and 'criticism' in tacit and explicit knowledge respectively. For Kolb, appreciation of immediate experience is an act of attention, it is valuing and affirming. In contrast, critical comprehension of symbols is based on objectivity, control of attention, dispassionate analyses and scepticism. Appreciation and criticism can almost be seen as 'attitudes' to experience.

The role of affirmation in appreciation means that tacit knowledge is the source of values. Thus, the use or expression of values implies the use of tacit knowledge. Appreciation is also characterised by openness, a holistic synthesising approach and by feeling. The use of these in conversation implies access to tacit knowledge. On the other hand, criticism requires an analytic and objective posture that is distant from the here-and-now, that destroys knowledge gained by apprehension. This is why writers on creativity (e.g. Leonard and Swap, 1999; Hayes, 1989) argue that the key to brainstorming is taking out criticism from the generation of ideas. Thus, criticism in conversation, or the use of critical faculties, can reduce the use of tacit knowledge and enhance the role of explicit knowledge.

We can also pick up clues from speech by examining the kinds of questions that people ask (Sparrow, 1998, Ch.6). The kinds of questions used in conversation can indicate the kind of thinking that lies behind it. For instance, questions such as 'Why?' or 'What did you think?' or 'What if ...?' indicate a critical or analytic stance and are asking for reasons and explanations and conscious interpretations of a situation. Questions such as 'What happened?' or 'How?' ask for more procedural and episodic information about an event, and may prompt recollection of past experiences. Questions such as 'How did it feel?' and 'How did you feel?' tap more directly into tacit feel or the performance of a skill and could unearth more apprehensive experience still.

Kolb (1984) also argues that it is difficult to communicate tacit knowledge. As we have seen, this is due to the difficulty we have in putting tacit knowledge into words. When sharing explicit knowledge two individuals do not need to share their personal learning experiences to communicate what they know about it. For example, such sharing could be in the form of an equation. However, tacit knowledge can often only be used interactively once two individuals have shared similar experiences or described the context in sufficient detail that they understand one another tacitly. Thus, allusions to shared experiences or the discussion of contextual details can point to the use of tacit knowledge.

James recognised this when he said that 'I cannot impart acquaintance with [people and things] to anyone who has not already made it himself [but I can] say to my friends, Go to certain places and act in certain ways, and these objects will probably come' (1890, p.221). Nonaka and Takeuchi (1995) also argue that 'socialisation', the opportunity to talk intensively and in a personal way, enables a group to create and use shared tacit experiences. Thus, instances of sociability in conversation, or an opportunity to talk off a subject, can indicate the creation or use of tacit knowledge.

One common feature of conversation is the recounting of a story or an episode (Sparrow, 1998). Such episodic memories can indicate the use of more tacit knowledge as they are used to reinstate memory and bring back details that would otherwise be missed. Episodes can also be used to represent ideal types of problems or solutions to situations (Orr, 1990). Thus, episodes can be used where explicit knowledge is less developed or very complex, and people may use retrieval cues that are the same as the learning cues. Storytelling, whether based on direct experience or the imagination, can provide listeners with access to issues of power, differing viewpoints, context and meaning for participants. These issues are closely related to tacit knowledge. Similarly, stories can be very imaginative and form part of an organisational dreamworld in which desires, anxieties and emotions find expression in highly irrational constructions (Gabriel, 1995). Further still, Huffman and Weaver (1996) found that people with strong abilities with imagistic forms of thought, that is, people who tend to use tacit knowledge more frequently, may access episodic material more easily.

2.4. Summary of the Differences Between Apprehension and Comprehension

According to cognitive psychology, the division of knowledge into two components, tacit and explicit, describes a division in the functioning of the brain. There is a division in our cognitive abilities to process and interpret our perceptions and experiences. These abilities, described as apprehension and comprehension (Kolb, 1984), determine the expression and form of tacit and explicit knowledge. These abilities also find expression in philosophical debates about the role of subjectivity and objectivity and the nature of knowledge.

We saw that comprehensive abilities such as objectivity, logic, reasoning and analytic abilities are likely to operate on explicit knowledge such as quantitative data or codes, plans and procedures. Similarly, the use of explicit knowledge is implied in the use of scientific or mathematical methods and theories, and hypotheses or the positing of causal relationships. In conversation, criticism, or the use of critical faculties, can reduce the use of tacit knowledge and enhance the role of explicit knowledge. For example, the use of 'Why?' questions encourages the use of conscious and analytic skills and draws attention towards explicit knowledge. Similarly, the use of a theory or codes, such as algebra or numbers, in conversation points towards the use of explicit knowledge.

We have also seen several features of the use, or creation, of tacit knowledge. For instance, the use of subjective, personal experiences and a focus on being faithful to sense experiences are likely to implicate the use of tacit knowledge. Similarly, the use of hunches and intuition, off-the-wall suggestions, and creative solutions to a problem, or the use of pictures or images, are likely to stem from tacit knowledge. In conversation, appreciation can encourage the use and creation of tacit knowledge. Tacit knowledge is also the source of values and these may be expressed in conversation. Tacit knowledge is often hard to express in words but contextual clues and stories that aid in the sharing of experience indicate its use.

Table 3.1 summarises some of these differences between knowing by apprehension and knowing by comprehension.

Table 3.1: Knowing by Apprehension and Comprehension

Apprehension	Comprehension
Tacit knowledge	Explicit knowledge
Concrete experience.	Abstract conceptualisation.
Sensations. See, hear and feel reality. Raw experiences are valid and nuanced. Here and now.	Ideas and theory. Selection or distortion of the flow of sensations. Permanence.
Know through intuition and personal experience. Hunches and intuition.	Know through rational inquiry and analytical confirmation. Hypotheses.
Faithfulness to sense experience. Use of contextual cues and episodic memories.	Separation from immediate experience enables prediction of the future.
Knowledge of acquaintance: that is, cannot be communicated unless someone has already grasped experience in the same way.	Knowledge about: that is, only by our thoughts do we know about experience.
Unconscious	Conscious
Feeling	Thinking
Appreciation and Openness	Criticism
Dogmatism	Scepticism
Affirming. Values.	Objective. Logic.
Valuing	Evaluating
Imagistic	Propositional

3. Reflection and Action

> 'The prehension dimension describes the current state of our knowledge of the world - the content of knowledge, if you will - whereas the transformation dimension describes the rates or processes by which that knowledge is changed.'
>
> (Kolb, 1984, pp.101-102, Footnote)

We have seen that the processes of apprehension and comprehension describe basic processes for grasping experience of the world and that these processes find form in tacit and explicit knowledge. However, there is another dimension to knowing where knowledge is transformed through reflective observation or active experimentation. These are two ways of doing something with knowledge that change the way that experiences are processed: experience is transformed by reflecting on it or acting on it.

This process of transformation of knowledge is dependent on having apprehensive and comprehensive experiences to transform. Similarly, perceptions are not learning unless we do something with them. Elbow (1986) refers to reflection as inventing new concepts and active experimentation as applying concepts and argues that 'they represent the two directions of traffic across the border between verbal and non-verbal experience' (p.33).

As with apprehension and comprehension, action and reflection work in dialectical opposition. They are opposites but one cannot exist without implying the other. As Freire (1992) puts it:

> 'When a word is deprived of its dimension of action, reflection automatically suffers as well; and the word is changed into idle chatter, into verbalism, into an alienated 'blah' ... On the other hand, if action is emphasized exclusively, to the detriment of reflection, the word is converted into activism. The latter action for action's sake negates the true praxis and makes dialogue impossible.' (pp.75 & 78)

Kolb (1984) refers to active transformation as extension and reflective observation as intention. Thus, transformation of experience can extend that experience out into the world through action, whilst transformation of experience through reflection can intensify that experience and make it more concentrated. He argues that this dimension coincides with Jung's (1977) work on extraversion and introversion. Extraversion asserts the validity and reality of the external world, demonstrated through action. Extraversion in the positive North American sense emphasises sociability and comfort with people, with the dark side being impulsiveness. Introversion asserts the validity and reality of the internal world, demonstrated by reflection. Introversion in the positive European sense emphasises control and conscientiousness, with the dark side being indecisiveness. Similarly, Piaget (1971) divides these operative aspects of thought into behavioural actions that transform objects or states and intellectual operations that are internal actions.

Kolb's (1984) dimension of transformation is involved in the creation of meaning and is well understood in the field of semiotics. Syntactics studies the intentional formal and theoretical characteristics of symbols whilst semantics studies the extensional use of signs and symbols to refer to objects in the world (Hofstadter, 1979). Intentional descriptions of experience can be imaginative and can be manipulated mentally such that we can split them or combine them at will, 'which means that descriptions can 'float' without being anchored down to specific, known

objects ... it gives us the ability to imagine hypothetical worlds' (pp.338-39). Extensional descriptions of experience are more likely to be attached to a central or more real concept.

Rorschach (1951) analysed the degree to which people emphasised colour or movement in their responses to the famous ink-blot projective test. Those people who responded more to the colour of the inks were labelled extratensive and were said to be outwardly oriented because of their responsiveness to outward reality. Those who responded to the test by emphasising movement were labelled as intratensive because they were less concerned with external, objective reality and emphasised more subjective experience. They were described as having a more active inner life.

This division between internal, subjective transformation of experience and external, objective transformation has a basis in physiological processes but the evidence is more limited than that for apprehension and comprehension. The division of the nervous system into sympathetic and parasympathetic aligns with the distinction between action and reflection. The sympathetic nervous system has a mobilising function in preparing for action and coping with the external world. The parasympathetic nervous system works towards protection, conservation and relaxation when less attention to the external world is required. Broverman et al. (1968) found that drugs that stimulate the sympathetic nervous system aid the performance of simple perceptual-motor tasks. Drugs that stimulate the parasympathetic nervous system produced poorer performance on simple tasks but improved performance on complex tasks that required less action and higher-order thought processes. Extension of experience through action is outwardly focused on the external world. Intention of experience through reflection is inwardly concentrated on the internal world.

Action and reflection also align with philosophical distinctions between subject and object. Kolb cites Jung (1977) and Diekman (1971) who argue that the action mode has come to dominate the reflection mode in human society and particularly Western technological societies. Eastern cultures have a greater emphasis on the receptive mode and have developed its complexity in the form of yoga and Zen meditation. Thus, Kolb puts the East-West split firmly in his

transformation dimension that describes the difference between an experimental active, doing approach (West) and an observational, reflective approach (East).

Nonaka and Takeuchi (1995) discuss Zen Buddhism and Samurai. They are concerned to emphasise the value of non-logical, apprehensive processes but the distinction between the two aligns with active-reflective transformation. Through their training Zen Buddhists and Samurai develop their apprehensive complexity. Buddhists develop this by internal meditation and question and answer conversation that explores paradoxical issues in a non-logical, metaphorical way. And Samurai develop apprehensive abilities through 'acting intuition' and impulsive 'thoughtless' activity. Here we have the two poles of internal reflection and external action applied to tacit knowing. As Nonaka and Takeuchi say: 'The dialectic used since Socrates and Plato is completely different from the practice of Zen Buddhism' (p.30).

The transformation of experience tends to be less well-recognised and discussed than the distinction between apprehension and comprehension.

Nonaka and Takeuchi (1995) build their model of organisational knowledge-creation on the basis of two axes: tacit and explicit knowledge and the individual and the organisation. However, as we shall see below, their distinction between individual and organisation would be better conceived of as a distinction between reflection and action. They do, however, incorporate this transformation dimension in their discussion. They refer to Dewey (1929) who said that 'ideas are worthless except as they pass into actions which rearrange and reconstruct in some way, be it little or large, the world in which we live' (p.138). They also discuss how socialisation can improve dialogue and enable 'collective reflection' and imply that reflective observation is difficult enough if you are used to having an active orientation but achieving it in a group context may be more difficult still.

Leonard and Swap (1999) argue that greater reflection is needed in order for groups to be creative. They argue that space and time be given over for 'invisible fermentation' and the incubation of ideas. Bessant and Francis (1999) acknowledge the importance of reflection for

formation of new concepts in learning organisations. Sparrow (1998) argues that 'if only managers would take time to stop and think and reflect on their behaviour they could make better decisions' (p.2). The corollary of this is, of course, that they might make fewer of them as they sacrifice action for reflection.

Drummond (1992) urges managers to allow more time for reflection and getting decisions right. Too often, she says, 'There is a basic drive to produce something that 'will do' ... Genuine exploration of the decision, to determine what the decision actually is, can come from proactive communication with subordinates to confront ambiguity and fuzziness' (p.2).

Schon (1991) says that there is value in questioning the automatic and unconscious performance of a skill, even if that performance is efficient. Through reflection, one 'can surface and criticize the tacit understandings that have grown up around the repetitive experiences of a specialized practice and can make new sense' (p.61).

Some authors argue that in some situations it is better to emphasise action over reflection. Cohen et al. (1999) argue that textbooks are no good for pilots and they need a mixture of practise and theory. They acknowledge that 'learning that is too tightly coupled to a directly experienced situation is brittle' but argue that 'The most robust learning, therefore, is likely to result from a combination of many experiences close to the target situation with some knowledge at a more general level' (p.2). Orr (1990) reports that photocopier engineers did not use trouble-shooting manuals, containing refined and reflective knowledge, because the reality was that the problems they encountered in their work were too various. Orr argues that 'Instructions must ultimately be interpreted in the context of their application, and this context will differ in ways that cannot be anticipated' (p.172). Hislop (2000) also acknowledges the role for active transformation of experience when he says that 'Knowledge and knowing is embedded within, and inseparable from, practise' (p.3).

The transformation of experience has a practical effect on the way that knowledge is expressed in conversation and communication. However, the transformation of experience through

reflection and action can only occur when there is some experience to transform and, so, is dependent on the grasping of experience. It makes more sense to view the two dimensions of prehension and transformation in combination and these issues are explored in the next section of this chapter.

3.1. Summary of the Differences Between Reflection and Action

Reflection and action, in dialectical opposition, transform experience and knowledge in different ways. See Table 3.2 for a summary.

The reflective dimension transforms knowledge by reflection and thoughtfulness, by concentrating on it internally. This activity transforms knowledge by the internal manipulation of concepts. By intensifying those concepts they become more refined and internally coherent. The focus is on a refined intention to do things, on efficiency and maximising the accuracy of tasks. Knowledge becomes idealistic and conceptual rather than practical.

The active dimension transforms knowledge by acting on it, by pushing it out into the external world. This activity transforms knowledge by applying it to the world and making changes in the world. Thus, the external world becomes objectified and knowledge is grounded through the experience of acting on it. The focus is on extension and effectiveness and maximising the completion of tasks. Knowledge becomes practical rather than theoretical. Concepts become real rather than ideal. Pragmatism is valued over coherence.

Table 3.2: Transformation by Reflection and Action

Reflective Observation	Active Experimentation
Reflecting.	Doing.
Seeing.	Acting.
Internal reflection about ideas and experiences.	Active extension of ideas and experiences in the external world.
Intellectual operations, internalised systems of transformation.	Transform objects or states by behaviour and action.
We can invent people or objects as descriptions that can float and not be anchored to specific, known objects.	Grounding of ideas and experiences by the experience of acting on them.
Introversion in the positive European sense of control and conscientiousness.	Extraversion in the positive North American sense of sociable and comfortable with people.
Efficiency - maximise accuracy of tasks.	Effectiveness - maximise completion of tasks.
Coherent.	Practical.
Truth.	Action.

4. Types of Knowledge and Learning Styles

We have seen how knowledge and learning are intimately related. This relationship is illustrated by the fundamental processes of apprehension and comprehension of experience and the transformation of that experience through action and reflection. There are different kinds of learning and these draw on and create different kinds of knowledge. Many of these processes are evident when we study how people learn or use knowledge and particularly when we examine our communication with each other.

This section examines how the fundamental processes described above combine to form further kinds of knowledge. We will see how these types of knowledge are formed in quite different ways and that this is best illustrated by the idea of learning styles.

In Chapter 2, we saw how Kolb (1984) argues that the combination of apprehension and comprehension with action and reflection leads to four kinds of learning and four kinds of knowledge. The diagram illustrating this process is reproduced again here (see Figure 3.1).

Figure 3.1 The Structural Dimensions Underlying the Process of Experiential Learning and the Resulting Basic Knowledge Forms

(Kolb, 1984, p.42, Figure 3.1)

Learning styles are pairwise combinations of the elementary learning strategies of prehension and transformation. As the learning modes are in dialectical opposition, each learning style is equally potent. Kolb uses an example of playing pool to describe how they work (1984, pp.64-67). A common learning strategy when playing pool is comprehension transformed through action. A pool player may use an abstract theory such as Newtonian physics to predict a course for the cue ball to hit another ball into a pocket. Basic physics may be recalled, say that the angle of incidence equals the angle of reflection, and measure out on the table the necessary angle. This learning style is known as convergence and emphasises abstract conceptualisation transformed through active experimentation.

Kolb's basic concept is of a learning style where an individual can have a unique style of learning based on particular combinations of prehension and transformation. Kolb thinks of learning styles as states rather than personality traits. These states achieve stability through consistent patterns of transactions with the world. He is aware that for any individual there are many forces that shape learning styles (Kolb, 1984, p.97). For example, for someone at work their current orientation will be turned towards the job in hand which will have a strong and

situation specific influence on learning. Behind that lies his/her skills, beyond that his/her current job, and then profession or career, followed by educational specialisation and psychological type. Each level could be assigned a learning style and they may not correspond with each other. This allows for considerable individual flexibility, particularly as current circumstances have a stronger but more situation specific influence on learning style.

Kolb's theory is focused on the individual. As such his description of learning styles (see Figure 3.2) focuses more on person-type characteristics than on the basic knowledge forms (see Table 2.1 in Chapter 2). However, we have already seen that the basic cognitive processes of apprehension and comprehension, and action and reflection, determine forms of knowledge. In the discussion of the learning styles below, the focus is on interpreting the relationship between styles of learning and types of knowledge and on the kinds of interaction that produces that knowledge. The nature of that interaction is partly determined by the attitude to knowledge and experience associated with each learning style. Thus, each learning style is discussed below along with examples of how it may be observed in group interaction and particularly in conversation.

This is important as these examples are used to create a coding frame to code turns at speaking. This coding is the main research instrument used in this study.

Figure 3.2 Characteristics of the Basic Learning Styles

(Adapted from Kolb, 1984, p.77-78)

4.1. Divergence

Divergent knowledge (see Figure 3.1) is formed through the combination of concrete experiences transformed through reflective observation. Kolb (1984) describes an 'adaptive competency' as a skill that enables completion of a task. He found that certain skills were associated with a divergent learning. The following skills, called 'valuing skills', were associated with the creation and use of divergent knowledge:

- being sensitive to people's feelings
- being sensitive to values
- listening with an open mind
- gathering information
- imagining implications of ambiguous situations (Kolb, 1984, p.96)

Kolb (1984) says that research on creativity 'has tended to focus on the divergent (concrete and reflective) factors in adaptation such as tolerance for ambiguity, metaphorical thinking, and flexibility' (p.32). Nonaka and Takeuchi (1995, p.63) and Leonard and Swap (1999) say that one of the rules of brainstorming is that there should be very little criticism, or no criticism without constructive suggestions. The aim is to reduce the incidence of comprehensive, critical activity which can close off options.

Metaphors are used in divergent and accommodative thinking because the use of metaphorical thinking helps to co-ordinate tacit knowledge. The focus here is on their use in divergent thinking. Donnellon et al. (1986) say that use of a metaphor means that we 'See one thing in terms of something else' and that 'Metaphors are one communication mechanism that can function to reconcile discrepancies in meaning' (p.48). Pondy (1983) describes metaphorical thinking as 'the assertion, perhaps made indirectly and surreptitiously, that 'A is B', where A and B belong manifestly to two different categories' (p.159). Verbrugge (1980) says that 'Metaphors redefine reality ambiguously by leaving the specific details open to individual interpretation' (p.52). They can allow interaction between people who have differing interpretations or preferences. Group members might also pursue shared understanding of new ideas by looking through a mental dictionary and using familiar words in a new context. This would also produce a changed definition for a particular term. Dictionaries are sometimes used in creativity exercises to fish for ideas (Sparrow, 1998, p.120) because using new words or using words in new ways can help connect disparate ideas.

Nonaka and Takeuchi (1995) say that metaphors help to 'express the inexpressible' (p.13). Using metaphors helps individuals express 'what they know but cannot yet say' and helps others to understand them. Morgan (1993) agrees when he says that 'The process operates by creating a tension between existing and potential understandings, creating space for the new to emerge' (p.23). But he also emphasises that there needs to be resonance and authenticity in a metaphor to create energy and involvement in a group (Morgan, 1993, p.291).

Sparrow (1998) makes a distinction between tacit feel and skills and relates this to the use of metaphorical thinking. Skills and tacit feel look much the same but skills require more consciousness in acquisition. In order to get a sense of this mental activity, the researcher needs to experience it for themselves. In the case of tacit feel, this can be done through introspection. He goes on to say that 'Metaphors are more likely to reflect non-conscious material. It can be argued that such metaphors are more likely to be tacit feel rather than skills, since there is little evidence of them being used in the course of skill acquisition' (p.209).

Stories are another way of accessing and communicating tacit knowledge. Brown and Duguid (1991) argue that stories are not rational; they are not like a decision tree. As we saw earlier, Orr (1990) found that stories helped technicians to diagnose problems when documentation stopped being helpful. They used stories for 'articulating hunches, insights, misconceptions, and the like, to dissect and augment their understanding [and to] work towards a coherent account of the current state of the machine' (p.45). This use of stories was reflective and tacit because the active mode had not produced a solution.

There are conversational techniques for keeping discussion divergent too. Clark and Brennan (1991) describe how acceptance of what someone has presented in their speech is often required. Ash (2002) extends this when referring to Well's (1999) concept of 'prospectiveness'. Prospectiveness is the range of possible responses afforded by a particular utterance. Responses can be divided into 'demands' (questions), 'gives' (answers) and 'acknowledgements' ('oh' or 'yes'). Participants can increase prospectiveness of a conversation by changing the nature of the follow-up response, for example, by providing another 'give' or

another 'demand' where a simple 'acknowledgement' is expected. This exploitation of possible follow-up within a sequence allows a more knowledgeable participant to contribute to the learning of the less knowledgeable in ways which nevertheless incorporate and build on the latter's contribution.

Wertsch (1992) and Nystrand (1997) distinguish between 'authentic' and 'test' questions by teachers. Authentic questions are more divergent because they:

> 'are questions for which the asker has not pre-specified an answer ... in which the students' thinking is genuinely solicited rather than simply responding with a predetermined response. Authentic questions invite students to contribute something new to the discussion ... [while a] test question allows only one possible right answer, and hence is monologic.' (Nystrand, 1997, p.38)

Finally, von Krogh and Roo's (1995) description of the kind of language needed for strategic conversations aligns well with divergent thinking. They say that this kind of conversation should be ambiguous, and based on dialogue and hypothetical exposition. The conversation should follow a strategy of embodiment, whereby people are open for new conversations, roles are dynamic and generalism is valued above specialism.

4.2. Assimilation

Assimilative knowledge (see Figure 3.1) is formed through the combination of explicit knowledge transformed by reflective observation. It is closest to what we would ordinarily think of as scientific knowledge, emphasising principles that can be applied universally, that are enduring and that can be stored in books or formulae. Kolb (1984) says that in assimilative learning if a theory or a plan do not fit the facts it is the facts that will be disregarded or re-examined rather than the theory. The emphasis is on abstract knowledge refined through reflection.

Kolb found that the following skills, called 'thinking skills', were associated with the creation and use of divergent knowledge:

- organising information

- building conceptual models
- testing theories and ideas
- designing experiments
- analysing quantitative data (Kolb, 1984, p.96)

Assimilative knowledge is explicit knowledge transformed by reflection. Nonaka and Takeuchi (1995) discuss how this kind of knowledge is produced by operationalising concepts and producing more detailed and specific concepts.

We saw that metaphorical thinking was a feature of divergent learning. In assimilation, Nonaka and Takeuchi argue that greater use is made of analogy. Analogy bridges the gap between an image and a logical model. They say:

> 'Association of two things through metaphor is driven mostly by intuition and holistic imagery and does not aim to find differences between them. On the other hand, association through analogy is carried out by rational thinking and focuses on structural/functional similarities between two things, and hence their differences.' (1995, p.67)

One of the features of assimilative learning is the use of reasoning. Sparrow (1998, p.156) identifies two kinds of reasoning. Separation thinking is used to define things, to discriminate and differentiate between concepts and laying them out for discussion. This could involve the use of specifying questions. Location thinking involves putting things on a scale such as in the use of ranking and the use of quantitative data. This kind of thinking could produce more precision from general statements and could be shown by the use of rephrasing to illustrate and specify shared understanding. Nonaka and Takeuchi (1995) also emphasise the operationalisation of concepts in this mode. This takes place as a result of 'externalisation' where tacit knowledge is converted into explicit knowledge through reflection. This is illustrated in the light-hearted newspaper column of Guy Browning. He contrasts action and reflection when he discusses planning:

> 'The essence of planning is thinking before doing. In today's busy world, thinking frightens people and if you stop to do it too often you may find yourself in a home. To protect ourselves we have [to] do something while we think. That's how the list was born.' (The Guardian, 2003, p.10)

In assimilation, knowledge is transformed through reflection rather than action. Thus, the focus in discussions is on specifying the conditions, limits and parameters for a particular connection, arrangement or concept. The focus is on refinement and internal consistency rather than on application and practicality. This emphasis on reflection could mean someone asking the same question several times, perhaps feigning ignorance, to encourage explicitness, articulation of knowledge or to emphasise assumptions.

Comprehension is a feature of assimilation and this brings in the use of logic. Edelman (1964) defines a logical argument as a set of utterances that includes a premise, an inference and a conclusion used in the context of disagreement to move another person to agreement incrementally. In assimilative learning the emphasis is on logic used incrementally. In convergent learning (see below) the emphasis is more on the use of logic for persuasion.

4.3. Convergence

Convergent knowledge (see Figure 3.1) is formed through the combination of abstracted experiences transformed through active experimentation. Kolb (1984) describes how someone using a convergent learning style is good at problem-solving and the practical application of ideas. They focus on solving specific problems rather than generating elegant theories. They are controlled in the expression of emotion, preferring technical issues, tasks and problems rather than social or interpersonal issues.

Kolb (1984) describes the skills, called 'decision skills', that he found were associated with the creation and use of convergent knowledge:

- create new ways of thinking and doing
- experiment with new ideas
- choosing the best solution
- setting goals
- making decisions (Kolb, 1984, p.96)

Kolb (1984, p.32) says that a convergent style of thinking is often emphasised in research on decision-making. This research emphasises abstract and active adaptive factors such as the rational evaluation of solution alternatives.

Sparrow (1998) again emphasises the use of reasoning as a type of thinking. However, in convergent thinking the focus is more on action and using logic to make decisions. In convergence the emphasis is on extending the semantic understanding of issues. Separation thinking is used to place explicit concepts in juxtaposition and lay them out for discussion. Location thinking is used to integrate explicit knowledge.

Sparrow implies that skills are often learned through convergent activity because, although they are practised unconsciously, they are consciously acquired. Skills could be learned through the conscious application of knowledge to a problem at hand. The emphasis is on action. Learning of skills can only be observed through immersion in the field of activity.

Von Krogh and Roo's (1995) description of the kind of language needed for operational conversations aligns well with convergent thinking. Convergent conversation is clear cut and definitive. It is typified by advocating particular courses of action based on explicit knowledge. Convergent thinking reaches for closure and this is often achieved through reliance on authority or a strategy of intimidation. They suggest that convergent knowledge emphasises fixed roles and the need for expertise and specialists.

Donnellon et al. (1986) describe some of the linguistic tools used in this push for agreement. These include 'linguistic direction': directing people to think about or decide on an issue in a particular way. However, they also argue that another feature of convergent conversations is the use of 'linguistic indirection'. This can be achieved through use of the passive voice (use of 'you' or 'one', rather than 'I'). This has the effect of obscuring the agent or subject and can dampen rebel interpretations. It achieves consensus and suppresses dissent but it can lead to distrust.

Finally, Nystrand's (1997) description of 'test questions', which allow only one possible right answer, can be considered as more convergent as they are directive and monological. Examples would be questions such as 'What do you think you are doing?' or 'Do you really think that that is appropriate here?'. This corresponds to a reduction in the prospectiveness of a conversation (Wells, 1999). The emphasis on decisions and decisiveness is about reducing the number of possibilities considered which is a feature of convergent knowledge.

4.4. Accommodation

Accommodative knowledge (see Figure 3.1) is formed by concrete experiences transformed by action. The emphasis is on tacit knowledge gained through actions and behaviour. Kolb (1984) says that in accommodative learning if a theory and a plan do not fit the facts then it is the theory that will be disregarded or re-examined rather than the facts. Problems are solved by an intuitive process of trial-and-error and by reference to concrete experiences generated through action.

Kolb (1984) found that the following skills, called 'acting skills' were associated with the creation and use of accommodative knowledge:

- committing yourself to objectives (I would emphasise commitment rather than objectives)
- seeking and exploiting opportunities
- influencing and leading others (with an emphasis on persuasion through feeling)
- being personally involved
- dealing with people (Kolb, 1984, p.96)

Nonaka and Takeuchi (1995) describe accommodation as learning by doing. This is achieved through imitation and practice and by internalising new experiences, perhaps before being able to externalise them. 'How?' questions are used rather than 'Why?' questions (p.63).

Accommodative knowledge can be generated by experiencing what someone else has experienced. This can be achieved either by going through what someone else has experienced but also by experiencing through the codified or articulated experiences of others (Nonaka and Takeuchi, 1995, p.69).

Accommodation relies on tacit knowledge and so we see the use of stories and metaphors again, as we did with divergence. However, in accommodation the emphasis is on action rather than on reflection and this involves the creation of feeling through others' experiences or actions. For example, Orr (1990) found that photocopier repair technicians told 'war stories' that help to illustrate apprehensive knowledge, to allow personal experiences to interlock, when comprehensive knowledge is insufficient. These stories contain contextual information which 'demonstrates the claimed validity of the facts of the story, guiding the integration of those facts to the hearer's model of the machine' (p.175). The emphasis here is on integrating knowledge with existing ways of knowing tacitly.

Ash (2002) describes the way stories integrate explicit knowledge tacitly as a method to accumulate wisdom. Linde (2001) explains how 'Stories provide a bridge between the tacit and the explicit, allowing tacit social knowledge to be demonstrated and learned, without the need to propositionalize ethics, specify in detail appropriate behaviour, or demonstrate why particular heroes of the past are relevant today' (p.163). Stories are one kind of accommodative knowledge and are good for communicating values and identity.

Donnellon et al. (1986) argue that 'Metaphors allow at least some group members in our study to experience the kind of 'cognitive revisions' that ... are often necessary for achieving closure in group decision making' (p.52). Metaphors are used as a way of muddying internalisation of discussion to allow a group to feel happy with a decision despite their differences. They suggest that they may be used during 'post-action sense making' (p.53). Post-action sense making is a good description for accommodation in general.

One further feature of accommodation and the internalisation of explicit knowledge is the use of humour. Goffman (1981) describes how the opportunity to talk off the subject for a short period allows a space in a conversation to feel how things are going. Someone may make a joke leading to a 'groan intoned jointly'. This can lead to a 'return to seriousness; or the maneuver can lead to the temporary establishment of a punning rule, thus encouraging an answering pun from the next speaker' (pp.72-73). This shift towards apprehension can be used to get a feel for a decision or a state of affairs without having to think consciously about it.

4.5. Summary of the Relationship Between Learning Styles and Types of Knowledge

We have seen how the fundamental processes of learning combine to form four learning styles. The crucial point about learning styles is that they are modes of adaptation to the world. We can choose to grasp experience apprehensively or comprehensively, and transform that experience either through reflection and action. These fundamental cognitive processes condition how it is that we know about the world. Thus, through these four different patterns of learning, we generate four different patterns of knowledge.

The characteristics associated with learning styles are carried through to types of knowledge. So, just as an assimilative learning style is about understanding experiences abstractly and then refining them through reflection, assimilative knowledge is abstract and intensively coherent. Another way of putting it is that an assimilative learning style has similarities to the logical and universal approach of mathematical methods and that assimilative knowledge is akin to mathematical knowledge.

The focus here has been on the way that individuals learn, and so, on how individuals create and understand what they know. Therefore, one assumption is that knowledge is embodied and inseparable from human understanding (Blackler, 1995). Another feature of knowing is that understanding often comes from the use of language and, specifically, from language used in interaction with others.

These connections between individuals and their knowledge, and between knowledge, language and interaction, allowed the researcher to examine conversation for evidence of learning styles, and so to determine the types of knowledge being used in that conversation. We have seen how certain features of language indicate the use of a particular learning style. That is, the use of metaphors to link seemingly unrelated ideas can be associated with a divergent learning style; the use of reasoning to get more precision from general statements can be associated with an assimilative style; the authoritative advocacy of a particular position in order to make a decision can be associated with a convergent learning style; and the use of stories to communicate how actions have been internalised can be associated with an accommodative learning style. Therefore, we can use conversational language to identify the use of learning styles.

5. Chapter Summary

This chapter has studied features of language and thinking that can be expressed in conversation. The study of this literature provided both the theoretical basis for the classification of learning styles and the more practical features of interaction that can be used to asses how knowledge is created and used in conversation.

Table 5.2 in Chapter 5 summarises these insights and was used as a coding frame to analyse conversation for evidence of the use of learning styles. (For example, where someone raised the prospectiveness of the conversation by asking an open and authentic question likely to elicit an intuitive and thoughtful response, their speech would given the code A10 and be classified as divergent.) The vast majority of entries in this table were drawn from the literature discussed above, and the references to this literature are also included.

It should be noted that some changes were made and a few entries were added during the analysis of the data collected for this research. However, the table was left largely unchanged.

The development of these changes and additions and the impact on the data is considered in Chapter 5.

There are methods, such as the repertory grid technique or cognitive interviewing that elicit mental material for analysis (see Sparrow, 1998) in an active way. However, the focus here has been on the methods we can use to observe learning styles in free-flowing interaction, and more specifically on the spoken component of that interaction. The literature suggests that basic knowledge processes change the way we communicate with each other. These changes in communication can be used to observe those knowledge processes. The next chapter considers what patterns we might expect to see in the use of learning styles in conversation.

Chapter Four

Patterns in the Use of Conversational Learning Styles

1. Introduction

We now move on to examine what the literature says about regularities in the use of learning styles. Kolb argues that each style is equally potent, that each style can contribute equally to our learning and knowledge. However, there are patterns in our use of these different ways of understanding the world. This chapter reviews what the literature says about some of those patterns and research questions are developed.

As noted in the previous chapter, Kolb et al. (2002) discuss five dialectics to understand conversation as experiential learning:

- Apprehension and comprehension
- Intention/reflection and extension/action
- Linear time and cyclical time
- Status and solidarity
- Individuality and relationality.

The last chapter (Chapter 3) examined the first two dialectics and how they inter-relate. There are three sections in this chapter and they discuss the final three dialectics.

The linear time and cyclical time dialectic to conversational learning is used to examine how learning styles can be used together to develop knowledge equally between the learning modes. Kolb (1984) argues that *individual* development comes from the integration of learning styles. However, Nonaka and Takeuchi (1995) argue that, in addition, *groups* can develop knowledge by integrative use of learning styles. Both sources apply the idea of a cycle or

progression through the learning styles to the creation of knowledge in group interaction. Kolb et al. (2002) also argue that people need to find a balance between conversations being too linear or discursive and being too circular or recursive. They argue that discourse tends to dominate and that people shy away from cycles, feedback or recurring discussions. A balance between the two, they say, 'will largely determine the depth and quality of learning generated in conversations' (p.11). Fundamental to this theme is that balance between different kinds of learning creates greater depth and quality of learning and knowledge.

Kolb et al. (2002) also argue that conversation in a group should be characterised by a mixture of status and solidarity: the group should not be dominated by a rigid hierarchy or pathological heterarchy; there should be a balance in conversation between people acting as individuals and as members of a group. They suggest that the 'individual maintains a sense of self while at the same time is aware of, and open to influence of others' (p.4). The patterns of use of learning styles in conversation are the principal focus for this research. However, these dialectics are important because they condition these patterns.

Critics of experiential learning theory have argued that it needs to incorporate status, gender, and roles for the unconscious and the social construction of knowledge (Kayes, 2002). The last two dialectics (i.e., status and solidarity and individuality and relationality) show that Kolb et al. (2002) have responded to criticisms that experiential learning theory is too individualistic by including overtly group-based concepts. Effectively, the issues raised by these dialectics are seen as conditioning interaction and the use of learning styles in conversation. Balance on these dialectics would allow balanced use of learning styles and increase the potential for learning of greater depth and quality.

2. Linear Time and Cyclical Time

Kolb et al. (2002) argue that 'conversational learning occurs within two distinct but interconnected temporal dimensions: linear time and cyclical time' (p.11). They actually call this

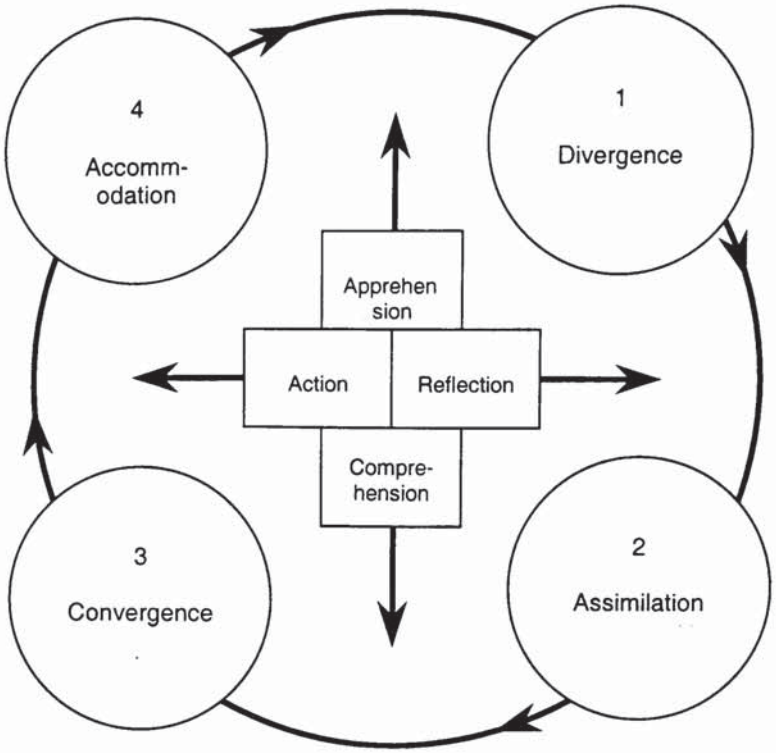
dialectic 'epistemological discourse and ontological recourse' focusing on the constant transformation of experience provided by action and reflection. Epistemological discourse is linear, quick and active. Ontological recourse is circular, slow and reflective. They suggest recourse tends to be avoided because of the 'fear of return of the same'. They argue that 'learners' ability to *simultaneously* engage in these *two temporal dimensions* will largely determine the depth and quality of learning generated in conversations' (p.11).

This concept is divided into two: firstly, greater learning and knowledge-creation develops linearly through repeated cycles of learning; secondly, greater learning and knowledge-creation develops through balance between discursive and recursive practice.

2.1. Learning and Knowledge Cycles

One way of understanding the distinction between linear time and cyclical time is to return to Kolb's original work. In experiential learning theory (1984), we move through a cycle of learning: concrete experience, transformed by reflection to abstract conceptualisation is further transformed by action to new concrete experiences. In terms of learning styles, this would imply that we move through a cycle of learning using learning styles in the following order: divergence, assimilation, convergence and accommodation (see Figure 4.1)

Figure 4.1 Progression of Learning Styles



Kolb says that we can learn using each learning style independently. However, the movement from using one style to another or, in his terms, the integration of two learning styles creates greater adaptive flexibility to deal with complexity. In von Krogh and Roo's (1996) phrase, we make 'finer distinctions' by developing greater skill and integrating diverse types of knowledge (p.423). Kolb extends this argument to create a theory of individual development. Individuals develop through consistent patterns of interaction with the world. In other words, we tend towards using a particular learning style and this conditions the choices we make in terms of education and career. However, individual development take place through the integrative use of learning styles.

Here we see the contrast between learning as a cycle and learning as linear development. Through cycles of learning, and cycles of integration, we develop in certain directions as human beings. For example, the combination of accommodation and divergence creates more refined tacit knowledge. Kolb (1984) would call it greater 'affective adaptive complexity' (p.153). This allows a person to sense and feel things in a more detailed and coherent way. The combination

of divergence and assimilation produces greater 'perceptual adaptive complexity'. This allows a person to get better at creating alternative meaning and observation schemes. The integration of assimilation and convergence produces greater 'symbolic adaptive complexity'. Here, people improve their ability to create symbolic systems and operationalise them. The integration of convergence and accommodation leads to greater 'behavioural adaptive complexity' which means a person is able to act more skilfully.

We saw in the discussion of learning styles that Kolb (1984) thinks of learning styles as states rather than personality traits. These states achieve stability through consistent patterns of transactions with the world. Although he is aware that for any individual there are many forces that shape learning styles his analysis focuses on individuals and their development. The test he devised to measure learning styles, the Learning Style Inventory (Kolb et al., 1995) is often used as though it elicits the consistent differences between individuals in their use of learning style. This approach is closer to the idea that learning styles are fixed for individuals. Indeed, Kolb's description of learning styles focuses more on person-type characteristics than on the basic knowledge forms.

This focus on the individual and the emphasis on individually-stable learning styles have generated some criticism of the LSI (Talbot, 1983, 1985; Loo, 1999). Indeed, when Carlsson et al. (1979) studied research and development project teams they found that variation in context and task had a strong effect on learning style. They said: 'We caution against the assumption that the learning preferences of individuals are fixed. It has been our observation that for many individuals learning style preference is highly situational' (p.44, Footnote 9).

However, in his discussion of the theory behind the LSI, Kolb explains that learning styles can vary according to our current task:

> At one extreme there are those basic past experiences and habits of thought and action, our basic personality orientation and education, that exert a moderate but pervasive influence on our behavior in nearly all situations. At the other end of the continuum are those increasingly specific environmental demands stemming from our career choice, our current job, and the specific tasks that face us. These forces exert a somewhat stronger but more situation-specific influence on the learning style we adopt.' (Kolb, 1984, p.98)

That is, whilst we are working on a task the learning style that we use is strongly influenced by the nature of that task and the context in which it takes place. The methods used in this research focus on conversation among a group of people working on a task. Thus, it may be that the task has a strong effect on the learning styles used by those people.

Kolb (1984) argues that better learning or development occurs by integrative use of two or more learning styles. That is, the highest form of learning would use all four styles simultaneously. However, he says that 'I suspect you would find that very few people follow this highest level of learning much of the time' (p.66). Instead, a more common form of development would occur with successive integration of pairs of learning styles and this may occur in a cycle. Kolb (1984) raised the concept of an experiential learning cycle but did not specify a sequence except at a general level.

However, Kolb et al. (2002) raise the prospect that conversation may move through a cycle: 'We propose conversational learning as the experiential learning process as it occurs in conversation. Learners move through the cycle of experiencing, reflecting, abstracting and acting, as they construct meaning from their experiences in conversations' (p.3). Here Kolb acknowledges that the use of one learning style may be followed by another in the order divergence-assimilation-convergence-accommodation and, further, that this may occur during conversation.

Kolb's (1984) theory of experiential learning focuses on individual learning and adaptation to the world and proposes that there are a variety of factors that determine the learning style in operation at any particular time. However, his analysis tends to exclude the possibility that learning style is also determined by interaction with others. However, his recent work (Kolb et al, 2002) on conversational learning is more alive to this possibility. A great deal of our learning takes place through interaction with other people. Thus, we need to be alive to the relational component of learning styles: it is part of the situation in which learning styles are used. This is discussed further in the section below on individuality and relationality. Here,

however, the idea that individuals move through an experiential learning cycle can also be extended to learning style progression in groups.

In their study of research and development (R&D) activities[1] Carlsson et al. (1979) measured learning styles by classifying managers' comments about the strengths and weaknesses of their groups' learning styles; they scored biweekly progress reports; and they also conducted periodic interviews with project team members. They found that R&D activity does follow Kolb's cycle: 'Most of the subjects appeared to be following a clockwise sequence through the stages of the Learning Model' (p.39). That is, groups working on a task would start to use a divergent learning style and then progress to using an assimilative learning style, followed by convergence and accommodation.

Sometimes the progression was not orderly:

> 'We found instances of stages being skipped, of project teams 'stuck' in a stage, and even instances of reverse (i.e., counterclockwise) movement through the stages. The managers involved generally agreed that the pictures were accurate and that the deviations indicated problems deserving of management attention.'
> (Carlsson et al, 1979, p.40).

There are several points of interest in this paper. Firstly, several cycles take place within a project. Secondly, the focus is on groups and knowledge and not on individual learning. Thirdly, they define the accommodative stage improperly. They call it 'execution', emphasising the active component, but miss the tacit feel for how well the action is going and the lead into socialisation. Lastly, they argue that it is possible to consciously manage a group's style of learning by thinking ahead or getting involved to move them on. This last possibility has implications for the utility of this research but was not tested here because of the focus on observation rather than on action.

Leonard and Swap (1999) also argue that the creative process has cycles that occur within larger processes. They say that there is a need for reflection after creativity (divergence) followed by convergence and a testing of the ideas created through action and accommodation.

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[1] They do not say which organisations, or what kind of organisations.

Nonaka and Takeuchi (1995) also argue that organisational knowledge-creation follows a cycle which they call an organisational knowledge spiral. Furthermore, they argue that this cycle works harder and faster when it occurs in group. Whereas Kolb argues that an individual may only integrate learning modes over a lifetime (see Kolb, 1984, pp.140-145), Nonaka and Takeuchi imply that, by working together, a project team may achieve this over the lifetime of a project.

As noted in Chapter 3, Nonaka and Takeuchi argue that four key processes are needed to use and create knowledge in an organisation. Each of these processes integrates the knowledge developed by two learning styles to create higher forms of knowledge that Kolb would call 'adaptive complexity'. Nonaka and Takeuchi call these processes 'knowledge conversion processes' because their model is driven by conversion between tacit and explicit knowledge and communication between individual and group. Like Carlsson et al. (1979) they focus on group learning and tend to ignore the possibility that individuals can create knowledge independently of others. In fact, their dimension of individual to group, organisation and beyond is better specified as action-reflection.

It is worth developing this idea further. Nonaka and Takeuchi define socialisation as 'a process of sharing experiences and thereby creating tacit knowledge such as shared mental models and technical skills' (1995, p.62). Like Kolb, they see the key to acquiring tacit knowledge as experience. Nonaka and Takeuchi argue that socialisation results from the creation and sharing of tacit knowledge through shared experience. We could also say that socialisation results from transforming concrete experience through action and reflection.

Nonaka and Takeuchi give two examples for socialisation. In the first someone from a bread-making machine project team learned how to make bread by working with a master baker. That learning was characterised by the creation of tacit knowledge through practice and could be called accommodation. In the second example, groups of people working on a project would relax informally outside the workplace to resolve complex problems. This allowed them to create

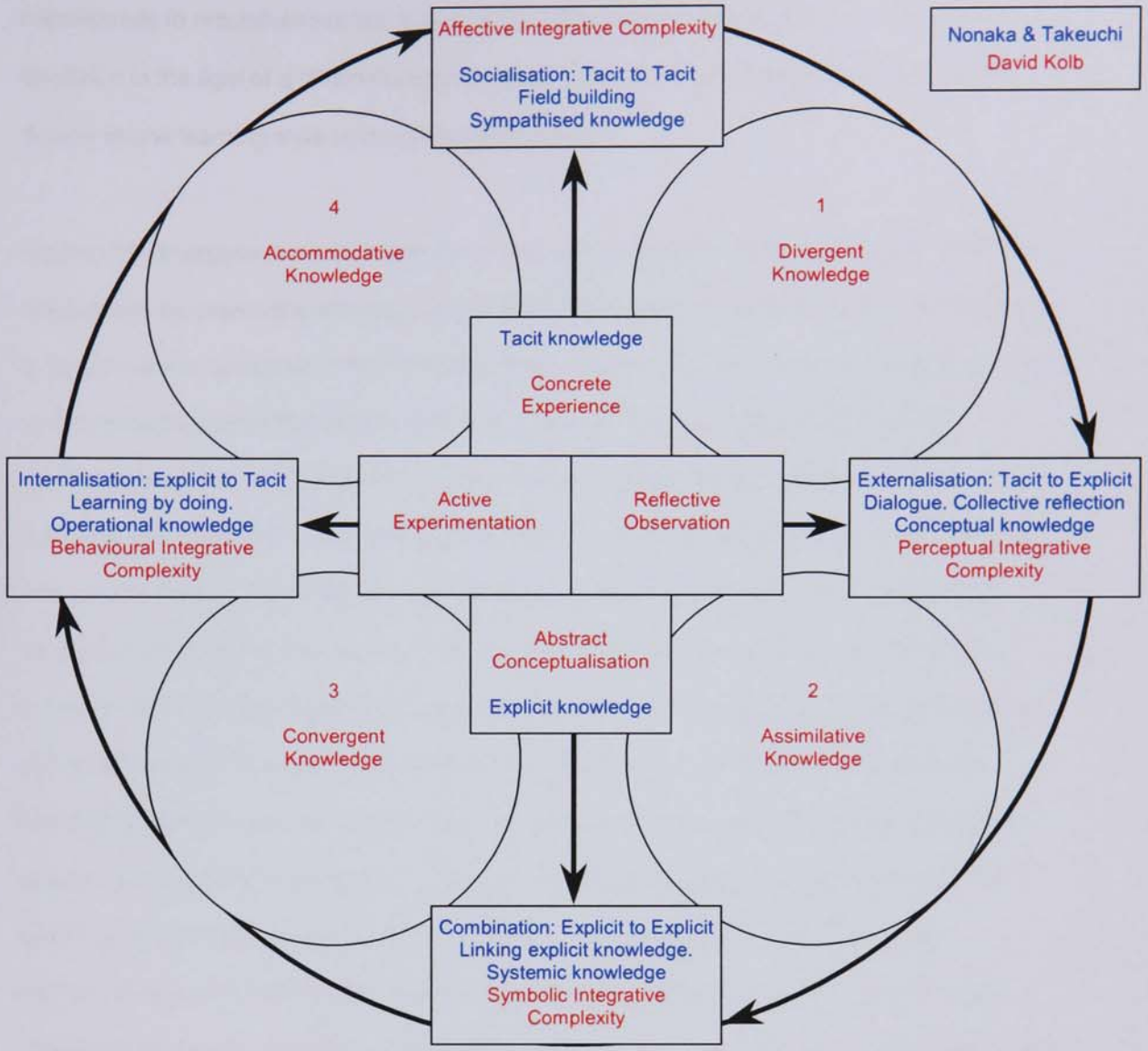
shared meanings and to intuitively search for solutions to those problems. The learning that took place was characterised by the sharing and creation of tacit knowledge through reflection and would foster divergent learning.

The combination of accommodation and divergence creates more refined tacit knowledge. Kolb would call it greater 'affective adaptive complexity'. It means that a person can sense and feel things in a more detailed and coherent way. Nonaka and Takeuchi would call it socialisation leading to greater sympathised knowledge.

Nonaka and Takeuchi argue that this sharing of tacit knowledge is the first stage of organisational knowledge-creation. Each stage builds on the knowledge developed in the previous stage. Socialisation is followed by the conversion of this shared tacit knowledge into explicit concepts through 'externalisation'. The next stage is the refinement of those concepts through reflection and the incorporation of them into a plan or prototype through action. This stage is called 'combination' and emphasises the use of logic and calculation to transform explicit knowledge. The final stage is 'internalisation' which they describe as 'learning by doing' (1995: 69). Here explicit knowledge is transformed through an active orientation. That action is then assessed qualitatively, using values and judgement, to get a feel for how it has gone. See Figure 4.2 to see how Nonaka and Takeuchi's model overlaps with that of Kolb. This overlap, and the progression through Kolb's 'cycle' and Nonaka and Takeuchi's 'spiral', may lead to an expectation of progression in the use of learning styles from divergence through to accommodation.

Put simply, there may be regularities in the use of learning style whilst working on a task. Kolb et al. (2002) suggest that learners move through a cycle of experiencing, reflecting, abstracting and acting in their conversations. Carlsson et al. (1979) and Nonaka and Takeuchi (1995) found several learning cycles within individual projects. Nonaka and Takeuchi also argue that a project may be divided into four stages and that there is a larger cycle that occurs over a whole project.

Figure 4.2 **Nonaka & Takeuchi's Model of the Knowledge-creation Process and Kolb's Model of Experiential Learning**



2.2. Discourse and recourse

Kolb et al. (2002) argue that the depth and quality of the learning that takes place in conversation is also determined by a balance between discourse and recourse. Their association of discourse with linearity, epistemology and objectivity implies activity and comprehensiveness. Their association of recourse with circularity, ontology and subjectivity implies reflection and apprehensive knowing. The balance between discourse and recourse,

which leads to greater and better learning, is a balance between all the learning styles. Kolb (1984) calls this 'integrity' in relation to individuals. The 'fear of the return of the same' corresponds to recursiveness and a fear of going back over previous learning, to assess it and re-work it in the light of a different learning style. This fear could produce 'stuckness' or the pursuit of one learning style at the expense of others.

Argyris (1979) argues that some patterns of learning are hard to break. He singles out an over-rational and an over-active strategy called Model I or single loop learning. This kind of learning is discursive and unilateral. It is characterised by individuals pursuing their own goals, producing conflict through competition and a need to win, suppression of criticism and minimising emotionality. We can see here the emphasis on comprehension and activity, that is convergence. The antidote is to balance learning with more creative thinking, using information with greater meaning, and developing shared goals. This he calls Model II or double loop learning and it is much more cyclical. The most important aspect of Model II is the ability to judge emotionally as well as intellectually. Through feeling it is possible to assess action and generate appreciation as well as constructive criticism. This feedback loop is essential to learning. In Model I individuals operate too discursively because they fear the return of their actions to haunt them. In particular, given the role of accommodation in the assessment of action, an over-emphasis on discourse could lead to convergence at the expense of accommodation. Sparrow (1998) says that we often do not appreciate the value of our less conscious abilities, in our skills and expertise, partly because 'We have all been trained to get to the point' (p.175). In Model II learning individuals can mix discourse with recourse and integrate their apprehensive abilities with their comprehensive abilities.

The concept of linearity is useful in understanding Simon's information processing paradigm (Simon, 1945; March and Simon, 1958). For Simon (1973), one of the key functions of organisation is decision-making and, given the limits of human cognitive capacity, the structure of the organisation aims to maximise rationality. Along with this idea comes the notion of linearity: lines of command, lines of communication, lines demarcating responsibility and

division of labour. By minimising and controlling interaction, bureaucracy reduces information overload. This control has similarities to Argyris' single-loop learning and convergence.

Simon missed the importance of implicit knowledge and meaning. The idea of circularity fills the gap with its emphasis on going round blockages, repeating attempts to solve problems, putting in more resources than will simply do the job once, and feedback loops.

2.3. Effectiveness and a Balanced Use of Learning Styles

The literature which compares different forms of knowledge or different kinds of learning often implies that an integration of these forms is desirable or more effective. Several authors address this issue of the need for balance and this can be extended to the use of learning styles. As Kolb (1984) says, 'The true path toward individual and cultural development is to be found in equal inquiry among affective, symbolic, perceptual, and behavioral knowledge systems' (p.140).

Each learning style is equally potent and this implies that in some situations there will be balance in the way they are used. One of the principal features of Kolb's argument is his need to redress the balance to include a greater role for apprehension and for reflection in the way we think about learning. The need for balance is recognised in the literature. For example, Mintzberg and Westley (2001) say that decision making is often seen as operating on scientific principles which emphasise abstraction and reflection. They argue that it should also be intuitive and active. Von Krogh and Roos (1996) argue that organisations need a mixture of divergent and convergent types of conversations to balance strategic and operational knowledge.

Sparrow (1998) refers to Warr and Conner's (1992) research examining how 'working styles' are shaped in young people in the first year of employment. It reveals a progressive reinforcement of a working style emphasising planning, working out, finding out for oneself and being systematic. This style emphasises discursive practices. This is at the expense of the alternative style emphasising co-operativeness, trust and interpersonal dealings. He goes on to say that

'The fact that people are actually succeeding through the adoption of the alternative style needs to be acknowledged and addressed' (p.12).

Mintzberg and Westley (2001) use a three-point model rather than the four points used here but they neatly capture some of these themes when they say that 'Science keeps you straight, art keeps you interested and craft [action] keeps you going' (p.93).

Leonard and Swap (1999) examine methods to encourage creativity in groups and to encourage divergence. However, they also argue that creative solutions must be tested and checked to see if the original needs have been met. This requires convergence and accommodation in addition to divergence. Like Carlsson et al. (1979), they imply that sometimes the process may need to be managed because 'the same people whose 'off-the-wall' approach benefits the group or organization during creation of options can be perceived as a pain in the collective neck when the time comes to agree on action' (Leonard and Swap, 1999, Ch.1).

2.4. Summary and Research Questions

The discussion about linear and cyclical time relates strongly to several of the research questions raised in the introduction about the role of tacit knowledge in knowledge creation, as well as the intimate relation between knowledge and the context of its use.

- Firstly, Kolb et al. (2002) argue specifically that conversational learning is better if there is a balance in the use of tacit and explicit knowledge. Also, they argue for a balance between action and reflection in conversation. Additionally, they and others (Nonaka and Takeuchi, 1995; Carlsson et al, 1979) argue that learning, and thus knowledge creation, can occur in a cycle with a predictable order in the use of the four types of knowledge.

- The distinction between discourse and recourse was discussed in relation to the use of learning styles. Kolb et al. (2002) argue that conversations need to balance discourse and

recourse: people who tend to over-use discourse, eschewing feedback and emphasising status, may tend to use convergence at the expense of other learning styles. This view aligns well with the attitude towards learning described by Argyris (1979) in his Model I type learning.

- We have also seen that, as well as the task, context has a strong influence on learning and the use of knowledge (Kolb, 1984; Carlsson et al., 1979). Thus, it is important to study both the nature of the task and the context in which it takes place when developing methods to study conversational learning and knowledge creation.

- Finally, we have also seen how research often focuses on either individuals or groups and this extends to 'knowledge cycles' too. Kolb (1984) discusses individual learning cycles and development while Carlsson et al. (1979) and Nonaka and Takeuchi (1995) discuss group learning cycles. Attempts to bridge the gap between individual and group-based explanations are discussed later in this chapter in the section on individuality and relationality.

3. Status and Solidarity

Another dialectic of conversational learning identified by Kolb et al. (2002) examines the nature of status and solidarity in a group and how that effects the depth and quality of that learning. They argue that a balance between status and solidarity 'opens a hospitable space where individuals engage in conversation with mutual respect and understanding towards one another' (p.17). Good conversation, they say, should not be too dominated by rigid hierarchy or pathological heterarchy. A rigid hierarchy where status is not connected to experience leads to 'a monologue from the top'. A pathological heterarchy, where all members of a group are the same, leads to aimless and repetitive conversation. Without status or leadership conversation can lose direction. Without solidarity, participants cannot build on or connect to each others' knowledge and conversation can lose relevance.

This dialectic draws together several themes in the literature. The issue of status and solidarity draws on analyses of power. As Blackler (1995) recognises, knowledge is often contested. There are those who wish to control it and to deny it to others. Weick (1993) also recognises that power can be influential. He argues that the environment can disrupt role systems but conflicts of interest can disrupt more fundamental sense-making activities. Without a balance between status and solidarity an organisation can be fragile, particularly in moments of crisis.

Misztal (2000) examines status and solidarity in relation to formality and informality. Formality is often connected to the ideas of status and power through the formalisation of interaction and status relationships in organisations. Formal relationships enable social capital to be realised and allow control over the distribution of knowledge and resources. Explicit knowledge is the ideal type of knowledge in a formal organisational system because it can be codified and moved around an organised bureaucratic system. Thus, formality is seen as impersonal and rigid. It is seen as divisive because it reduces the ability of people to talk across formal boundaries of status and communication horizontally across the organisation has to go through the status system.

Informality is often connected to the ideas of solidarity and equality. Relationships in an informal system are based on co-operation, shared values and fellow feeling. Knowledge in an informally organised system, based on equality, can be moved around more flexibly and according to the needs of all members rather than just the needs of those with higher status. Tacit knowledge is seen as the ideal type of knowledge in informal systems of organisation (Misztal, 2000).

Kolb et al. (2002) argue that conversational learning is most effective when there is a balance between status and solidarity. Misztal (2000) agrees. She argues against the idea that a group must operate with either one or the other and tries to balance the argument that a group is characterised either by power or equality. She points to dual trends towards both increasing formalisation and increasing informalisation. Formal and informal organisation of relationships both have a useful role to play.

This view is shared by those who study networks. The study of networks of people takes as a starting point a denial of a top-down authoritarian approach (Kickert and Koppenjan, 1997; Kickert et al., 1997). But this is tempered by a recognition that there should not be too much self-regulation. A balanced approach is therefore required.

3.1. Status and Solidarity and Organisational Structure

The issues of hierarchy and heterarchy are also fundamentally related to the structure of groups and this can be related to ideas about the most appropriate structure for relationships in an organisation.

Burns and Stalker (1996, first published 1961) describe mechanistic and organic systems of management. At the heart of these systems is the way that the rights of each member to control activity and information are defined. In mechanistic structures integration is achieved through rules, procedures and policies. This emphasises status, formality, comprehension and explicit knowledge. In organic structures integration is achieved through teamwork, flexibility and mutual co-operation. This emphasises solidarity, informality, apprehension and tacit knowledge. Schein (1972) also found that comprehension is associated with more bureaucratised and rigid interaction whilst apprehension of experience seems related to the flatter, bottom-up, organic kind of organisation.

Lawrence and Lorsch (1969) built on the work of Burns and Stalker by suggesting that an organisation sometimes needs the successful operation of both status and solidarity. They define differentiation as differences in the cognitive and emotional orientation of managers in different functional divisions of an organisation. They define integration as the quality of collaboration among departments whether or not they are different or similar to each other. They argue that in a dynamic environment, organisations are highly differentiated: parts of the organisation concerned with research are the most organic whilst those concerned with production are the most mechanistic. However, they stress that whether the environment is

stable or not, all organisations need integration. In other words, in a stable environment all parts of an organisation may be mechanistic and integration is achieved through an emphasis on status. In a dynamic environment, an organisation must integrate systems based on both status and solidarity.

Brown and Duguid (1991) argue that the formal organisation can use status to create a top down solidarity. It achieves this through canonical practice: the use of explicit knowledge, e.g. manuals, training programs, and formalised systems of relationships, e.g. organisational charts and job descriptions. However, the core can also use that system of status to prevent bottom up solidarity (or alternative systems of status) by downskilling, freezing out certain groups, or ossifying flexibility. Hislop (2001) argues that a primary function of a firm is to integrate diverse knowledge and that informal communication and intensive teamworking is best for integrating knowledge.

3.2. Status and Solidarity in Innovation

The study of innovation is appropriate here because the focus tends to be on smaller groups than the literature on the structure of organisations. Also, the creation and use of knowledge is seen as particularly critical. Innovation is also a form of conversational learning because, as Misztal says (referring to Lundvall, 1992) 'since learning, which is a central activity in the system of innovation, is a social activity that involves interaction between people, learning-by-interaction is essential in the production of innovation' (p.155).

Innovation is also seen as more creative and divergent than the 'normal' functioning of an organisation and that brings with it special implications for status and solidarity in innovating groups. For example, Brown and Duguid (1991) argue that the core of large organisations sometimes views self-constituting innovative communities as counterproductive. Kirton (1980) argues that people in an organisation fall into two categories: adapters fall in with formal status systems and consent to work by those systems; innovators need to do things differently, and tend to buck authority. He argues that a proper balance is for an organisation to have more

adapters than innovators. Shane (1994) studies product champions in innovation. He finds that they are in a minority, have deviant preferences and often attempt decision-making outside the formal hierarchy. Indeed, Schumpeter (1991) bolsters the idea that innovators require solidarity within the group and different status systems to the rest of the organisation. For him, successful innovation is 'a feat not of intellect, but of will. It is a special case of the social phenomenon of leadership' (p.65).

Zaltmann, Duncan and Holbeck (1984) argue that the highly creative initiation stage of innovation needs less formalisation and an expansion of informality. This implies less need for formal status systems and a greater need for solidarity. Formalisation can lead to role conflict in the initial stages but can reduce role conflict and ambiguity in the implementation stage. Status and hierarchy can be an aid at this point. Chesnais (1996) agrees and calls for greater solidarity in innovation. Since co-operation can lower the cost and risk of introducing new technologies, there is widespread recognition that 'successful innovation calls for co-operation' (p.21).

Nonaka and Takeuchi (1995) discuss 'requisite variety' as an enabler of knowledge-creation. They urge organisations to keep flat, non-hierarchical organisational structures, or to change structure frequently. Many people must communicate with many others and new or disrupted status systems may allow this to happen. They also argue for greater solidarity by stating that shared intention, shared commitment and aspirations enable organisational knowledge-creation.

3.3. Observing Status and Solidarity in Conversational Learning

We have seen the role for status and solidarity in organisations and in innovation. This section describes some of the ways that we might see status and solidarity in interaction. A common theme seems to be that status is more associated with convergence and solidarity with divergence.

Argyris (1979) seems to imply that status over-rides solidarity in single-loop learning. He says that in this kind of learning people 'tend to use unilateral behavioral strategies such as advocating a position and simultaneously controlling others in order to win that position, controlling the tasks to be done, and secretly deciding how much to tell people and how much is to be distorted, usually to save somebody's face' (p.65). He argues that we can learn to overcome this kind of learning.

Von Krogh and Roos (1995) contrast operational and strategic types of conversations. Operational conversations tend to be characterised by authority and intimidation leading to an emphasis on hierarchy, rationality and conflict. Strategic conversations tend to be more co-operative and egalitarian.

Several authors argue that tacit knowledge is particularly difficult to manage and that formal rules and control should only be instigated at a broad level. Gray (2001) argues that organisations can manage very rationally to organise the context for communication but tacit knowledge should not be codified. Status and hierarchy are inappropriate for the sharing of tacit knowledge and such interaction should be hands-off. Truch (2001) argues that organisations can catalogue knowledge and put people in touch with each other but they should not store tacit knowledge. Hislop (2001) says that intensive informal interaction, characterised by solidarity, leads to better integration of knowledge and learning. Orr (1990) found that the organisation of photocopier repair jobs by the organisation sets the context for tasks but the use of tacit knowledge to solve problems required informality and solidarity. Ichijo et al. (1998) argue that, without solidarity, tacit knowledge cannot be shared. Solidarity can provide legitimacy for tacit knowledge.

Goffman (1981) provides an insight into how status operates when he says that formality means roles are pre-defined and fixed. Informality allows individuals to choose roles more flexibly. Interestingly, he also finds that people with higher status have greater freedom to choose their roles and have greater ability to operate informally.

Nonaka and Takeuchi (1995) found that informality created solidarity and allowed people to share experiences. For example, when project team members met outside the workplace, drank alcohol and shared meals they could share experiences in a relaxed way. By removing themselves from the workplace people could reflect collectively. They moved from an active orientation in a hierarchical situation to solidarity and reflection.

3.4. Summary and Research Questions

We have seen that definitions of knowledge must take account of how knowledge is socially situated: knowledge is largely social, being created through interaction and used interactively. Thus, one of the research questions raised in the introduction and in this review relates to the role of status and solidarity in conversational learning.:

- More specifically, Kolb et al. (2002) argue that conversational learning takes place where a group finds a balance between status and solidarity. They argue that good conversational learning occurs where participants strike an interactive balance between rigid hierarchy and pathological heterarchy.

- We have also seen that status and solidarity are closely related to formality and informality and that certain types of knowledge may be associated with each. Formal organisation is often characterised as being based on status and hierarchy, whereas informal organisation is characterised as being based on solidarity and heterarchy. Use of explicit knowledge and an active orientation is often connected to hierarchy, whereas tacit knowledge and a reflective approach is often connected to heterarchy.

- Furthermore, it was also suggested that a greater emphasis on solidarity may be more appropriate at the initiation of a project when socialisation, tacit knowledge and reflection are most valuable. Similarly, a greater emphasis on status may be more appropriate at the implementation stage when explicit knowledge transfer and action are most valuable.

4. Individuality and Relationality

According to Kolb et al. (2002), 'The tension between individuality, where a person takes in life experience as an individual process, and relationality, where life is an experience of connection with others, can be described as an intersubjective process whereby an individual maintains a sense of self while at the same time is aware of, and open to influence of others' (p.14).

This section explores this tension and movement between individuality and relationality in relation to conversation, learning and interaction. We have seen how Kolb's (1984) experiential learning theory is mainly focused on individuals and their predominant learning style. We have also seen how Nonaka and Takeuchi's (1995) theory of organisational knowledge-creation tends to focus on groups as they convert knowledge from one type to another. Both theories recognise that learning and knowledge-creation necessarily involve people acting as individuals and as members of a group but tend to emphasise one side of this dialectic. Firstly, these two theories are examined and the following sections provide some discussion of how we can think of an integration between these two poles.

4.1. Kolb: Personal and Social Knowledge

Kolb (1984) uses the concepts of apprehension and comprehension to define two kinds of knowledge: personal and social knowledge. Personal knowledge is defined as 'the combination of my direct apprehensions of experience and the socially-acquired comprehensions I use to explain this experience and guide my actions' (p.105). Social knowledge is defined as 'the independent, socially and culturally transmitted network of words, symbols, and images that is based solely on comprehension' (ibid.).

The belief that knowledge can stand alone, that it can exist independently in a written work or mathematical notation, is an illusion. We have to use some apprehension processes to understand it: 'Social knowledge, however, cannot exist independently of the knower but must

be continuously recreated in the knower's personal experience ... to yield personal knowledge and meaning' (p.105).

Kolb (1984) argues that 'The critical difference between personal and social knowledge is the presence of apprehension as a way of knowing in personal knowledge' (p.109). Thus:

Personal knowledge is formed from apprehension and comprehension.
Social knowledge is formed from comprehension.

Resnick (1991) calls this position a reductive approach and argues that 'People also build their knowledge structures on the basis of what they are told by others' (p.2).

The transaction between personal and social knowledge helps us understand how knowledge is created socially:

> 'The concept of transaction implies a more fluid, interpenetrating relationship between objective conditions and subjective experience such that once they become related, both are essentially changed' (Kolb, 1984, p.36).

Kolb says this transaction occurs between an individual and her/his environment. An individual is a feeling and thinking person who knows things by apprehension and comprehension. In order to communicate her/his knowledge and put it into the environment, she/he expresses experience comprehensively. By doing this the environment is changed. This is predominantly done by the use of language.

However, conversational learning implies that the immediate environment for that conversation is a group. The transactions between the individual and the group could be quite intense. So much so, in fact, that communication becomes inter-subjective as well as inter-objective. In other words, we may be able to communicate our apprehensions of experience or at least share apprehensive experiences. Some of these concerns are addressed by Kolb in his recent work (Kolb et al., 2002) with the use of the dialectic of individuality and relationality.

4.2. Nonaka and Takeuchi: Organisational Knowledge-creation

Whereas Kolb saw individuals interacting with their environment, Nonaka and Takeuchi see groups of individuals interacting with each other. For Nonaka and Takeuchi, knowledge-creation has to be social:

> 'Our dynamic theory of knowledge creation is anchored to a critical assumption that human knowledge is created and expanded through social interaction between tacit knowledge and explicit knowledge. We call this interaction 'knowledge conversion.' It should be noted that this conversion is a 'social' process *between* individuals and not confined *within* an individual. According to the rationalist view, human cognition is a deductive process of individuals, but an individual is never isolated from social interaction when he or she perceives things.' (1995, p.61)

They acknowledge that 'In a strict sense, knowledge is created only by individuals' (p.59). But, for them, organisational knowledge-creation is something different, that *more* is created by the interaction of those individuals. For example:

> 'Organizational knowledge creation, therefore, should be understood as a process that 'organizationally' amplifies the knowledge created by individuals and crystallizes it as part of the knowledge network of the organization.' (op. cit., p.59)

What they do is to frame their discussion of knowledge-creation always in terms of the organisation. Organisational knowledge-creation is the aim, not individual knowledge-creation. Individuals may create knowledge, but it only has use once it is shared with a wider community. And it is only by sharing knowledge that knowledge is reinterpreted and recreated. It is not so far from saying that only by sharing knowledge can new knowledge be created.

Sparrow (1998) acknowledges the value of Nonaka and Takeuchi's ideas but has a reservation:

> 'It would be convenient to assume that people in close and constant proximity and interaction learn all there is to know about each other's perceptions, but this is not the case.' (p.50)

Research on group processes has shown that as a group matures in an informal, naturalistic setting, some aspects of group members' views can be elicited but 'More recent research has shown however, that different processes are useful for facilitating the elicitation of different kinds of information' (ibid.). Encounters can vary and different kinds of thinking can be used. 'We need, therefore, to explore the 'conversations' that individuals have with their own mental material, in the course of their practice' (ibid.).

Organisational knowledge-creation tends to remove the individual from the picture. This has two effects. Firstly, it removes attention from how individuals create knowledge. Nonaka and Takeuchi do not describe or explain individual processes of knowledge-creation. Secondly, their explanation removes attention from how individual skills and relationships with other people can constrain the sharing of knowledge.

4.3. Integrating Individuality and Relationality

A more refined analysis would include both knowledge-creation and knowledge sharing but allow for their independence. This would allow for the following possibilities:

1. Individuals can create knowledge in relative isolation from other people. This can involve actively experimenting in the material world and using the senses, as well as thinking and reflecting on experience.

2. Individuals share knowledge with other people. This may or may not involve a reinterpretation by the originating individual of their own knowledge. They may need to express their personal knowledge more explicitly, implying further knowledge-creation. Or they may communicate their personal knowledge tacitly.

3. The people who gain that knowledge will reinterpret it, to different degrees, using their own mental schemata. This implies still further knowledge-creation.

Thus, knowledge can be created without sharing it. And sharing knowledge can create new knowledge, but only if the shared knowledge is reinterpreted by individuals. For example, a book that is in every library but is never read will not advance knowledge. This is related to Blackler's (1995) argument that we should think of knowledge as 'embodied'.

This research uses the concept of learning style, as used in conversation, to study how knowledge is created in a group. Kolb (1984) conceives of learning as a process carried out by an individual in his/her 'environment'. Thus, he often treats learning style as a property of individuals. Indeed, he has constructed the Learning Style Inventory test to elicit these consistent tendencies in an individual's transactions with the world. However, he also acknowledges that the situation a person finds himself/herself in has a strong influence on the learning style he/she uses. In a conversational setting, for example, the learning style that an individual uses could be influenced by the knowledge they have about the subject of the conversation and by the knowledge that others in the conversation have.

Nonaka and Takeuchi (1995) focus on the way knowledge is created and used in group settings. We saw earlier in this chapter that their theory of organisational knowledge can be expressed in terms of learning style (Section 2.1). The learning style used by a group may change according to the stage of a project using knowledge that has been created in a previous stage. Their focus is on the integration of group learning styles. Their theory does not explicitly allow for individual differences in learning style. In a conversational setting, two peoples' learning styles may be different. By interacting in conversation they may integrate those learning styles.

By focusing on the use of learning styles by individuals interacting with each other in conversation it may be possible to see the degree to which an individual is consistent in their use of learning style during that conversation. It may also be possible to see how his/her use of learning style is also dependent on the learning styles of the people they are in conversation with, and how this relates to their knowledge of what they are talking about.

One of the questions investigated in this research is the extent to which we can observe consistent tendencies to use particular learning styles formed by personality, education, career choice and job. The corollary of this question is the extent to which we can observe how situation-specific effects such as role and task affect learning style.

Thus, it is possible that by examining an individual's conversation we will see that their use of learning style changes over the course of that conversation. And by examining an individual's learning style measured by the Learning Style Inventory, his/her role in the context of his/her conversation and the nature of the subject he/she discusses we might see how these forces interact.

Although, an individual may tend to use a particular learning style more than others, his/her use of a learning style may also be determined by the knowledge that they have and the knowledge that they need in a particular situation. Furthermore, it may be that working in a group also produces tendencies in an individual to use a particular learning style matched by others in the group.

Thus, this research examines the dialectical integration of learning styles used individually and relationally in conversation. It examines how much peoples' use of learning styles is affected by their individual predispositions or by properties that emerge from interaction in a group.

4.4. Individuality and Relationality: Calls for integration

The relationship between individuality and relationality is explored in several fields. Allport (1962) described the individual-group relationship as social psychology's 'master problem'. Social psychology asks if there is 'more to groups than the sum of the individuals that comprise them' (Brown, 1988, p.3). There are several ways of defining groups: they can be comprised of individuals that share a common fate or they can be defined by social structure, status, roles or relationships. More reductionist views emphasise individuality. For example, Allport (1924) said that 'There is no psychology of groups which is not essentially and entirely a psychology of individuals' (p.6). More constructivist views emphasise relationality (for example, Mead, 1934; Lewin, 1951). They argue that groups have unique properties which emerge out of the network of relations between individual members. These approaches emphasise individuality and relationality, and argue that the structure of groups is formed through face-to-face interaction.

Resnick (1991) argues that in most psychology 'social' and 'cognitive' stand in a figure-ground relationship, not interacting. However, there is an emerging literature on social cognition. She says that: 'We seem to be in the middle of multiple efforts to merge the social and cognitive, treating them as essential aspects of one another rather than as dimly sketched background or context for a dominantly cognitive or dominantly social science' (p.3).

This approach to individuality and relationality is also useful for understanding knowledge and problem-solving. For example, Zhang (1998) sees that the 'representation of a group problem solving task is distributed across individual representations, which jointly represent the abstract structure of task' (p.809).

We can also see this balance between individuality and relationality in knowledge management and organisation studies. Blackler (1995) argues that the unit of analysis in the study of knowledge work should be socially-distributed activity systems, rather than either individuals or the organisation. Brown and Duguid (1991) say that this perspective can also allow an analysis of how groups form an organisation (p.55). They study the nature of collaboration in organisations and link individuality and relationality to learning: 'Not only is the learning in this case inseparable from working, but also individual learning is inseparable from collective learning' (p.46).

Some social theorists also see the need to reintegrate the individual back into social theory. Boden (1994) argues that 'a remarkable range of authors [are] now pondering the role of agency given the overdetermined status of structure in sociology and other social sciences' (p.9). All too often, she says, 'People are effectively, although rather magically, made to disappear from much social science theory and research' (ibid.). Thus, human agency and the interactive foundation for structure is explained away 'in an effort to view structure all the more clearly in its solidity and sustained persistence' (ibid.). She argues that too much has been made of Durkheim's (1964) concept of 'conscience collective'. However, Spender (1996) argues that Durkheim has been misunderstood: 'Durkheim's argument was not that collectives think. On the contrary, it was an exploration of the social or collective nature of each socialised

individual's thinking, learning and remembering processes' (p.69). Giddens (1984) has developed structuration theory to attempt to break free of the dualism of agency and structure and argues for a 'duality of structure' emphasising both individuality and relationality.

4.5. Social Psychology and Individuality and Relationality

Tajfel (1978) saw all social behaviour as lying on a continuum from 'intergroup' behaviour to 'interpersonal' behaviour. He suggested three criteria to help place behaviour on this continuum. The first is the presence or absence of at least two clearly identifiable social categories. The second is the degree of variability in the attitudes or behaviour within a group. Interpersonal behaviour would show the normal range of individual differences. Intergroup behaviour would be more uniform. The third is the degree of variability in attitudes or behaviour to other group members within an individual. Interpersonal behaviour would show a normal range of variability. Intergroup behaviour would show more homogeneity of attitudes or behaviour towards other group members. Intergroup behaviour is defined by interaction on the basis of membership of a group, whereas interpersonal behaviour is defined more by individuals, personal characteristics and interpersonal relationships (Brown and Turner, 1981; Brown, 1988). Relationality could be divided into interpersonal relations and intergroup relations. Most situations contain elements of both.

Turner (1982) argues that people can switch from attitudes and behaviours sourced from interpersonal relations to attitudes and behaviours sourced from intergroup relations. The switch is governed by changes in self-concept, in the way people view themselves. Thus, people attempt to make actions socially or 'logically' coherent by exercising their personal or social identities.

Social psychologists have studied the degree to which people move from interpersonal behaviour to intergroup behaviour on the basis of their real or imagined group interests. One of the key issues is the degree to which a shift to intergroup behaviour leads to intergroup conflict. Sherif's (1966) theory of intergroup conflict based on the famous 'summer camp' studies has

been most influential (Sherif and Sherif, 1953; Sherif et al., 1955, 1961). He studied how cohesion within a group leads to intergroup conflict. His findings illustrate how groups with high levels of relationality avoid inter-group conflict. When groups have common or superordinate goals, or if they can blame the context for failure, then people can behave as members of a group but without intergroup conflict. It is helpful to have separate tasks for different groups. High self-esteem and strong affiliations to a group can also lead to risk and failure tolerance, even in group conflict or in difficult environments. These findings show how overt relationality can lead to resilience and still allow learning to take place.

Linde (2001) argues that an individual can understand the largely tacit knowledge of social relations as an individual or as a member of a group. As an individual, a person understands the identity of a group, the meaning of membership and how to be a member. As a member of the group, the individual has social knowledge about work practices, the way the group works together and how decisions are made.

Weick (1993) studied how respectful interaction develops and is sustained, even in difficult situations. He argues that individuals need to understand each other intersubjectively. Formally ascribed roles may become less meaningful but social support may continue if there has been interchange and synthesis of meanings. Individuals may need to change such that joint or merged subjectivity develops. This is more likely to happen through informal face-to-face interaction rather than through formal routines. His approach also puts an emphasis on trust, honesty and self-respect. Here we see that the emphasis is on relationality in a dynamic or difficult environment.

However, Damon (1991) warns against an over-emphasis on context and social constructionism. People bring developmental skills to interactions and some skills and knowledge are privileged. When people talk about a subject and use and create knowledge about that subject, their interaction is partly determined by the nature of that subject as well as individual-group processes. The knowledge, expertise and cognitive abilities that a person

brings to a group context may be expressed in that context without the need for great intersubjectivity.

Donnellon et al. (1986) describe one way this may occur using the concept of equifinal meaning. For them, 'organization members may have different reasons for undertaking the action and different interpretations of the action's potential outcomes, but they nonetheless act in an organized manner' (p.44). Referring to Weick (1969, 1979) they say that 'It is not necessary that members subscribe to the same goals or share the same interpretations of their joint actions' (ibid.). In fact, common ends and shared meanings do not cause joint action. They acknowledge that there must be some agreement of interdependence about exchange and rules of exchange within group. However, they argue that joint action can take place when individuals do not share goals or meaning. Indeed, they argue that common ends and shared meanings are a result of interaction and joint action. This would fit a model like Kolb's where accommodation and tacit knowledge follow active approaches to learning.

Bougon (1992) concurs and argues that individuals only need to use common labels to work with others, not detailed shared concept definitions. Mutual understanding does not need homogenous beliefs and cognitions. Rather, mutual understanding can be knowing how cryptic collective labels affect others and knowing the degree of concept sharing and promotion of shared meaning. This implies that individuals sometimes only act as though they have knowledge of meanings others use.

4.6. Activity Theory and Individuality and Relationality

Activity or prospect theory originating in the work of Vygotsky attempts to provide a role for both individuality and relationality in our thinking. One of Vygotsky's (1978) key contributions was to say that children regulate their own behaviour by replaying or re-experiencing verbally-mediated exchanges with other individuals. The social character of these exchanges is retained in mature verbal thought (Jary and Jary, 1995). Thus, social experiences shape individual interpretative processes. This emphasises relationality. However, individuals can also jointly construct

knowledge under particular conditions of social purpose and interaction (Resnick, 1991). All activity theories attempt to unify individual knowing and doing in the context of the collective, situated, tentative nature of knowing (Blackler, 1995). Learning can be seen as socialisation and groups can also enact new conceptions.

Vygotsky argued that explicit social knowledge becomes implicit in an individual through internalisation. This echoes the 'internalisation' of Nonaka and Takeuchi (1995). Reber (1993) augments this by suggesting that, following Kolb and James, individual concrete experience can also form explicit social knowledge. This echoes Nonaka and Takeuchi's concept of 'externalisation' (1995: 64).

Another useful concept provided by Vygotsky (1978) is the 'zone of proximal development'. The zone of proximal development is a 'region of activity that learners can navigate with aid from a supporting context, including but not limited to people' (Ash, 2002, p.2). Tensions, discontinuities or incompleteness in knowledge can provide a force for change. These forces can be individual or social. Individuals learn in this zone through individual concrete experiences or through interaction with others. Ash says that this concept helps to underpin a 'socio-cultural perspective of learning in informal environments' (p.2). Sparrow (1998) describes a positive role for relationality in development: 'groups can be more rigorous and rational than individuals choose to be' but they can also 'widen the pool of potential insights' by sparking off ideas in each other (p.226).

Ash (2002) also discusses how the interaction of multiple overlapping zones of proximal development can form an 'ongoing social scaffolding' where one person's contribution can support another's contribution. This can occur when no one person has all the knowledge necessary, but together the group can further individual and group understanding.

These ideas are also closely related to the idea of sense-making. Weick (1993) argues that the concept of individual rationality has been over-stretched. In response to Simon's conception that problems are at their heart structured and solvable, but our cognitive abilities are limited, a

focus on context, subjective understandings and the role of groups shows that complex problems may be solved in interaction (Nightingale, 1998). People interpret their situation socially and they can change their conception of it socially, even though their environment may be unstable.

Weick argues that we need to understand rationality as normative and contextual as well as formal and logical. Thus, people make sense of their environment individually and by reference to the socially-defined situations they find themselves in. To understand how we achieve this we need to examine naturalistic decision-making. Weick undermines overly-structural explanations by focusing on how organisations may be held only tenuously in place. He argues, instead, for the concept of structuring: formal structures of constraint along with informal structures create shared interpretive schemes.

4.7. Creation of Knowledge Through Interaction and Sense-Making.

Conversation depends on our knowledge about the subject of that conversation and our knowledge about ourselves and the people we talk with. How does individuality and relationality express itself in conversation?

Levine and Moreland (1991) argue that accounts, routines, jargon, rituals and symbols all help to define the nature of a work group. They can be seen as behavioural expressions of the thoughts shared among group members.

The concept of 'schemata' helps to bridge the gap between individuality and relationality. Some schemata are concerned with our relations with others. Some schemata are knowledge-based and rely on individual expertise. Sparrow (1998) refers to schemata as mental templates for organising information. People, objects and events can all populate schemata. Schemata include expectations or prototypes (Rosch, 1973) for these populations based on our experience. Abercrombie (1960) defined schemata as 'experience organized in fairly well-defined patterns' (p.54) and Drewer (1972) said they function 'as a kind of vague standard,

arising out of past experience, and placing any fresh experience in its appropriate context and relation'. In some ways they are like accumulated experiential knowledge or 'complexity' in Kolb's terms.

Scripts are specialised schemata for action and activity and seem to be applicable to the making of conversation. Thus, 'A script is a schematic retention of context-specific mental material about events and event sequences' (Sparrow, 1998, p.99).

Sparrow's interest is in unearthing and externalising such schemata for the interest of the social scientist. He says that imagistic thought, which is associated with tacit knowledge, is often used in our imagination as we play out scripts in our heads. He argues that imagistic thought can be used in both reasoned, consciously-led type of thinking as well as in free-flowing, less-conscious musing type of thinking. Of interest here, though, is the way that these schemata enable people to interact and share experiences, and in turn, create new scripts.

Boland and Tenkasi (1995) say that effective integration of different knowledge bases requires a complex set of perspective making and taking, involving the development of an understanding of the 'unique social and cognitive repertoires' (p.351) that each knowledge base is founded upon. Baumard (1999) says, rich communication is about 'facilitating the delicate process of integrating ideas and energies' (p.201).

Resnick (1991) argues that 'Knowledge is an interpretation of experience, an interpretation based on schemata, often idiosyncratic at least in detail, that both enable and constrain individuals' processes of sense-making' (p.1). Thus, fundamentally, everything is personally constructed but socially-constructed schemata provide information and guidance. Through these schemata, social processes become cognition. Knowledge and cognition are 'distributed across several individuals whose interactions determine decisions, judgements, and problem solutions' (p.3).

4.8. Summary and Research Questions

Knowledge and learning are often portrayed as the properties of either individuals or groups and organisations: that is, either individuals or groups have knowledge or learn. One of the challenges of this research, raised in the introductory chapter, was to investigate the processes by which knowledge is created simultaneously by individuals and by a group.

- We have seen that, for Kolb (1984), tacit and explicit knowledge is created within individuals and communicated through the sharing of explicit knowledge. Nonaka and Takeuchi (1995) give a greater role for the sharing of tacit knowledge within a group through shared experiences and partial codification of tacit knowledge.

- However, Kolb et al. (2002), along with others (e.g. Weick, 1993; Resnick, 1991; Zhang, 1998) have also put forward the idea that knowledge should be seen as held and interpreted intersubjectively. For Kolb et al. (2002) conversation should be characterised by a balance of both individuality and relationality, whereby an individual maintains a sense of self whilst being open to the influence of others.

- Learning styles can be seen as an individual psychological trait which is relatively stable over time, or as being more determined by his or her situation, where learning style would depend on the style used by others and the individual's changing knowledge of that situation. Kolb's Learning Style Inventory can be used to elicit the consistent tendencies in an individual's transactions with the world as it is designed to be largely free of contextual variations. These results can be compared with the effects on conversational learning style where the situational and relational nature of the situation that a person finds himself/herself in, and the task he/she is in engaged in, may have a strong influence on the learning style he/she uses.

- Activity theory and writers on sense-making also argue for the dual nature of individuality and relationality. They argue for an interplay between personal and social experience which

has, at heart, an understanding of experience grasped both apprehensively and comprehensively. Overlapping 'zones of proximal development' and the ongoing 'social scaffolding' on which knowledge and new meanings are built are concepts that can help us to understand the interplay between individuality and relationality that takes place in conversation.

5. Chapter Summary

The following dialectics have been used to understand conversation as experiential learning

- Apprehension and comprehension
- Intention/reflection and extension/action
- Linear time and cyclical time
- Status and solidarity
- Individuality and relationality (Kolb et al., 2002).

In the last chapter (Chapter 3) we saw how apprehension and comprehension are fundamental to the way we experience the world and to the nature of knowledge. These experiences are transformed by acting or reflecting on them and are held in different ways in the form of tacit and explicit knowledge. We also saw that the combination of the first two dialectics forms four learning styles and four types of knowledge. These dialectics were used to understand the features of conversation associated with each type of knowledge that can be observed as people are interacting with each other. These properties were used to generated a coding frame for conversation that can be used to analyse how knowledge is created and used by a group of people working on a project.

In this chapter the last three of Kolb's dialectics were examined.

Linear Time and Cyclical Time

There may be regularities in the use of learning style by a *group* whilst working on a task. Kolb et al. (2002) suggest that learners move through a cycle of experiencing, reflecting, abstracting and acting in their conversations. Carlsson et al. (1979) and Nonaka and Takeuchi (1995) found groups following several learning cycles within a single project. Nonaka and Takeuchi's work also suggests that a group's learning style may follow a cycle over a whole project.

Status and Solidarity

The review of the literature showed how status and solidarity affect conversational learning. Kolb et al. (2002) argue that conversational learning takes place where a group has a balance between status and solidarity. Good conversation is not too dominated by rigid hierarchy or pathological heterarchy.

Formal organisation is often characterised as being based on status and hierarchy, whereas informal organisation is characterised as being based on solidarity and heterarchy. Use of explicit knowledge and an active orientation is often connected to hierarchy, whereas tacit knowledge and a reflective approach is often connected to heterarchy.

A greater emphasis on solidarity may be more appropriate at the initiation of a project. A greater emphasis on status may be more appropriate at the implementation stage.

Individuality and Relationality

Lastly, Kolb et al. (2002) argue that conversational learning takes place where there is a balance between individuality and relationality. One of the questions investigated in this research is the extent to which we can observe consistent tendencies within an individual's use of particular learning styles formed by personality, education, career choice and job. This could be measured by the Learning Style Inventory. The corollary of this question is the extent to

which we can observe how situation-specific effects such as other peoples' use of learning style and the task affect conversational learning style. For example, it may be that working in a group also produces tendencies in an individual to use an emergent group learning style. Concepts from activity theory and from writers on sense-making help to describe the interplay between individuality and relationality that takes place in conversation.

Chapter Five

Methods

1. Introduction

This chapter explains the actions taken to collect, prepare and analyse the data used in this research. The first section discusses different research methods associated with the analysis of speech. It locates this research within content analysis and discusses the validity and reliability of this method. The second section discusses the data collection, how the boundaries of the fieldwork were set and the effect on the results. In particular, it examines the different ways that data was collected and the use of conversation as data. The third section describes three elements of data analysis: data reduction, data display and drawing conclusions.

Briefly, this research used qualitative and quantitative methods to examine the nature of learning in conversation. Data collection involved non-participant observation and recording of conversation and discussion in a group working on a project. The data was analysed using content analysis of their speech. The transcripts and the detailed understanding that came from being immersed in the data were used to explore some of the patterns revealed by the data.

2. Research Methods

This research is more positivistic than phenomenological; this means that I have no philosophical objections to attempts to quantify qualitative data such as naturally-occurring speech. Although it makes extensive use of naturally occurring conversation this research is closer to content analysis than discourse analysis or conversational analysis.

Miles and Huberman (1984) argue that a positivistic approach to the analysis of qualitative data is not a contradiction in terms. They argue that a logical positivist approach that treats social phenomena as real, as well as present in the mind, has to express that reality as precisely as possible. That is, there should be valid and verifiable methods for capturing social relationships and their causes. This does not mean that the researcher can dispose of meaning and uncertainty. Indeed, they argue that the induction of fuzzy concepts from a deep understanding of data is a valuable tool. However, they suggest that orderliness, a degree of formalisation of the analysis process, allows for a more thorough and explicit observation of how data leads to conclusions. They argue that:

> 'Methodologically, our beef is with the somewhat magical approach to the analysis of qualitative data advocated on the grounds that such an approach is idiosyncratic, incommunicable, and artistic.' (Miles and Huberman, 1984, p.20)

Miles and Huberman (ibid.) suggest that, despite their protests, ethnographers and social phenomenologists sometimes use procedures that are like those used by quantitative researchers when they count instances of social phenomena or create ordinal scales of intensity.

The approach of Miles and Huberman can be used to argue that some similarities exist between content analysis and other more phenomenological processes and that it is possible to be rigorous and explicit about the research methods used in ethnographic research.

2.1. Content Analysis

Content analysis represents a formal approach to qualitative data analysis where text is systematically converted to numerical variables for quantitative data analysis.

Jary and Jary describe it as:

> 'a research technique for the objective, quantitative and systematic study of communication content. It involves charting or counting the incidence, or co-incidence, of particular items belonging to a set of (usually) predetermined categories.' (Jary and Jary, 1995, p.119)

Mostyn (1985) refers to content analysis as 'the diagnostic tool of qualitative researchers, which they use when faced with a mass of open-ended material to make sense of' (p.117). Krippendorff's (1980) definition is that 'content analysis is a research technique for making replicable and valid inferences from data to their context' (p.21). This definition stresses the relationship between content and context. This was appropriate because I wanted to make a connection between learning based on the content of what people said and the social context in which they said it. It also emphasises that reliability and validity are central concerns in content analysis (Hussey and Hussey, 1987).

Silverman (1993) lambastes content analysis saying that 'its theoretical basis is unclear and its conclusions can often be trite' (p.59). This can be turned around into an argument that content analysis requires a sound theoretical purpose and this should be reflected in the development and use of a scheme for categorising data.

There is some argument within content analysis about the degree of interpretation which coders make when categorising items of data. Manifest content, such as a particular word or phrase, is physically present and requires little inference to code. Latent content requires more interpretation by the coder. Robson (1993) contrasts 'low-inference latent content' such as warmth or favourableness with 'high-inference latent content' such as a complex personality typology. He says that: 'As with other techniques of data collection, it is obviously likely to be more straightforward to achieve reliable results with low-inference systems. However the research question should determine the type of system you are using, and it may well be that a high-inference system is appropriate' (1993, p.276).

This research used a high-inference coding system that required quite a high level of interpretation of what people were saying. The coding frame was developed from theory which itself had a sound basis in empirical research. And my interpretation of the coding frame required a clear understanding of that theoretical background. The theoretical background provided the external validity for the use of this method in this research.

Robson (1993) also argues that the coding categories should be exhaustive and mutually exclusive and a content analysis can be no better than its system of categories. This would be true if only the quantitative data was used in the subsequent analysis and writing up. However, in this research the findings from the content analysis were verified by looking back through the transcripts and undertaking further qualitative data analysis. This provided internal support or validity.

Another problem with content analysis is that large amounts of data that could help to understand the phenomenon being studied are discarded when codes are applied (Hussey and Hussey, 1987). Thus, critics of content analysis challenge the assumption that meanings can be studied quantitatively, arguing that meanings are conveyed by absence as well as presence, and by context rather than frequency (Jary and Jary, 1995).

However, in its more sophisticated form, content analysis can take account of these critiques, and can make a powerful contribution to sociological analysis. Miles and Huberman (1984) regard data reduction as an integral part of data analysis and argue that it can be done intelligently. 'Converting words into numbers, then tossing away the words, gets a researcher into all kinds of mischief. ... The solution to this problem ... is to keep words and any associated numbers *together* throughout the analysis. Essentially, words and numbers keep one another honest' (p.55).

2.2. Discourse Analysis

'Discourse analysis' can mean many things. Potter and Wetherell (1987) acknowledge that discourse analysis is used in different ways by different people: 'It is a field in which it is perfectly possible to have two books on discourse analysis with no overlap in content at all' (p.6). There is, however, some agreement that 'discourse' includes all forms of spoken interaction, both formal and informal, and all kinds of written texts. Discourse analysis then becomes the analysis of this speech and text. Potter and Wetherell (1987), along with many

discourse analysts, expect to gain 'a better understanding of social life and social interaction from our study of social texts' (p.7).

Potter and Wetherell (1987) argue that one of the key distinctions between discourse analysis and content analysis is the attitude to coding. In discourse analysis coding is quite distinct from doing the analysis: coding is used to extract theoretically relevant instances for further examination from the bulk of the data collected but it is not part of the analysis itself. They make this clear when they say, a little dismissively, that:

> 'In this sense [coding in discourse analysis] is quite different from standard techniques of content analysis where, for all intents and purposes, coding data into categories and looking at the frequency of occurrence is simply equivalent to the analysis.' (Potter and Wetherell, 1987, p.167)

The content analysis undertaken for this research is not 'standard' in that it involves a high level of interpretation and is supported by an in-depth understanding of the data. However, the case was studied over a period of some time to examine how a whole project progressed and the very close reading of some types of discourse and conversational analyses would have been difficult to achieve. Some comfort was gained from a self-deprecating Erving Goffman (1981) who said: 'it remains to microanalysts of interaction to lumber in where the self-respecting decline to tread. A question of pinning with our ten thumbs what ought to be secured with a needle' (p.2)

This research shares some similarities with discourse analysis and certainly is sensitive to some of the regular features of talk that discourse analysis has uncovered. Above all, discourse analysis is concerned with language; and language not just as a code for transfer of information but language as inseparably involved with processes of thinking and reasoning. Language is also fundamental to interaction between people.

2.3. Ethnomethodology & Ethnography

This research could not easily be described as ethnomethodology but it has some affinities with an ethnomethodological approach. At first glance, content analysis may seem at odds with

ethnomethodology's highly phenomenological approach which claims to pay full attention to the way that social reality is created by individuals. Content analysis can make many assumptions about individuals' social reality through the use of coding and categorisation.

Ethnomethodologists claim that mainstream sociologists have failed to study members' possession of social competence, treating members merely as 'cultural dopes' (Jary and Jary, 1995). For ethnomethodologists, social reality is always to be seen as the rational accomplishment of individuals. They make the methods and tacit knowledge that members possess into a topic for analysis. I, too, recognise that participants fundamentally create the reality of their learning experience: it is not ultimately provided by the context, or their role, or the task they are undertaking. This research also assumes that, and relies on, the skill of participants to create their own learning experience. However, I do use learning style, task, role and context as concepts to describe the way that participants interactively construct their learning experience, and focus less on the participants' definitions of the situation.

Ethnomethodologists often seek to analyse the accounts provided by members in particular contexts and, in this, they have affinities with symbolic interactionists. Accounts often include 'justifications' for actions or states of affairs. This research does not specifically examine accounts such as these. However, the coding frame and the process of coding does acknowledge the recurring members' methods, e.g. turn-taking, that ethnomethodologists have revealed (e.g. Goffman, 1981).

This particular piece of research could only be described as 'conversational analysis' in the broadest sense that it analyses naturally occurring forms of talk. The objective in conversational analysis proper is to uncover general principles which govern the organisation of talk, such as the rule of turn-taking and the implications of these for specific contexts. My aim is wider than this. Rules do govern the organisation of talk. However, my aim is not to try and uncover these rules but to see whether there are further regularities that these rules create.

However, this research could perhaps be described as ethnographic. It involved the direct observation of an organisation and the production of a written description. I gathered data by being in the social setting I was researching. I attended meetings, shadowed test engineers on the factory floor, I had long informal chats with one of the directors and kept careful records of these activities. However, I wouldn't say that I had fully immersed myself in the activities under observation. For example, I was not a participant and I was overtly there for research purposes.

However, like an ethnographer, I had to immerse myself in the conversation. Sparrow (1998) has described how such immersion can improve the researcher's sensitivity and understanding:

> 'We can learn quite a lot from listening carefully to people's language and thinking in the course of conversation. People can become remarkably adept at 'reading' other people. ... Much of the information that we have acquired through research into organizational behaviour and processes has been derived from detailed qualitative data analysis, after the event. It is possible to record interviews and subsequently conduct more extensive analyses. We can include reflection on our own practices in these analyses.' (p.80)

Sparrow (1998) also says that it is difficult to elicit and measure apprehensive learning processes but that it can be possible through participant observation. Thus, it is difficult to read transcripts and understand the tacit processes going on without being able to dwell in the data. Jorgensen (1989) argues that through participation the researcher can 'observe and experience the meanings and interactions of people from the role of the insider' (p.21). This 'indwelling' can take various forms. For example, Sparrow (1998) contrasts roles assumed nominally and those where you become more completely and intensely involved. At the extremes, you may not experience the world of fellow participants because you are not in it or you may immerse yourself so that you become what you study and lose reflective ability. At times like these, Sparrow (1998) says that 'The skills of reflective practice are required to bring them under conscious scrutiny' (p.204). Entering another world helps to attune yourself to the stock of knowledge, emotion and motivations of others.

I did not try to question the participants or brief them on the nature of learning styles. In fact, I tried to remain as inconspicuous as possible. Another course open to me was to have set up experiments, to set and modify the nature of the task, or to organise a learning encounter in a hypothetical and experimental situation.

In contrast to a large number of studies simply using a test such as the Learning Styles Inventory (Kolb, 1995) or the Learning Styles Questionnaire (Honey and Mumford, 1982), I wanted to take account of the subject matter and social context. I agreed with Entwistle (1984) who argued that 'it is now widely recognised that learning theories must be derived from ecological settings'.

Certainly, I did not consider attempting to alter the course of the participants' discussions or deliberations. Educational researchers Entwistle and Ramsden (1983) incorporated learning into their research into learning styles. They built on the work of Pask (1976) by generating a decisive and rigorous method to categorise students by learning style. Above all, this method was interactive and reflexive: it measured the students' responses to an episode of learning rather than a test. However, it examined the kind of learning that takes place in a teaching environment. The purpose of my research was different to the extent that the participants were entirely self-directed. Indeed, they knew much more about what they were learning about than I did. My aim was to be open-minded and sensitive within a naturally occurring and spontaneous situation whilst maintaining rigour and integrity within my chosen analytical methods.

2.4. Reliability

Reliability can be defined as:

> 'The dependability of data collected, or of the test or measurement used to collect it. A reliable measure is one which gives the same results if the same individuals are measured on more than one occasion.' (Jary and Jary, 1995, p.552)

One of the benefits of content analysis is that it tends to use documents or recordings that can be stored and revisited at a later time; and it uses categories or a coding frame to classify the data. The use of coding frames means that content analysis is amenable to replication of results and this implies it can have a high level of reliability. In a low-inference latent coding scheme, a different coder could code the same data using the same scheme and reproduce the same results. However, a high-inference latent coding scheme, such as used in this research,

depends on the level of interpretation required by the coding scheme and the way that the coder interprets that scheme and the data.

This research made fairly extensive use of the latent properties of the speech of the participants: a lot of interpretation and prior knowledge was needed to code the data. However, I undertook to make the coding frame as specific as possible to reduce the variation that could be caused by different interpretations of the data. This included identifying specific tools of speech that might signal the use of a particular learning style. In addition, I revisited some of my coding during the analysis and there was good intra-coder reliability. However, the method would also benefit from tests for inter-coder reliability. Although care was taken to complete the coding with integrity and without bias, there was a risk of unintentional bias in the data. Future work using this coding frame should include test for differences between coders.

Of course, it is harder to claim reliability with regard to the more ethnographic analysis of the transcripts because it involved greater personal interpretation of the data. In this kind of analysis I used the quantitative data as a guide as well as my understanding of the theoretical constructs I was investigating.

2.5. Case Study as a Research Method

This piece of research uses data generated from a single group of people. Thus, it should be described as a case study. However, at the same time, a data set of 2,815 cases was generated. This raises the question of the appropriateness of the case study as a research method and how findings from case study research can be applied to other situations.

Gummesson (2000) relates the issue of generalisation to case study research when he says that 'A frequent criticism is that case study research is inferior to methods based on random statistical samples of a large number of observations' (p.87). He argues that it is possible to make valid theoretical generalisations from case study research.

A case study can be defined as:

> The study of a single instance of a phenomenon either for its own sake (e.g. a particular person or a strike), or as an exemplar or a paradigm case of a general phenomenon. (Jary and Jary, 1995: 62).

As a research method, case studies have a poor reputation and as descriptive or explanatory research tools they have a low status. Indeed, Gummesson (2000) says that a piece of research based on a case study that claimed to be explanatory is often 'looked on with scepticism, or sometimes even horror, by mainstream business school professors' (p.85). Hagg (1978) reproduces some common conceptions about case studies: 'Case studies lack statistical reliability and validity; Case studies can be used to generate hypotheses but not to test them; Generalizations cannot be made on the basis of case studies.' (p.88). Indeed, many researchers who use only one or two cases often say 'Naturally, there are too few observations to allow generalisations', or 'This study should be seen as exploratory. The evidence is anecdotal.'

This attitude implies that case studies tend to lack both reliability and validity. According to Gummesson (2000) an important advantage with case study research, which would also apply to ethnographic approaches, is the opportunity for a holistic view of a process. Holism may be viewed as the opposite of reductionism. Reductionism consists of breaking down the object of study into small, well-defined parts. But in a holistic view the whole can be understood only by treating it as the central object of study (pp.86-87). Thus, a good holistic piece of research would entail a sophisticated appreciation for the case studied. Thus, a refined and sensitive appreciation of the object of study can imply good external validity. On the other hand, a good piece of reductive research would require a sophisticated comprehension of a situation, which emphasises reasoning skills and explicit knowledge, would imply good internal validity. Thus, Gummesson (2000) argues that case study research that has such internal and external validity has 'integrity'.

2.6. Validity and Generalisation

Validity can be defined as:

> 'The extent to which a measure, indicator or method of data collection possesses the quality of being sound or true as far as can be judged ... this means that it is thought to measure what it sets out to measure.' (Jary and Jary, 1995, p.714)

A common distinction is made between internal and external validity. An increase in a measure's internal validity would indicate a refinement or an improvement in its meaning in the context it was used. An improvement in a measure's external validity would indicate an improvement in its applicability to other contexts. In terms of this research, the coding frame and my understanding of how to use it, and my understanding of the data, were refined and improved in the context of this case study. Thus, these efforts led to greater internal validity. However, this method has not been tested outside of this context and this must limit confidence in its external validity.

Miles and Huberman (1984) criticise some positivists who 'have been too concerned with *internal* validity and conceptual certainty, coming to grief when their data lacked authenticity and meaning - *external* validity' (p.20). Thus, external validity is closely related to generalisation and meaningfulness. A piece of research considered to have external validity would be seen as possessing credibility, insight and believability.

Titscher et al. (2000) make a distinction between two kinds of external validity: 'empirical generalisation' and 'analytical or theoretical generalisation' (p.40). Empirical generalisation is the more usual form in which conclusions from observations of a set of objects are taken to apply to the whole set or population of objects. Classically, this is achieved through the use of probability samples. Analytical generalisation refers to conclusions that lead to further theoretical assumptions, hypothesis development or clarification of concepts that can have wider implications than the case being studied.

Glaser and Strauss (1967) argue that theories and models should be 'grounded' in real-world observations rather than be governed by established theory. They also argue for a distinction to be made between theory generation and theory testing (see also Gummesson, 2000, p.95). The generation of grounded theory requires greater creativity and receptivity than the testing and refining of existing models. Glaser and Strauss (1967) argue further that 'Since accurate evidence is not so crucial for generating theory, the kind of evidence, as well as the number of cases, is also not so crucial. A single case can indicate a general conceptual category or property; a few more cases can confirm the indication' (p.30). In other words, grounded theory can have high levels of validity.

Thus, it is possible to argue that the method used in this research, high-inference content analysis of conversation, may contribute to the external validity of the results. The theory and research on fundamental learning processes incorporated into the coding frame, and the transformation of those ideas and analysis into research questions relating to the use of knowledge in conversation is relatively new. If this research can be said to have external validity it would be through its clarification of the concepts of knowledge and learning and the development of more refined research questions in relation to knowledge-creation in work groups. Also, the methods used in this research, and the immersion of the researcher in the data, means that the concept of learning styles in conversation was grounded in real-world observations and, through this, gains validity. This potential for generalisation and meaningfulness, however, will be realised by using these methods for further research in several different situations.

3. Data Collection

The fieldwork took place in a company where senior managers were planning the construction of a goods lift and goods area to expand the capacity of their production area. The largest part of the data drawn on in this research was collected by recording the conversations in formally-arranged meetings where the lift and goods area was discussed. My understanding of what

happened in those meetings would have been severely restricted if I had not also taken the opportunity to get other concrete experiences of the people, their work and the premises. My understanding was also complemented by the use of a standard instrument developed by David Kolb (Kolb et al., 1995) to work out individuals' preferred learning styles. The issues surrounding this data collection are discussed below.

3.1. Fieldwork

During the latter part of 2000 I approached thirty companies asking if they would participate in my research. I needed a project, product or process that a relatively stable group of people would be working on for some time. I wanted to find a concrete task that was relatively simple to define so that the research would have explicit limits and be readily identifiable by the participants. The aim of this was to limit the extent of the research because of the detailed nature of the coding I was to do. I needed the study group to be relatively stable because I needed to get to know them and their style of working. I wanted to examine the conversation that took place early on in a project to capture some of the creativity and greater use of tacit knowledge that might take place at that time. I was also clear that the data collection would take some time and by limiting the practical focus of the fieldwork I thought it would also reduce the fear of a participating organisation that I would be there indefinitely.

Of the thirty organisations contacted, only three met these criteria and responded positively. The rest of this section describes why Audio Devices[2] was the most appropriate choice for this research.

I first approached Audio Devices in January of 2001. I gave a presentation about what my research was about and the kind of data I wanted to collect to the directors. After my presentation they agreed to help. I suggested that I would like to study the development of an innovative product or process but they explained that most of the research and development work was now carried out overseas. However, they suggested that I attended the meetings they

were having to plan some changes to the way they organised their offices and I determined that these discussions were suitable for my research.

The period of fieldwork was from February 2001 to August 2001. The first two meetings I attended at Audio Devices were on 26 and 27 February 2001. In these two meetings, the group discussed several issues. However, although I was recording all the conversation in these meetings I quickly realised that the discussions of the walkway and the canteen would be short-lived. The other subject that I eventually discarded was the refurbishment of the new office building (despite that being the ostensible reason for the meetings).

It was through these meetings at Audio Devices that I came to realise that the discussions about the proposal to build a goods lift would be most fruitful for my analyses. Audio Devices had employed an architect, Ian[3], to co-ordinate the design and implementation of this part of the project. In practice this meant that Ian would liaise with structural engineers, draughtspeople, planning authorities, building inspectors, lift manufacturers, quantity surveyors and, lastly, the contractors. Ian would not have allowed me to shadow him in this work. It would have been difficult for me to do so as well, as he worked on several projects concurrently. However, as discussion developed during the meetings at Audio Devices it became clear to me that the Audio Devices' directors were not simply going to let Ian get on with the work and then attend meetings to report activity that had taken place elsewhere. They were actively engaged in the design process.

The purpose of the fieldwork was to record conversation that would allow analysis of the fluctuating learning styles of the participants. A condition of that analysis was that learning took place during the conversation. In other words, the participants would know a lot more about the topic of the conversation at the end than at the beginning. It was important that knowledge was created rather than simply transferred from one person to another. I knew that a greater degree of innocence about a subject could lead to larger steps in learning. And the hope was that some

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[2] Audio Devices is not the real name of the company.
[3] Only first names are used in order to protect the anonymity of the company and participants.

members would learn through others' learning. Another important aspect was that of the time period being covered. A longer timescale meant that knowledge created at one point in time would be reproduced and recycled at another point in time.

Thus, there were several reasons why the design of a goods area became the subject of this research:

- The engagement of the participants.
- The focus on a specific bounded project that developed over several weeks.
- The stability of the group and fixed times for the majority of the discussions.
- The way the meetings became the forum for debate about the issues.
- The lack of knowledge of lifts or experience of commissioning them on the part of the people from Audio Devices.
- The lack of knowledge about, or practical experience of, how well the building had operated in the past on the part of Ian. He also did not know what would work best for Audio Devices or how much they were prepared to spend.

3.2. Collecting Data on Organisational and Personal Context

The organisational context for this research and the personal context of the participants is described in Chapter 6. The purpose of this section is to outline the material used to create that description.

My experience of Audio Devices was formed through several contacts with the company, its premises and its personnel. Most of this experience was gained during the time in and around the meetings where the lift and goods area was discussed. These formed the formal part of the data collection described below.

However, there were other contacts that drew on several sources. As Titscher et al. (2000) have said:

> 'An investigator conducting a case study is not bound to a particular method; it is rather more typical that case studies are rarely satisfied with a single method of data collection. An explanation for this is that an attempt to analyse a particular case comprehensively (in its context) almost always needs to involve different levels, and these require different methods of data collection.' (Titscher et al., 2000, p.43)

My principal informant within Audio Devices was Bob, the technical director, who formally led this project. I had several informal conversations with him about the project, the history of the company, the other members of the group, the founder of the company, the company's products and current business activities. Bob provided me with organisational charts. I also had informal conversations with Bruce and John about the project and current business activities.

I also interviewed Ian, Bob, Bruce and Ian separately to find out about their education and to go through their curriculum vitae. I also questioned them on their personal views about the lift and its purpose and their roles within Audio Devices.

There were several documents that I was given access to. I was copied in to several emails between the participants during the project. I obtained copies of sketches and plans as they were produced and the specifications provided by the lift companies.

I studied the formal organisational history of the firm using their website and a video recording of a presentation to Audio Devices staff by one of their first employees. The video provided a glimpse into some of the explicit organisational values promoted by the firm to its employees.

Through John, the director of production, I spent three days on the factory floor attending production meetings and shadowing test and repair engineers. I was able to chat informally to the engineers and the supervisors although how much they censored themselves given my contact with the directors I cannot tell. A list of these contacts can be found in Appendix 1.

3.3. Using the Learning Style Inventory

The Learning Style Inventory (LSI) (Kolb et al., 1995) is a simple self-description test, based on experiential learning theory, that is designed to measure the strength of peoples' preferences

for the four learning modes: concrete experience, reflective observation, abstract conceptualisation, and active experimentation.

The main participants in the meetings (Ian, Bob, John, Bruce and David) were asked to complete the questionnaire. The results were used to see how closely their score matched their favoured learning style as measured using their coded turns at speaking. This section explains how to interpret the scores on the LSI.

The basic form of the test is a nine-item self-description questionnaire. Respondents are asked to decide which of a group of four words is most like them. They give this word a score of four. The word which they decide is least like them is given a score of one, and so on.

eg	4	happy	3	angry	1	fast	2	careful

One of the attractions of the LSI is that respondents can work out their own scores immediately after they have completed the test and gauge their responses against those of a representative population. The ranks are combined to form scores which are plotted onto the poles of a ready-made 'target' (see Figure 5.1). By joining the points together, and by calculating an overall score for each of the two dimensions, the researcher and respondent can determine the respondent's learning style. Appendix 2 contains the LSI along with instructions on how to complete it, calculate the results and interpret them.

Figure 5.1 Learning Style Profile Norms for the Learning Style Inventory

(Kolb et al., 1995, p.51)

The scales for the scores on each of the poles of the targets do not have equal intervals. This is because norms for the scores were developed from a sample of 1,933 men and women ranging in age from 18 to 60 and representing a variety of occupations. (Two-thirds had a college degree or higher. Two-thirds were male.) Kolb describes the thinking behind the test:

> 'In technical testing terms, we were seeking a test that was both *normative*, allowing comparisons between individuals in their relative emphasis on a given learning mode such as abstract conceptualization, and *ipsative*, allowing comparisons within individuals on their relative emphasis on the four learning modes - for instance, whether they emphasized abstract conceptualization more than the other three learning modes in their individual approach to learning.' (Kolb, 1984, pp.67-68)

Theoretically it is possible to have a high score on the two poles of each dimension at the same time. This would show high developed abilities in opposing orientations. At the same time, however, each pole is dialectically opposed to the other. Thus there should be an inverse correlation between the scores on each pole but not one that is perfect. Also, there should be a

low correlation between scores on the opposing dimensions of concrete experience/abstract conceptualisation and reflective observation/active experimentation. Tests by Kolb and others confirmed that these relationships were supported by the data (Kolb, 1976, 1984).

There have been criticisms of the validity and reliability of the Learning Style Inventory (Freedman and Stumpf, 1978, 1980; Cornwell et al., 1991). Some of these relate to the validation of Kolb's two bi-polar dimensions which use ipsative measures. Ipsative measures are clearly represented when subjects are required to rank options as they do in the LSI. Using factor analysis to identify underlying dimensions may be misleading as the scoring method guarantees that some scales must be negatively correlated (Loo, 1999).

The LSI was redesigned by Kolb in 1985 and in 1999 in response to some of these concerns over the psychometric properties of the measure (Greer and Dunlap, 1997; Kayes, 2002) and opinion is divided about whether these changes are an improvement (see Malinemelis, Boyatzis and Kolb, 2002; and Loo, 1999). However, many studies agree with Yahya (1998) who treated LSI responses as scales and concluded that 'Kolb's LSI has high construct validity'. Overall, there is evidence that Kolb's LSI does measure two bi-polar dimensions.

An alternative measure to the LSI is Honey and Mumford's (1992) Learning Style Questionnaire (LSQ). The LSQ has been widely applied in the fields of management training and education. However, Duff and Duffy (2002) investigated the psychometric properties of the LSQ because they could find only limited evidence for the measure. They found that there was 'no consistent relationship between scores on the four learning style scales, two bipolar dimensions and academic performance' and 'no support the for the stability or generalizability of the model' (p.147). They concluded that, 'the LSQ is not a suitable alternative to the LSI and LSI-1985' (ibid.). Thus, the LSQ was not used here.

In the research presented here, the LSI was used to indicate any potential individual consistency in the use of a particular learning style. In other words, the results were interpreted as a measure of a person's 'fixed' learning style. It was used to look for agreement or conflict

between learning style and information collected about the education and occupations of each participant. The results from the LSI were also used to triangulate the results from the coding of learning styles from the recorded conversation of the participants.

However, there remain some concerns over the reliability of the LSI. In particular, Loo (1999) notes that 'test-retest studies display a lack of stability' (p.214). (Similar observations have been made with respect to the LSQ, see Fung et al., 1993). The LSI is a standardised test that is designed to be administered quickly and simply in many situations by many different people. Thus, it is possible that it may not compensate for or be unaffected by contextual factors.

Kolb cautions against thinking of learning styles as fixed personality 'traits'. For Kolb (1984), individuals vary in their use of learning styles and situational factors have a stronger but less persistent effect than psychological factors (p.98). Indeed, other studies that have measured learning styles without using the LSI have found substantial situational variation in the use of learning styles (Carlsson et al., 1979; Veenman et al., 2003).

The implication of this variation was that results from the LSI presented here could have been different if they had completed the LSI at different times. Indeed, the results could vary according to the situation the participants were in at the time they completed the inventory. However, the participants in this research were only asked to complete the LSI once, halfway through the period of the fieldwork. Given the relatively easy administration of the test, it would have been useful to repeat the test and compare results over time. Similarly, participants could have been asked to complete the LSI based on how they thought others would have answered. This could have shown what they thought of each other's learning styles.

However, given the focus of this research on the *conversational* learning styles of the participants it was judged that the triangulation of the LSI scores both with background information and the aggregated results of their conversational learning style of each participant were sufficient.

The remainder of this section describes some other features of the LSI that affect the interpretation of LSI scores and that relate to the wider concept of learning styles. Some of these issues are raised again in the discussion but they need to be introduced here. For this we need to go back to Kolb's explanation of what the LSI shows:

> The important point, however, is that the LSI measures differences only in the elementary knowledge orientations, since the forced-ranking format of the inventory precludes integrative responses. (Kolb et al., 1985: 76).

That is, the LSI measures the strength of an individual's orientation to the four learning modes: concrete experience (key word: feeling), reflective observation (key word: watching), abstract conceptualisation (key word: thinking), and active experimentation (key word: acting). If we then treat the abstract-concrete and active-reflective dimensions as negatively correlated with each other and unidimensional we can characterise that person as having a tendency towards one of the elementary forms of knowing (or 'learning styles'). This coincides with the theory where two modes combine to form a learning style but it also assumes that active experimentation, say, lies on the same scale as reflective observation. Kolb suggests that his third and higher level of knowing, produced through the dialectic synthesis of the two underlying dimensions, could be indicated by high polar scores on the same dimension. He calls these 'mixed types' but not all will be clearly measured by the LSI (see Kolb et al., 1985, p.76).

This is important because it indicates that the LSI is not designed to identify higher levels of learning. Although Kolb (1984) says that the inventory was constructed with 'the hope that the measures of learning style would predict behavior in a way that was consistent with the theory of experiential learning' (p.68), Kolb et al. (1995) offer a useful caution:

> 'It should be emphasized that the LSI does not measure your learning style with 100 percent accuracy. Rather, it is simply an indication of how you see yourself as a learner. You will need data from other sources if you wish to pinpoint your learning style more exactly (e.g., how you make decisions on the job, how others see you, and what kinds of problems you solve best). Be aware of stereotyping yourself and others with your LSI scores. Your scores indicate which learning modes you emphasize in general. It may change from time to time and situation to situation.' (Kolb et al., 1995, p.51)

Indeed, it was entirely possible that someone's integrated and sophisticated adaptation of learning styles to a particular situation would differ from their scores on the LSI. This possibility is addressed in the analysis and the discussion (Chapters 7, 8 and 9).

3.4. Observing and Recording Conversation

Around fifteen hours of recording took place over six months and nineteen occasions. Nearly seven hours of the recorded time was derived from the twelve meetings where the design and planning goods area construction was discussed. The most important element of the data that I needed to capture was the speech in the meetings. To this end, twelve meetings were transcribed totalling 84,000 words.

3.4.1. Transcription

The system used for the transcription paid little attention to pause-length and did not provide the rigorous and systematic detail of overlaps in speech or intonation such as used in the 'Jefferson style' of transcription used by conversation analysts (Atkinson and Heritage, 1984). I did, however, examine the meaning and content of what the participants said. Part of this was determined by looking at some of the technical aspects of speech identified by discourse and conversational analysts such as 'preferred' and 'dispreferred seconds' and overlapping speech. I noted longer or more unusual hesitations, particularly when nobody spoke. I coded overlaps as much as possible and noted distinctive intonation, particularly when questions were used. Stops, checks, informal grammar, linguistic stumbling, repetition and mid-speech refinements of meaning were all coded as were many 'umms' and 'errs'.

Transcription involved listening all the way through a tape, audio-typing a first hearing and then checking a draft printout against the tape and entering corrections. As Potter and Wetherell (1987) found the ratio of tape time to transcription time was about one to ten.

Not all of the meetings that were recorded were fully transcribed. Occasionally, a discussion was not coded if it moved well away from the subjects of the goods area and the lift. Examples included discussions of where people had gone on their holidays, or longer informal discussions recounting experiences of building the existing premises. However, I coded these off-subject discussions where they occurred shortly before or immediately after discussions focused on the goods area or lift.

3.4.2. Body Language

A large part of the analysis was based on the text transcribed from the audio recordings of meetings. An audio recording, of course, does not allow you to record body language such as gestures or facial expressions, pointing to particular features of plans or eye contact. However, I was also present at each of the recorded meetings and took notes about seating arrangements, entrances and exits. I also noted particularly expressive movements such as someone with their head in their hands, or everyone apart from the speaker with their fingers on their mouths. These notes were written on to the transcripts and aided the coding process. Of course, unstated thoughts and unexpressed emotions or the pictures in peoples' heads were not recorded in these meetings.

However, a surprising amount was picked up from the recordings. All the various intonations of speech were available. The pace of conversation varied. Sometimes people spoke louder to over-ride someone else. You could also tell when someone was looking at a plan or through their papers by the rustling sound. Sometimes, Bob unconsciously tapped his pen on the table. this appeared to be when he wanted to bring a discussion to a conclusion. It was also possible to tell when someone was smiling when they were talking. The features of the discussions were noted on the transcripts and were used in coding.

3.5. Effect on Results of Restricting Analysis to Design Discussions in Formal Meetings

Certain discussions about the lift were not recorded. As my fieldwork at Audio Devices did not begin until January 2001 I was not able to record the initial meeting between Ian and Audio Devices' managers. Indeed, it would have been difficult to be present for the conversations that took place to decide that they needed a lift in the first place. There were also several contacts between the participants outside of the meetings I attended. Some of these I have listed in my record of communication between the participants about the goods area (see Appendix 1).

The more important contacts that were missed were conversations about the goods area design that took place outside of the formal meetings in the weekly management meetings at Audio Devices and the participants' informal corridor discussions. However, I was copied in on important emails and given copies of plans and drawings and I did get reports from Bob of some informal discussions outside the meetings. Indeed, I asked Bob to tell a detailed story of how it was that Audio Devices finally pulled out of the tendering process because of the escalating costs. This story showed distinctly accommodative activity as it showed how Audio Devices internalised the results of the tendering 'experiment'. It may be that these informal 'corridor' discussions were the context for internalisation and socialisation activity that was not expressed in the meetings I attended. If this is case, then the data analysed here may tend towards the use of assimilative and convergent learning styles.

Although, discussion of the new office building refurbishment was included in the transcripts, I did not code the turns where it was discussed. The subject of the new office building formed part of the formal role of the meeting but Bob mostly dealt with it outside of these meetings and just reported his activity to the group. The new building and the goods area were quite separate subjects. Even where conversation moved from one subject to the other there was very little cross-fertilisation of ideas.

The discussions of the planning and tendering part of the project were recorded, but were not included in the findings presented here. The main reason for this was that I wanted to focus on

the development of the plans for the goods area rather than their implementation. The design discussion was more about defining what was needed and developing concrete concepts and plans that met those needs. It was more akin to the examples of the knowledge-creation envisaged in Nonaka and Takeuchi's (1995) work.

One further reason was that the planning and tendering aspects of building the goods area involved the activity of other parties such as planning authorities, surveyors and contractors and I did not record the discussions with these parties. When planning and tendering were discussed Ian often tended to report this activity and the people from Audio Devices tended to simply clarify their understanding of it.

At the risk of getting ahead of myself, some initial results are outlined below to outline how the focus on the design process, and the exclusion of planning discussions, effected the results. That is, we need to know the predominant learning style of the tendering and planning discussions. What affect did the exclusion of these discussions have on the overall learning style of the discussions analysed in this research?

There were 432 weighted valid turns on the subjects of planning applications, practical issues during construction, timings of the works, the tendering process and costs in the first eight meetings. Most of these turns were characterised by comprehension and the use of explicit knowledge, whereas the design discussions were predominantly reflective and showed mixed use of tacit and explicit knowledge (see Table 5.1)

Table 5.1 Learning Styles of Turns in Planning and Tendering Discussions Compared With Design Discussions

	Planning & Tendering		**Design**	
Learning Style	No. of Turns	%	No. of Turns	%
Divergent	63	15%	**814**	**29%**
Assimilative	**126**	**29%**	**978**	**35%**
Convergent	**170**	**39%**	545	19%
Accommodative	73	17%	478	17%
Total	432	100%	2815	100%

Planning and Tendering discussions from meetings 1 to 8 only (26 Feb to 29 May 2001)

This makes sense in that language would focus on explicit plans and have more active and experimental elements as participants grappled to make a reality of their design. Another aspect of getting the works completed would have been to push other parties to do their job. This pushiness is an element of active experimentation. This was reinforced by Ian's observation that when contractors get involved meetings are less amicable as each party defends their corner (Meeting 9, 19 June 2001).

The discussions about the potential and actual costs of the lift were not included either. The principal reason was that costs were barely discussed during the conversations on design. There were less than a hundred turns talking about costs until the quotations were received after Meeting 10, 3 July 2001. The inclusion of these turns would have had very little impact on the findings presented here.

4. Data Analysis

Miles and Huberman (1984) suggest that qualitative data analysis consists of three activities: 'data reduction', 'data display' and 'conclusion drawing/verification'. The methods associated with these activities are central to data analysis.

Data reduction is part of data analysis because the choices of which chunks of data to code, the use of a coding frame and the method of applying those codes are all analytic choices. Data reduction sharpens, sorts, focuses, discards and organises data so that conclusions can be drawn from them.

Data display is also part of data analysis because displays of data can lead to further analysis or lead to conclusions and action. The most common form of display for qualitative data is narrative text. However, text can be supplemented by displays that concentrate data and make it immediately accessible. Displays can present two elements simultaneously rather than

sequentially. Thus, displays allow the researcher to take in more data at any time and reduce the dependence on particular examples. Data displays also reduce data.

Drawing conclusions and verifying those conclusions are also part of data analysis. Meanings and patterns emerging from data have to be tested for plausibility or validity.

4.1. Data Reduction

> 'Data reduction refers to the process of selecting, focusing, simplifying, abstracting and transforming the 'raw' data that appear in written-up field notes.' (Miles and Huberman, 1984, p.21)

Parts of the transcribed meetings were selected for further analysis. The focus for that selection was the design of the goods area and lift. It excluded discussions directly concerned with the planning authorities, preparing the tender, the tendering process or preparations for the construction. Thus, the design of the goods area and lift took around four hours and twenty minutes of discussion in ten meetings.

Individual turns at speaking were coded using the coding frame developed as a result of reading the literature and the experience of the first stage of coding (see Table 5.2 in the next section). In all, 2,872 individual turns at speaking were coded. 283 turns could not be given a code and were instead given a 'missing' code of 'X', leaving 2,589 turns with a valid code. Examples of turns that could not be coded are described in Section 4.1.2

A turn was defined from the point at which an individual began to speak to the point at which someone else began to speak. Given our skill at turn-taking in conversation this definition was acceptable for the majority of turns at speaking. However, another aspect of our skill at turn-taking in conversation is the ability for one person to insert their turn within someone else's turn. The following section illustrates what was meant by 'turn' in this research. The lowercase letters identify turns that are technically separate but were coded as single turns:

	Bob:	Does it matter to you which door you come through? Quite honestly? If one pair was enormous?
	John:	Umm.
	Bob:	I mean, they both open into the same area.
	John:	Yes.
	Bob:	There's no walls.
	John:	It's ... I don't know. We have taken machines in through both doors.
	Ian:	Have you?
a	John:	Yes. Depending on ...
	Ian:	Where you were going!
a	John:	... where they want to ... Well, how ... where we were going and ...
b	Bob:	But if we said that ....
a	John:	... how they were coming off the truck.
b	Bob:	But if we said that there was one pair of doors.
	John:	Hmm. We'd do it somehow. Although ...
	Ian:	The back doors. You're not going to have any facility for raising and lowering.

Of course, some turns were longer than others. If a turn was between 45 words and 75 words (or between three and five lines on my transcripts) and it was reasonable to give the whole turn the same code then it was given a weight of two. If a turn was between 75 and 105 words long it was given a weight of three, and so on. Of course, there was always a good chance that a long turn could be assigned more than one code. In these situations, the turn was split and codes and weights were applied accordingly.

From here on in 'turn' should be taken to mean a 'weighted turn' unless stated otherwise. The results are presented using weighted turns. When the weights were applied to the discussion of the goods area and lift design there were 3,104 weighted turns of which 289 weighted turns could not be coded. This left 2,815 weighted turns with valid codes.

4.1.1. Development of the Coding Frame

In this section the development of the coding frame is discussed. The coding frame was the principal instrument used to determine the learning style of the discussions of the group (see Table 5.2). We saw in Chapter 3 how the ingredients for the coding frame were 'deduced' from the literature. The study of the literature provided both the theoretical basis for the classification of learning styles and the more practical features of interaction that can be used to assess learning styles in speech. Each one of these practical sources is noted in the coding frame.

However, some changes were made to the first draft of the coding frame (see Appendix 3) after some observation of the meetings studied for this research and through immersion in the data. In particular, contact with the data indicated that some codes that were too inclusive or were not focused enough on the nature of speech. Indeed, this development through practical use, this 'induction', improved the coding frame and made it more relevant.

A few of the initial codes were dropped. For example, the initial coding frame included a code for 'Influencing and Leading Others' in accommodation. However, experience with the data suggested that a great deal of what was said could be coded like this because of the way people use speech to manage shared interpretations. Thus, this code was dropped and alternatives used.

Table 5.2 Coding Frame for Conversation Learning Styles

Accommodation	Divergence
D1 Creating intuition and feeling through action. Nonaka & Takeuchi, 1995:69. D2 Learning by doing. Practice. Imitation. 'How?' questions, rather than 'Why?' questions. Could be learned tacitly. Doing randomly or intuitively and internalising consequences. Nonaka & Takeuchi, 1995:63. D3 Trial and error. Nonaka & Takeuchi, 1995:69. D4 Internalising experience of self and of others. May be experiential but also through articulated experiences of others. Nonaka & Takeuchi, 1995:69. D5 Persuasion by emotion. Forceful expression, emotional amplifying, heightened co-response. Choice of emotive words. Red lights in speech: colloquial terms, strange terms. Could be metaphorical. Donnellon et al., 1986. D6 Episodic memories used to reinstate memory. Episodes used to represent ideal types of problems / solutions. Episodes used where explicit knowledge is less developed or very complex. People can may use retrieval cues that are the same as the learning cues. Sparrow, 1998:Ch6; Orr, 1990. D7 Stories guide integration of facts to personal schemata. Stories help illustrate apprehensive knowledge when comprehensive knowledge is insufficient or too complex. Less need to specify in detail. Orr, 1990:175, Linde, 2001:163. D8 Jokes and light-heartedness. Space in conversation to feel how things are going. Groan intoned jointly, punning rule. Talking off subject for a short period. Goffman, 1981:72-73. D9 Working out the rules of assessment. D10 Checking or feeling for how things are going.	A1 Constructive suggestions with little criticism. Nonaka & Takeuchi, 1995:63, Leonard & Swap, 1999. A2 Tolerance for ambiguity. Kolb, 1984:32. A3 Metaphorical thinking, making intuitive, fuzzy connections. Kolb, 1984:32. A4 Flexibility. Kolb, 1984:32. A5 Imagining implications of ambiguous situations. Kolb, 1984:96. A6 Open mindedness. Openness to new ideas and experiences. Kolb, 1984:96. A7 Using metaphors used to co-ordinate tacit knowledge. Nonaka & Takeuchi, 1995. Asserting, perhaps indirectly and surreptitiously, that 'A is B', where A and B belong manifestly to two different categories. Pondy, 1983:159. A8 Stories articulate tacit knowledge and keep a coherent account of a difficult or complex situation. Brown & Duguid, 1991. A9 Articulating hunches, insights and misconceptions Orr, 1990:45. A10 Increasing prospectiveness of conversation (fewer simple acknowledgements, open questioning). Ash, 2002:20. A11 Ambiguity, dialogue, hypothetical exposition, open for new conversations, ability to act in roles flexibly. Von Krogh & Roos, 1995:Table1. A12 Use of 'we' and 'I'. A13 Role freedom in informality. Goffman, 1981 (see Misztal, 2000:Ch1). A14 Authentic questions. Nystrand, 1997:38. A15 Gathering information in the sense of hunting and gathering, casting about. Kolb, 1984:96. A16 Undulating intonation. A17 Voicing needs, expanding list of needs, using (direct, sensory, imagistic, personal) experience to identify needs. A18 Creating or offering alternatives. A19 Jokes to express needs by making need extreme.
Convergence	Assimilation
C1 Closing off of options. Making decisions. Kolb, 1984:96. C2 Actively experiment to see if connections hold together. Kolb, 1984:96. C3 Decreasing prospectiveness of conversation (more acknowledgements, less demands, more critical questioning). Ash, 2002:20. C4 Test questions. Monologic. Allowing only one right answer. Nystrand, 1997:38. C5 Rational evaluation of solution alternatives. Kolb, 1984:32. C6 Choosing or explaining the best solution. Kolb, 1984:96. C7 Clear cut, advocacy, authoritative exposition (using authority), intimidation, reaching for closure, acting within fixed roles, need for expertise and specialists, power linked to expertise. Von Krogh & Roos, 1995:Table1. C8 Use of 'you' or 'one'. Use of 'should'. C9 Formality, roles more fixed. Goffman, 1981 (see Misztal, 2000:Ch1). C10 Persuasion by logic. Donnellon et al., 1986. C11 Flat intonation. Serious demeanour. C12 Exposition, talking to explain something in a closed-ended way, decision made, implying no discussion needed, 'that's just the way things are'.	B1 Critical evaluation (criticism) more than constructive suggestions. Nonaka & Takeuchi, 1995:63. B2 Use of data, universal rules or principles, scientific formulae, codified procedures, computer code, standards. Nonaka & Takeuchi, 1995:27. B3 Analysing quantitative data. Kolb, 1984:96. B4 Modelling concepts, building models from concepts. Kolb, 1984:96. B5 Finding structural or functional similarities between things. Use of analogy. Like location thinking. Nonaka & Takeuchi, 1995:67. B6 Sorting, adding, combining, categorising like in a database. Nonaka & Takeuchi, 1995:67. B7 Specifying conditions, limits or parameters for a particular connection or arrangement. B8 Organising information. Connecting separate pieces of information. Kolb, 1984:96. B9 Designing experiments. Thinking about how to find the information to test a particular connection between ideas. Creating hypotheses. Kolb, 1984:96. B10 Generating more detailed and specific concepts. B11 Use of logical arguments comprising a premise, an inference and a conclusion. Donnellon et al., 1986; Edelman, 1964. B12 Use of reasoning. Separation thinking: defining things, discriminating and differentiating between things. Laying things out for discussion. Specifying questions. Sparrow, 1998:156. B13 Use of reasoning. Location thinking: putting things on a scale, ranking, use of numbers. Use of interpreting questions. Getting more precision from general statements. Rephrasing to illustrate shared understanding. Sparrow, 1998:156. B14 Systems thinking. Plurality seeking. Advanced forms of reasoning. Sparrow, 1998: 156 B15 Operationalising concepts, producing more detailed and specific concepts. Nonaka & Takeuchi, 1995:67.

Many new codes were added because the immersion in the data meant that I understood the literature more clearly and used it more expertly. A few codes were also added based on features of the speech examined in those first three meetings that fitted into a particular learning style. For example, a new code signifying divergence was added (A17). This code was given to speech where the speaker voiced needs or expanded on a list of needs, particularly where they used direct experience to illustrate those needs. This was partly drawn from Nonaka and Takeuchi's (1995) idea of the early stages of 'externalisation' but also from the experience of seeing examples within the discussions. Consider the following extract that shows John saying that the lift needs to respond quickly and using experience to support his position:

B1	John:	And if it's going to take fifteen minutes ... tough luck.
B7	Ian:	Well, it doesn't take fifteen minutes, does it? I mean this lift shouldn't be any different to a passenger lift.
X	Bob:	This ...
X	Ian:	This ... The lift that we're ... not this
A17	John:	the comments I've had about the one out there is that ...
A17	Ian:	It takes an intermina ...
	John:	... it seems like an age.

The changes were made after coding the first three meetings (26 Feb, 9 Mar and 20 Mar). After the changes were made, sections from these first three meetings were blind-coded again using the revised coding frame. This exercise showed that, although some turns were coded differently, the overall learning style of turns changed very rarely. Thus, the initial coding of the first three meetings was used.

To summarise, the coding frame was used to code turns at speaking. Each turn at speaking was examined as a discrete entity for evidence of a particular learning style and assigned a code from the coding frame. The coding frame was designed using insights from the literature and modified after a period of testing and immersion in the data. There were several codes and each one was assigned to one of the four learning styles: divergence, assimilation, convergence and accommodation. The next section examines the coding process itself.

4.1.2. The Coding Process

Coding was an intensive laborious process but it did entail a detailed reading of the speech of each transcript. Once a code had been assigned to a turn it was written onto the transcript. As the reading progressed I would learn more and more about the interaction that was taking place. Notes were made in the margin of the transcripts that were used in later in-depth analysis.

Some turns were easy to code, some were harder and some were impossible to code. A turn was easy to code if it could be simply matched with one of the codes in the coding frame. Before committing to that code I would think about the learning style that the code fell into and check that the turn did seem to fall onto one side of each dimension that comprised the learning style. For example, if someone was specifying the conditions, limits or parameters for a particular arrangement (code B7) I would check that it appeared to be reflective (rather than active) and comprehensive (rather than apprehensive).

A turn was less easy to code if there were some elements in the speech that indicated one side of one dimension but both sides of another. For example, a turn could be ostensibly comprehensive because the person made use of a logical argument but it might not be clear if the turn was active or reflective. In this case, the codes associated with each of the comprehensive learning styles (convergence and assimilation) were examined to see if any of the codes typified the use of that turn in the transcript. If it did, the turn was coded accordingly.

The two situations above were common, but there were also many occasions where a turn was harder to code. Many turns were very short; consisting of just a few words. In these situations there was only a little information that could be used to code the turn. Or the turns had little force, perhaps designed more to facilitate interaction. Secondly, some turns were not spoken clearly or other people were talking at the same time. Thirdly, sometimes the coding frame could not help to make a distinction between two codes associated with two different learning styles.

In the first two situations, I would examine surrounding turns for additional evidence. I would ask myself what the speaker had said in his previous two or three turns, what other speakers had said and what codes they had been given. This would often provide the necessary additional information I needed to code the turn. Obviously, this was a change from assessing each individual turn on its merits alone. It made use of the way that the conversation was going and a conception of what the individual participants were achieving with their talk. In this sense, this backward scanning would have had a slight smoothing effect. It also had the effect of making the coding more interesting.

Another kind of response was of an 'echo' or the correct completion of someone else's sentence. If the style of the response was not clear, it at least had the function of showing, at least temporarily, that the listener's understanding was aligned with the speaker's intention. In these situations the listener's turns were often given the same codes as the speaker.

Some turns were difficult to code because they were difficult to understand. For example, 'Oh' or 'Umm' would mean something to the participant and the listeners but would not be clear to the coder in terms of the coding frame. These turns were given the code 'X'. On occasion, however, these turns would mean something to the coder, because of his understanding of the speaker's attitude given his last few turns, and they would be given a valid code.

Some turns at speaking could not be coded at all. For example, a participant's response to another participant's turn would appear as a flat response that neither raised or lowered the prospectiveness of the conversation and had no particular identifying features. These neutral responses could not be given a code from the coding frame. Instead they were given an 'X' and effectively set to missing. Also, other parts of meetings could not be transcribed or coded properly because the voices were too quiet or indistinct. These turns were also given an 'X'.

Sometimes it would be very difficult to code a particular turn even though it was clear that the speaker was conveying something meaningful and there was some evidence to use for coding. Very often, these difficulties would reflect the difficulty of attempting to categorise a turn to either

end of a dialectic. This was partly due to sophisticated and combinatory use of learning styles (what Kolb calls 'integrative learning') that achieve higher levels of learning or knowledge creation by the participants.

However, a more urbane problem was that speech tools appeared twice in the coding frame but with different emphases. For example, the use of metaphorical thinking, or the ability to allow fuzziness to exist in thinking, could be evidence of both divergent thinking and accommodative thinking. In divergent thinking it would be used to explore inconsistencies, to allow partial and ambiguous expression of concepts, whilst pursuing greater critical understanding (code A7). In accommodative thinking, it would be used to allow different interpretations of meaning to exist whilst maintaining a common plan for action (code D5). What became increasingly obvious as I thought about this categorisation was that a feature of speech assigned to one style could be used to serve another. What was important in these cases was to look for evidence for the dimensions that categorised the use of these speech tools into learning styles.

It was also important when someone was reporting or recounting activity that took place outside the meeting to try and code the overt characteristics of the speech rather than the activity reported in the speech. For example, in Meeting 5 (5 April 2001) John said that he had got the dimensions needed for the loading bay through practical experiments (concrete experience and an active playful orientation implying accommodation). However, the style of his speech was assimilative.

Another feature of coding was the tendency to focus less on individual turns and more on the general drift of the conversation. The danger lay in assigning codes based on my expectations of a progression from one style to another rather than on the evidence that the turn provided. Potter and Wetherell (1987) caution that the researcher must be aware of the 'ever-present possibility of alternative descriptions and categorization' and ask why a person chose to say what they said, and not something else (p.3). Titscher et al. (2000) observe that researchers may become unreflective when under stress and divert to a theory-in-use (Argyris, 1995) and so 'changes creep in - almost unnoticed':

> 'Researchers can distance themselves, and develop detachment from their own assumptions and modes of procedure by giving themselves a chance for reflection, by taking a short break, by transferring their activities to some other level.' (Titscher et al., 2000, p.17)

This was useful advice. By taking a break I could reconnect to my espoused method of coding. It was interesting to note that, here again, we see a connection between an active, doing orientation and theory-in-use, and a reflective, observant orientation and espoused theory.[4]

4.1.3. Data Entry

Once all the turns were coded this information was entered into an Excel spreadsheet and into a STATA data set. The Excel spreadsheet was used for basic summaries of the data and for creating charts. Stata was used to calculate statistics.

The following variables were entered:

Meeting number	Number from 1 to 10
Subject number	Number from 1 to 15
Person number	A unique code for each speaker
Style code	Code from the coding frame

The following variables were derived:

Unique turn number	Position of the turn within all turns
Turn number within meeting or subject	As above but within a meeting or subject
Apprehension/Comprehension	Apprehension = 1, Comprehension = 2
Reflection/Action	Reflection = 1, Action = 2

4.1.4. Statistical Test Used to Assess Strength of Learning Cycles

Once the data was entered it was possible to produce tables with percentages and to calculate statistics. One summary measure used, the Spearman rank correlation coefficient, requires discussion.

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[4] See also Titscher et al., 2000, p.205.

One of the questions the research attempted to answer was 'Do people change their use of learning style as their learning progresses through the experiential learning cycle?' More specifically, do people use a divergent style of talking, followed by an assimilative style, a convergent style and an accommodative style?

One way to answer this question was to see if learning styles made this progression during a discussion and to work out the strength of the relationship between the position of a turn in a discussion and the learning style used for that turn. Thus, learning style was treated as an ordinal scale with each learning style given a ranking score:

1 Divergence
2 Assimilation
3 Convergence
4 Accommodation

Turn position within a discussion was also on an ordinal scale such that the first turn would have a ranking score of one, the second turn would have a score of two and so on. Both variables were ordinal which meant that a Spearman rank correlation coefficient had to be calculated to assess the degree that the two scores were related. Put simply, I expected the learning style score to increase as turn position increased.

The method for calculating the coefficient is to rank order both variables' values separately. Determine the differences between the ranks of both variables by calculating:
d = Rank(Turn Position) - Rank(Style).

The Spearman rank correlation coefficient is then:

$$(R_s) = 1 - \frac{6 \sum d^2}{n^3 - n}$$

Rank-order numbers are used instead of values which makes the rank correlation a distribution free test. Although the rank correlation coefficient can be interpreted as indicating the 'strength'

of an association between two ordinal scales, quantifying this strength is so complex that for all practical purposes this is a non-parametric test.

There were many ties in the ranks of the learning style variable: that is, there were only four ranks that could be used across many turns at speaking. Siegel (1956) recommended that the value of the coefficient should be corrected when the proportion of ties was large. However, Daniel and Terrell (1986) disagree. A quick check for this correction indicated only a small change.

Another feature of the Spearman correlation meant that some care needed to be taken with its interpretation. A strong Spearman correlation was possible even if only three learning styles were used in any particular discussion. That is, a strong Spearman correlation only indicated that the direction of variation of the two variables coincided and not that all learning styles were used. A large coefficient indicated that the ordering of some of the styles was correct, but not that all four were present and that one necessarily followed the other.

Care was taken with evidence for use of the accommodative learning style in this research. The theory suggested that accommodation was used to process the tacit responses to feedback and activity that had taken place. However, there were several discussions where there was little use of an accommodative learning style. It was possible that these discussions could still have had high Spearman correlation coefficient because of progression from divergence, through assimilation to convergence without use of accommodation. An examination of the results in Table 7.12 and Table 7.13 indicated that both high and low correlation coefficients were produced in discussions with little accommodative activity. In addition, the interpretation of these subjects using the visual aids of the 'talkograms' (see the next section and Table 7.13) was used to augment the use of the Spearman statistic. Indeed, care was taken to always discuss the statistical results with reference to the distribution of turns by learning style as well as the grounded interpretation of the researcher.

Levels of significance were calculated by the STATA program. Note: If n > 30, the distribution of $Z = R_s * \text{sqrt}(N - 1)$ can be approximated by a Standard Normal Distribution.

As a statistical test to check whether a relation between two variables exists, this test is better than the standard correlation coefficient because the latter will only work when there is a linear relation between the variables. In this situation I could not easily assume that there was a linear relation between the two variables.[5]

4.2. Data Display

> 'We define a 'display' as an organized assembly of information that permits conclusion drawing and action taking. Displays in daily life vary from gasoline gauges to newspapers to computer screens. Looking at displays helps us to understand what is happening and to do something - further analyses or action - based on that understanding.' (Miles and Huberman, 1984, p.21)

Each meeting was studied for patterns in the use of learning styles. There could be upwards of 400 turns at speaking in each meeting so I needed a method for getting an overview. Summary contact sheets were devised that summarised activity in each meeting (see Figure 5.2). These were single sheets containing the main themes, issues, problems and questions that were raised in each meeting.

The tape counter readings for each meeting would be plotted down an A4 sheet of paper. Each tape was listened to and all the various subjects that were discussed would be noted along with the exact tape counter readings. The person who started each subject or made the first contribution to it was also noted. Different columns were used for subjects that formed separate groups. For example, in Figure 5.2 three columns were used: column one was for discussion about the refurbishment of new offices, column two was for discussion of lift design and column three was for planning and construction issues.

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[5] However, the turn position was a close approximation to time, an interval scale. And, theoretically, we could expect that learning styles would be evenly distributed and equidistant. This again could approximate to an interval scale. Indeed, when I calculated standard correlation coefficients they were often close to the Spearman correlation coefficient.

Initially, these sheets were used when I needed to listen to specific sections of a tape or to select sections for transcription and coding. However, the sheets for the first few meetings were also used to create a set of codes as a system for cataloguing the various subjects that came up for discussion.

As the coding progressed I realised that the dominant style of a meeting could change according to the particular element of the goods area that was being discussed. Different parts of the project would come up for discussion in several meetings. As a result, I used the summary contact sheets to develop a comprehensive set of 'subjects' that constituted the goods area project as a whole. These sheets also allowed me to assess how these subjects were discussed over more than one meeting (see Table 7.11 in Chapter 7).

Once the data was entered it was possible to see exactly how many turns there had been on each subject in each meeting. Table 5.3 shows the number of turns at speaking by subject and meeting for the part of the project analysed here.[6]

[6] See Appendix 4 for the same table with estimates for the times of the subjects discussed in each meeting.

Figure 5.2 Summary Contact Sheet for Meeting 6 on 24 April 2001

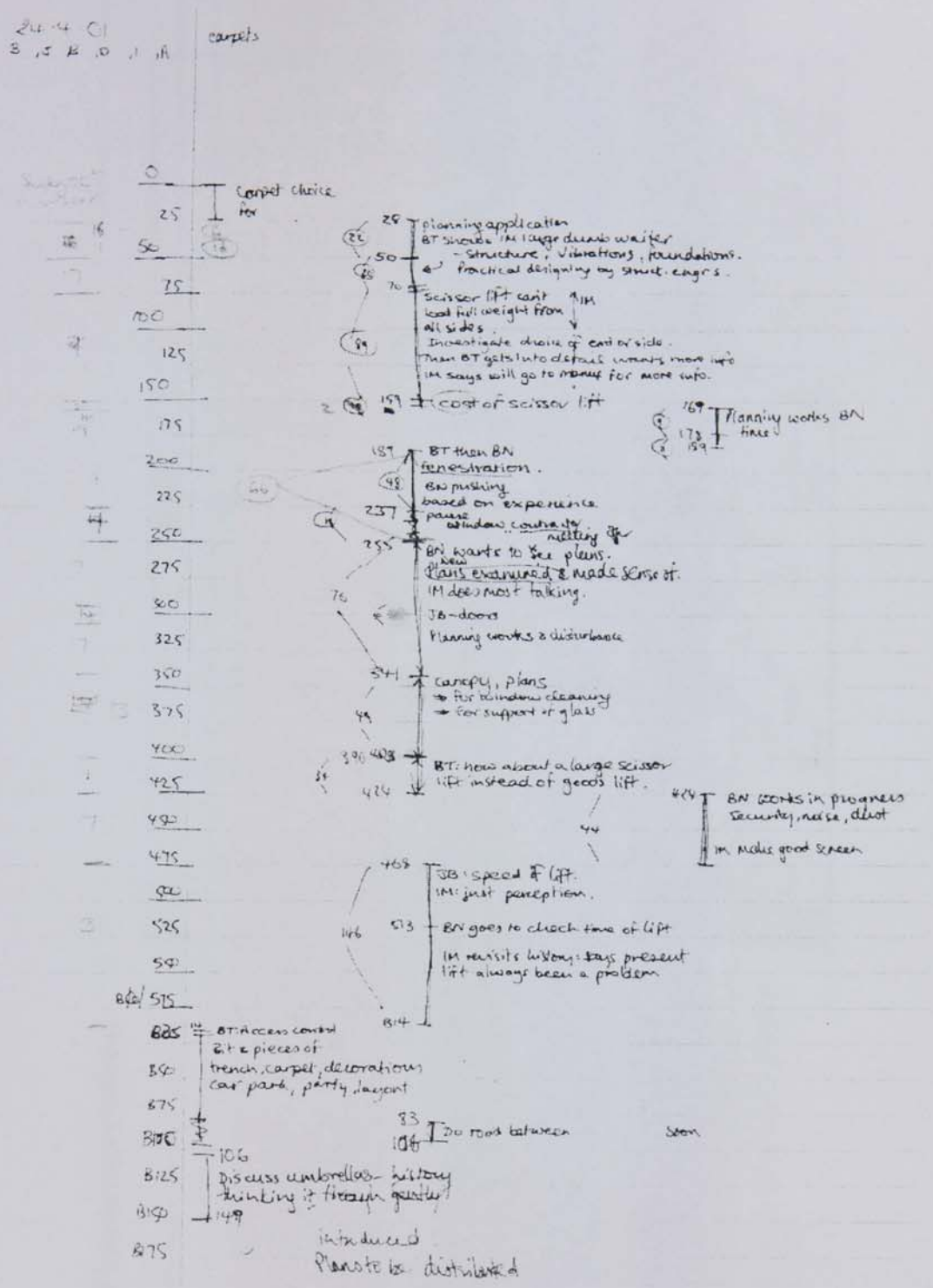


Table 5.3 **Number of Weighted Turns by Subject and Meeting**

Weighted Turns by Subject & Meeting

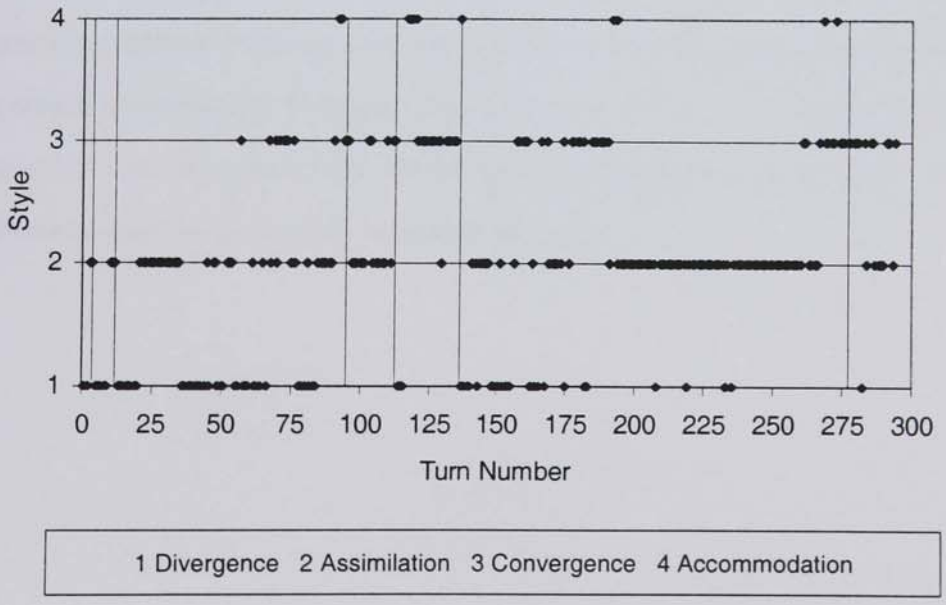
Subject		Meeting										Total
		1	2	3	4	5	6	7	8	9	10	
	Lift	278	73	120	10	69	228	100	90	135	9	1112
1	Type of lift	149		13			50		25	27		264
2	Location on building	83	50			18						151
3	Performance			54		8	122	7	32	13		236
4	Appearance, windows	11		39	10	43	56	36		59		254
5	Lift machinery, plant room, ducts	25	23	14					33	36	9	140
6	Lift control & operation	10						57				67
	Goods in / out	144	98	276	18	213	124	73	325	336	96	1703
	Scissor lift	124	29	25	0	18	83	18	23	141	20	481
7	Placement	98		15								113
8	Type, size	26	29	6		10					3	74
9	Specification, operation, gates			4		8	83	18	23	141	17	294
	Loading Platform	20	51	127	18	182	0	0	125	139	0	662
10	Shape, size, function		51	58	11	56						176
11	Ramps, steps	20		44	7	15				43		129
12	Balustrading			25		111			125	96		357
	Other goods in / out	0	18	124	0	13	41	55	177	56	76	560
13	Canopies, lighting			91		6	31	28	14	33		203
14	Type of doors		9	33		7	10	27	158	1	63	308
15	Drainage		9						5	22	13	49
	Total goods area & lift design	**422**	**171**	**396**	**28**	**282**	**352**	**173**	**415**	**471**	**105**	**2815**
		26 Feb	9 Mar	20 Mar	29 Mar	5 Apr	24 Apr	8 May	29 May	19 Jun	3 Jul	
	In addition to these people, Alec also attended all these meetings.	Ian Bob John Bruce David	Ian Bob	Ian Bob John Bruce David	Bob	Ian Bob John	Ian Bob John Bruce David	Ian Bob John Bruce David	Ian Bob John	Ian Bob John Bruce David	Ian Bob John Bruce David	

4.2.1. Talkograms

Titscher et al. (2000) describe a tool for the analysis of conversation called a 'talkogram'. Talkograms serve to capture quantitative indicators in the interactions displayed in discursive texts. They are one way of reducing an enormous quantity of text to a manageable size for analysis. The collected and transcribed episodes are measured by counting words, contributions, turns, etc. Then words or turns are coded. So talkograms can be drawn for an episode (p.42).

This research made extensive use of such talkograms to see whether turns coded to a particular learning style clustered and formed meaningful patterns. Put simply, a talkogram was a scatterplot showing the learning style of all the turns at speaking on a particular subject. They also showed how a subject was discussed over several meetings. Figure 5.3 shows an example of the talkogram for Subject 9 where the discussion centred on the specification for the scissor lift, and how the scissor lift would work in practice.

Figure 5.3 Talkogram for Subject 9: Scissor Lift Specification, Operation & Gates

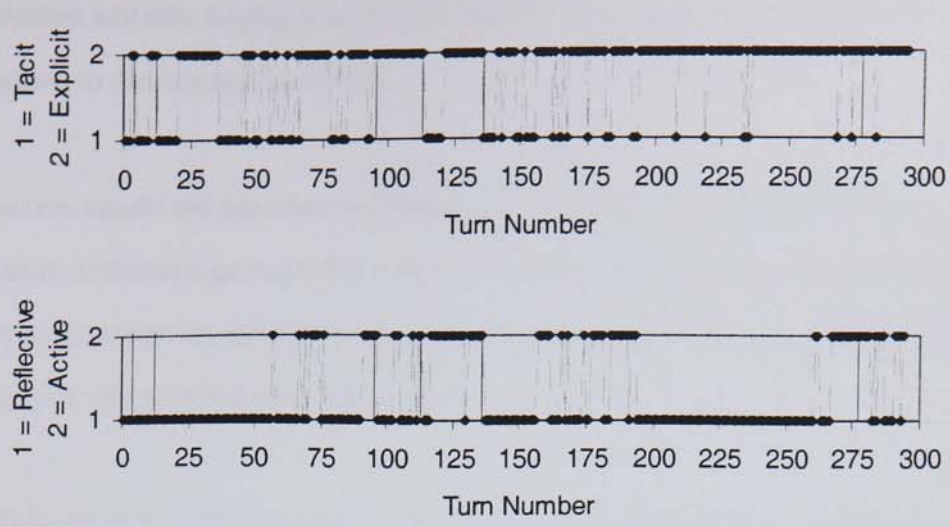


This talkogram can be read as follows:

The x-axis shows that this subject was discussed for nearly 300 turns. The vertical lines indicate this subject was discussed at seven meetings. The distance between the vertical lines indicates the number of turns spent discussing this subject at each meeting. So, in this example, there were only two meetings where this subject was discussed for more than fifty turns. The y-axis indicates the learning style of each turn and each turn is represented by a dot. Thus, assimilation was the most common learning style used in these discussions. There was a progression over the first 135 turns from the use of divergent turns to the use of assimilative turns and then convergent turns. Participants used very few accommodative turns. There was no progression through the learning styles in the last two meetings although there was a marked and almost invariant use of an assimilative learning style for a period of almost 75 turns.

Sometimes, an examination of the talkogram for a subject would show that there was little pattern in the use of the four learning styles. I would want to see the relationship between comprehensive and apprehensive learning styles (i.e., assimilative and convergent learning versus accommodative and divergent learning) and between active and reflective learning styles (i.e., convergent and accommodative learning versus divergent and assimilative learning). In addition it was useful to see switches between learning styles that would obscure the data in the talkogram. To display these variations I produced a '3D Talkogram' (see Figure 5.4). The '3D' merely refers to the three axes displayed in the talkogram: turn number, prehension (tacit versus explicit) and action/reflection.

Figure 5.4 3D Talkogram for Subject 9: Scissor Lift Specification, Operation & Gates



This 3D talkogram can be read as follows:

When discussing Subject 9, people used language that was predominantly explicit and reflective. The benefit of the 3D talkogram is that it can show consistent use of one learning 'dimension' where there is little consistent use of one learning style. For example, in this subject, we can see that reflective learning styles were used fairly consistently, despite some switching between divergence and assimilation. Similarly, people switched between tacit and explicit learning styles more frequently than between active and reflective styles. Discussions where learning styles changed from divergence through to accommodation would show more explicit turns in the middle two quarters and more active turns in the last two quarters of a discussion. The patterns in the chart showed that this did not happen in this subject.

4.3. Conclusion Drawing/Verification

So far, this chapter has discussed the methods and data sources used to examine the research questions developed in the previous chapter. The three chapters that follow this one display the results and discuss them and they illustrate how the evidence was used to answer those research questions. These chapters are written so that this process is transparent but a few comments are needed here to orient the reader and explain how the data and methods were

used to draw conclusions. Thus, this section examines how the data analysis, including data reduction and data display, allowed conclusions to be drawn from the data and provide some answers to the research questions.

The core results are produced in Chapter 7. Principally, this chapter contains a quantitative analysis of the data generated by coding the discussions where the group designed the lift. Individual and group patterns in the use of learning styles were treated separately to examine which had the greatest explanatory value.

Tables displaying patterns in individuals' use of learning styles were used to assess each person's most commonly used learning style and how it changed during discussions. A measure of individual consistency in use of learning style and Spearman rank correlation coefficients were used to look for patterns in individual variability in the use of learning style. An important addition to this analysis was the use of data from the Learning Style Inventory. The LSI results for each participant were compared with their conversational learning style to discover what each method measured and to investigate whether learning styles used in conversation aligned with relatively stable learning style predispositions measured by the LSI. This triangulation of methods provided insights into the qualities of both methods and the contexts where each had greater validity. For instance, the LSI was designed to be context-free and measured longer term predispositions in learning style. Conversational learning style allowed the nature of the task to be included in the assessment of learning style and so it was sensitive to changes in learning style in relation to the subject being discussed and the context of that discussion.

The investigation of group patterns used the same conversational data and the same tables and measures of conversational learning style but here conversational learning style was seen as a group phenomenon. In particular, Spearman rank correlation coefficients were used to measure the strength of learning cycles during the project and the circumstances that were most likely to lead to a strong learning cycle. These coefficients were generated by cutting the data in different ways: that is, by looking at the project as a whole, by meeting and by subject matter. In

addition, a measure of consistent use of learning styles between turns *within the group* was used to answer questions about whether consistency led to stronger learning cycles.

Qualitative analysis of the data is presented in Chapter 8. Here, Kolb et al.'s (2002) dialectics of conversational learning were used to focus discussion of a more in-depth analysis of three subjects. The three subjects were chosen on the basis of the quantitative analysis which showed that they had learning cycles of very different strengths. Each subject was discussed over several meetings and so the separate sections were brought together in a new transcript. This was useful because it was possible to see continuity over a subject even though it was discussed in different meetings. The talkograms were essential here because they allowed whole subject discussions to be displayed in one place and they provided a picture of how the strength, or lack of it, in the learning cycle came about. However, I also found it necessary to summarise these discussions and write a 'learning style commentary' alongside it for two of these subjects (see Appendices 8 and 9). This commentary described the use of conversational learning styles but focused on groups of turns and the relationship of the language used to knowledge.

These summaries, the focus on particular subjects, and a fewer number of turns, meant that individual contributions to the discussion could be interpreted in relation to the overall group learning style for the subject. This process was interesting because I had generated some hunches about each subject whilst coding the data. Some of these were confirmed by a detailed analysis whilst others were shown to be wrong. In addition, new insights came from this immersion in the data. This process was anchored by the quantitative data and talkograms and the underlying hypotheses about learning cycles. However, the renewed immersion in the data meant that I could explore some explanations for the patterns revealed in the quantitative analysis by looking again at the substance and meaning of the conversations that had taken place. Thus, the quantitative results were verified by a return to a more qualitative interpretation of the data. The re-examination of the transcripts and my immersion in the data lent greater inductive power to the findings and followed Miles and Huberman's (1984) view that 'words and numbers keep one another honest' (p.55).

The next chapter (Chapter 6) is quite short. It provides the background to the company and working situation of the participants studied in this research. It is important because it provides the context needed to understand the position of each participant in relation to the other participants and the context for their discussions. It also provides crucial information regarding the background and formal role of each participant which is used to understand the results from the Learning Style Inventory.

5. Summary

Data collection took place in a company where senior managers were planning the construction of a goods lift and goods area to expand the capacity of their production area. The largest part of the data drawn on in this research was collected by recording the conversations in formally-arranged meetings where the lift and goods area was discussed.

Parts of the transcribed meetings were selected for further analysis. The focus for that selection was the design of the goods area and lift. It excluded discussions directly concerned with the planning authorities, preparing the tender, the tendering process or preparations for the construction. Thus, the design of the goods area and lift took around four hours and twenty minutes of discussion in ten meetings.

Individual turns at speaking were coded using a coding frame (Table 5.2) developed as a result of reading the literature and the experience of the first stage of coding. The coding process produced a data set of 2,589 unweighted turns at speaking with a valid code.

This research is more positivistic than phenomenological; this means that I have no philosophical objections to attempts to quantify qualitative data such as naturally occurring speech. Although it makes extensive use of naturally-occurring conversation, this research is closer to content analysis than discourse analysis or conversational analysis.

This research could not easily be described as ethnomethodology but it has some affinities with an ethnomethodological approach because it takes the effects of individual intentions and actions seriously. This research also relies on the skill of participants to create their own learning experience. However, I do use learning style, task, role and context as concepts to describe the way that participants interactively construct their learning experience, and focus less on the participants' own definitions of the situation. The research could perhaps be described as ethnographic. It involved the direct observation of an organisation and the production of a written description. I gathered data by being in the social setting I was researching.

Several means were developed to reduce and display the data that allowed analysis and the drawing of conclusions. Summary contact sheets helped to map the discussions that ranged over ten meetings and contributed to a classification of the different subjects that were discussed in those meetings. Crosstabulations of the numbers of turns of each learning style were used to analyse patterns by individual, meeting or subject. A measure of consistency in the use of learning style and a measure of the strength of a learning style cycle were developed. Also, talkograms were devised to reduce enormous quantities of text to a manageable size for analysis and to provide subject overviews.

I revisited some of my coding during the analysis and there was good intra-coder reliability. However, the method would also benefit from tests for inter-coder reliability. Of course, it is harder to claim reliability with regard to the more ethnographic analysis of the transcripts because it involved greater personal interpretation of the data. In this kind of analysis I used the quantitative data as a guide as well as my understanding of the theoretical constructs I was investigating.

The principal method used in this research, high-inference content analysis of conversation, contributed to the external validity of the results. The theory and research on fundamental learning processes incorporated into the coding frame, and the transformation of those ideas

and analysis into research questions relating to the use of knowledge in conversation is relatively new. If this research can be said to have external validity it would be through its clarification of the concepts of knowledge and learning and the development of more refined research questions in relation to knowledge-creation in work groups. Also, the methods used in this research, and the immersion of the researcher in the data, means that the concept of learning styles in conversation was grounded in real-world observations and, through this, gains validity. This potential for generalisation and meaningfulness, however, will be realised by using these methods for further research in several different situations.

Chapter Six

Description of Case Study and Participants

1. Introduction

The results drawn from analyses of the data collected for this research cannot be understood without understanding the people, company and premises that the data came from.

These observations are drawn from my time spent observing activity in Audio Devices as well as emails, informal discussions, formal interviews, a company video and their website. They are presented here to provide a context for the results that follow. They illustrate the atmosphere and culture of the company and the attitude of the managers to their premises. They describe the people who participated in this research and their role in relation to the company and the project studied. They also describe the history of the relationship of Ian, the architect used for the goods area design, with these managers. The descriptions of the participants are used in later chapters to understand the results from the Learning Style Inventory and their conversational learning styles. Finally, I describe the background to, and give a summary of, the lift project which this research studied.

2. Company, Premises and Culture

Audio Devices is a medium-sized firm designing and manufacturing professional audio equipment. At the time of this research around 120 people worked for Audio Devices in the UK. Out of total revenues of $120 million world-wide in 2001/02, the UK accounted for around $32 million.

One hundred and five people worked at the UK headquarters, where the data collection took place. Among these employees there were two main groups: production (60 people) and marketing (45 people). I got to know people from the management team (excluding marketing) and from production. Marketing, which was mostly concerned with providing services to people in the professional audio industry, actually moved out of Audio Devices' building to another building during the course of the lift project. Production employees, which also included repair and service personnel, were on the factory floor and in the offices upstairs.

In the early 1990s Audio Devices' London operations were in four buildings and the decision was taken to move and consolidate them in one building. They decided to move from London to a newly-formed business park in the countryside. They commissioned a building there and moved in in 1992.

Audio Devices bought a plot big enough to build two buildings opposite each other, or so they thought, but decided to build only one at first. They commissioned the building themselves because they wanted to be involved with its design. They didn't want to go through a long tendering process, so they chose a 'cost plus' contract: a single contractor charges a fixed price plus a percentage profit.

When they chose a plot they wanted at the business park, they also chose to use the architects that came with it. Ian, a partner in firm of architects, had been invited to do some speculative design work on the business park and had been given a designated plot. Ian was heavily involved in the design and construction of Audio Devices' new building. He was also employed by Audio Devices for two years, and had a desk there, during the construction of specialist listening rooms on the site.

It became a 'build by book' contract. Bruce, the financial director, once said, 'We are the worst kind of company to have a build by book contract with.' The way these contracts normally work is that the contractor is given the design, goes off and builds the building and then the client signs it off. But Audio Devices' UK management wanted to be involved every step of the way.

The final snagging list, a list of items to be done before completing the contract, was described as 'more like a snagging book'. This story was told to me at least three times: firstly, to let me know the lift project underway at the time was small compared to the project for the whole building; and secondly, to let me know of the trouble that they could cause, or could take, to get the job done the way they wanted it.

The management at Audio Devices told me other stories of the pains they would take to get things they way they wanted them. For example, Bob, the technical director, arranged for a new public address system to be installed in a new building. He asked for there to be no tones alerting listeners to an imminent announcement. The system was installed with the tones active and so he called the company back. The tones were removed. However, Bob noticed that the little red light, indicating that you could speak, only lit a few seconds after pressing the address button. Bob questioned the delay and was told that the delay was just part of the system. He said: 'No it's not. It because the system is waiting for the tones to finish.' The engineer disagreed and went away but eventually came back to remove the delay.

So, what was it like in Audio Devices' premises? Upstairs was an open plan carpeted office. It had wide walkways and large desks. It was neat. Coffee and tea cups needed lids when walking around to avoid spillage. Photocopiers were not allowed in corridors because of the noise.

The lobby and production area were downstairs. John, the director of production, made a point of trying to keep the crowded production area tidy. Cardboard boxes were moved out of the way before meetings. No posters were allowed on the walls. There was a white floor, anti-static precautions, benches, shelves, testing and soldering equipment. The overall feeling was light, airy and quiet.

At the time of this research Audio Devices was still privately owned by the founder who was still involved with its operation. His way of doing things and his way of thinking were invoked by others at times. Many decisions were informed by a reference to things he said at some point, or would say in a particular situation. For example, in a visit to Audio Devices' new building in

the UK he climbed onto a table with a screwdriver to fix an air conditioning rattle. He is reported to ask many questions and not always on expected subjects. Employees need to be well prepared. He has been described as a 'technical genius' and someone who is incredibly 'disciplined'. Indeed there seemed to be genuine respect amongst those in management who had worked with him since the early days. This kind of reference to the founder is used to identify and justify needs within the company.

One of the striking things about the company is that many employees have worked for Audio Devices for decades.

Ted, Audio Devices' first employee gave a presentation to UK staff when he came over from the US. He said:

> 'I hope you have as any parties here as we seem to have in [the U.S.]. We'll always take the opportunity of having a party to celebrate someone's tenth anniversary, or fifteenth, or whatever. Or, the sale of a thousandth unit. Any excuse'.

This was an aside but the message was quite explicit. Employees were urged to socialise. Two good reasons to socialise were long service to the company, or the success of a new product. Long service was defined as no less than ten years. This emphasised that staying with the company for a long time was seen as a good thing, that many others had done the same and it was worthwhile celebrating it.

One consequence of the long-standing employment of many managers at Audio Devices is that they knew each other well. This settled way of working could also have been habitual and excluded new solutions to problems. Nevertheless, as a group the feeling was one of co-operation, tolerance and respect. There was little evidence of aggression, domination of one by another or impatience. The atmosphere was gentle, perhaps even genteel. This was an environment where solutions to problems may be reached more slowly, allowing time for reflection and intuition, not necessarily the primary skills of engineers. For example, Kolb (1984) found that engineers tend to have a convergent learning style when measured using the LSI because of their practical and logical orientation.

Audio Devices in the UK is dominated by engineers: electrical and electronic engineers or sound recording engineers. For example, the production manager who devised an automatic calibration system for a piece of equipment was put in charge of their IT department. Until 2001, there was no dedicated human resources, or personnel, department or manager. Even marketing is largely made up of people who provide technical consulting services.

One implication is that comprehensive skills of rational and logical thought and active skills of application and practicality could have been to the fore. Consequently, apprehensive skills of creativity and ability to deal with people, and reflective skills of refinement and observation could be less in evidence.

3. Principal People Working on the Lift Project

This section gives a description of the people involved in the lift design meetings studied here. It includes facts about their education, their position at Audio Devices, and their formal organisational role in these meetings. Further analysis and discussion of their learning styles, their informal roles and their contributions to the design are left until later. The list puts those who talked most at the top.

Two of the most striking things about the people from Audio Devices were their ages and the length of time they had worked for the company (see Table 6.1). The company had grown through the seventies and eighties but retained many of its employees who had joined the company early in their careers. Thus, the top management positions (at least in the UK) were held by people of a relatively similar age who had all been with the company for at least fifteen years. Bob, John and David were, or had all been, engineers.

Table 6.1 Key Participants in Lift Project Meetings

	Ian	Bob	John	Bruce	David
Age	64	60	48	48	
Years at Audio Devices	32	10	15	20	23
Education	Architect	Electrical Engineer	Electronic Engineer	Anthropology	Maths
Training	Architect	Engineer	Engineer	Accountant	Engineer
Job	Architect	Technical Director	Production Director	Financial Director	Managing Director

3.1. Ian - Architect

Ian was a partner in the firm of architects employed to design the building of the lift and loading bay for Audio Devices. He only came to their premises for the meetings, to meet with people such as the planning inspector or take a few measurements for the structural engineers. He co-ordinated the design work and spent a lot of time communicating with the structural engineers and draughtspeople. He also liaised with the sub-contractors for the lift, scissor lift and the work on the windows and doors. He was also Audio Devices' main contact for the tendering process when the principal building contractors were bidding for the contract, although the quantity surveyors co-ordinated this activity.

He had a diploma in architecture and had always been an architect. He was a commercial architect and had experience with building flats, supermarkets and warehouses. His association with Audio Devices had begun in 1991 when he had agreed to do some speculative work on the business park which the company eventually chose for their new premises. He was the architect for their existing premises and had actually worked on site for two years before the Audio Devices staff moved in.

His role in the meetings examined here was as the person who had the most experience in building design. He knew most about what options were available and how much they would cost. Ian also acted for them in his contacts with other people involved in doing work for the

proposed construction and so reported their activities to the Audio Devices group and answered their questions.

3.2. Bob - Director of Technical Services

Although it appeared that Bob had only two people working for him in technical services, this was because he was due to retire the following year. He had been at Audio Devices for the longest time out of the design group and had been the third person to be employed by its founder back in 1969. He had graduated in electronic engineering and worked as a design and production engineer in the electronic industry until joining the company. At Audio Devices he had been production manager and was production director from 1980 to 1990. In recent years he had been wearing a 'quality assurance hat'.

He had been most closely involved with the building of their current premises in the early nineties and, of the design group, had been the person who had had most to do with Ian, the architect. Audio Devices had taken a keen interest in the planning of their building and Bob was also the person most involved in what could be described as the management of the estate. He said that, in the past, he had also been an informal sounding board for employees with personal issues to discuss. Indeed, until the previous year, there had not been anyone devoted to personnel functions in the UK.

His role in the movement of staff and goods in the research here was to organise and manage the refurbishment of the new office building and to chair the meetings regarding this and the design of the goods area and lift.

3.3. John - Production Director

John was director of production which meant that he oversaw production, the off-production staff, purchasing and stores. The production manager managed the day-to-day running of production. There were also two shift leaders. Part of his role was to enable the production of

new products that had been developed in the US. He was concerned with organising the purchase of new equipment and learning about how to use new technology for assembling electronic devices.

John had graduated in electrical engineering and was a chartered engineer. Before joining Audio Devices in 1986 he had worked in electronic design and development, in oil exploration, and in manufacturing. When he joined Audio Devices he had worked for Bob. He became production director in 1991.

Part of the impetus for the movement of staff to the new office building was the need for more space for production staff and some slow-moving stock. Given his responsibilities, John represented the key users of the new loading bay and goods lift. He had also produced the plans of the layouts for the new offices and the space that was created in the existing building.

3.4. Bruce - Finance Director

Bruce had graduated in anthropology but despite a keen interest in the field he had trained as a chartered accountant. He then worked abroad for six years before joining Audio Devices as an accountant in 1981. Thus, he had been working for Audio Devices for twenty years. By 2001, he was in charge of accounts, the IT department, the human resources manager and staff such as the receptionists. He also dealt with legal issues, such as the purchase of the new office building.

His formal role in the design meetings was to keep an eye on costs (although this would have been shared), to work out the contractual situation and work out the timings of contract and the works.

3.5. David - Managing Director

David had become managing director of the UK operations of Audio Devices a year before these meetings began. He oversaw all aspects of the company's operation in the UK, including marketing, professional audio, manufacturing and a licensing office in London.

David had been with Audio Devices for 23 years. He graduated in mathematics in 1973, spent four years in the television industry, and then joined Audio Devices in 1977. Within Audio Devices, he had held several positions in both the UK and US, including applications engineer, sound consultant, applications manager, director of product planning, and then vice president of marketing in the US.

David talked very little during the design meetings. His role was to monitor a project that involved spending a large amount of money. In some senses he was there to take responsibility for the decisions made.

4. Summary of the Design of the Lift Project

This section summarises the design of the lift project at Audio Devices. It describes the whole process from beginning to end, including parts of the project which were not captured in the meetings observed (see also Table 6.2).

Production in Audio Devices' purpose-built premises had become difficult because of the lack of space. In particular, there was too little space for storage. In November of 2000, Audio Devices decided to take action. They called in Ian, the architect who had been employed when their existing building was commissioned, and decided to investigate the cost and utility of a two metre square lift to be built on the side of the building.

Table 6.2 Summary of the Lift Project

Nov 2000	Audio Devices management decided to investigate what kind of lift they wanted and how much it would cost. They met with Ian, the architect, and favoured a goods lift built on the side of their premises.
Jan 2001	Initial drawings prepared.
26 Feb 2001 (M1)	Options discussed. Decided size and location of goods lift. Accepted need for additional scissor lift. Initial discussion on size and shape of loading bay.
9 Mar (M2) 12 Mar	Designed loading bay and refined plans for scissor lift. Audio Devices gave consent to continue developing plans.
16 Mar	Bob prepared a sketch of the loading bay area.
20 Mar (M3)	Decided to have a glass canopy over loading bay and to rear doors as well. Discussed planning permission, location of ramp & steps in loading bay, and external appearance of lift shaft.
22 Mar	John refined sketch of the loading bay area.
5 Apr (M5)	Further discussion of design of loading bay. Discussed balustrades to protect people using bay area. Appearance of lift shaft and use dummy windows. Using the loading bay.
24 Apr (M6)	Discussed specification of scissor lift and loading problems. Discussion of canopy structure and how to minimise disruption and dust during works. Talked about whether the lift would be quick enough.
8 May (M7)	Planning application discussed. Discussed operation of lift doors and controls. Refined plans for canopy.
29 May (M8)	Discussed renovation and changing goods in/out doors. Discussed problem of balustrading around loading bay restricting movement. Lots of other bits and pieces.
9 Jun	Planning permission agreed.
19 Jun (M9)	Discussed works and discussion of sub-contractors. Discussed what the specification on scissor lift meant in practice. New drawings examined and questions asked. Quantity surveyor taking measurements for budget.
3 Jul (M10)	Structural engineer and quantity surveyor come to meeting. Planning works. More discussion on changing rear goods in/out doors at rear of building.
13 Jul	Tendering package prepared and sent out. Audio Devices order lift and scissor lift.
24 Jul	Marketing and sales departments move out to new office building making space on the first floor for a goods store.
6 Aug	Tenders returned.
7 Aug (M11)	Discuss higher than expected figures in the tenders.
16 Aug	Bob asks to meet contractors. Then he thinks about high figures. Impromptu meeting of Audio Devices' participants. Requests cancellation costs from Ian.
17 Aug 01 (M12)	Some redesign attempted but minds are made up at Audio Devices.

(Mnn) denotes meetings for which transcripts were available.

Audio Devices' original building had been designed with Audio Devices' needs in mind. But they hadn't allowed enough for the expansion of their production facilities. Bob said: 'That was a mistake. But we did get most things right.' They had a passenger lift in the centre of the building. However, on the ground floor it opened into the building's lobby. The people at Audio Devices did not want to move storag

e items, and production and stores staff, through this area. They were also concerned about damage to doors and walls.

The lift was to be a major element in the reallocation of floor space that was underway. The ground floor of the building was allocated to the lobby and the factory floor. The upstairs of the building was an open-plan office and allocated to all the other functions of the company. The overall plan was that Marketing would move out of the first floor offices into a neighbouring office building which Audio Devices would purchase. Goods and materials could then be stored in some of the upstairs space in the existing building. The goods lift would allow the easy movement of goods between the loading bay area, the production area and the goods area upstairs. Audio Devices was also going to investigate whether it was feasible to build a covered walkway between the two office buildings, and whether it was worth moving partitions in the existing building to make better use of space. They also needed to refurbish the new office building to bring it up to their standard.

By February 2001 initial drawings had been prepared and Ian had come up with an approximate budget figure of £130,000. Audio Devices confirmed that they wanted to proceed with the project. As design progressed through March, the group realised that they needed a larger loading bay or platform around the lift because the roadway outside was lower than the ground floor level. They also needed some way to move goods between the roadway and the loading platform. They chose a scissor lift and extended the plans for the loading bay to fit it all in. They also decided to install a glass canopy over the loading bay.

During April and May the plans were refined and further elements were added. The size and shape of the loading bay, ramps and steps were all changed to get the best use from it. To improve the appearance of the lift shaft, dummy windows were added to continue the line of windows on the building. Balustrading was added to the edge of the loading bay for safety.

The meetings in June were increasingly concerned with planning permissions and the sub-contractors that were being contacted. Specifications on the lift and scissor lift were examined to see if they would work in practice.

In July a quantity surveyor was brought in to manage the tendering process and to keep an eye on costs. There were also several discussions about how to improve the size and function of the goods in/out doors. By 13 July a package had been prepared and sent out to three firms for tender. The goods lift and scissor lift were ordered. The new office building had been purchased and refurbished and staff moved out of the first floor of the original building to make space for goods to be stored.

The quotations were returned in August. The group met to discuss them and were all surprised at the high figures of around £270,000. On 16 August Bob asked to meet the contractors at Audio Devices but an impromptu meeting to discuss the lift quickly decided that, although the plans met their needs, they were too expensive. The total costs to Audio Devices would have been £340,000. The whole group met Ian, the quantity surveyor and the structural engineer for a final time on 17 August to discuss the latest developments. Some redesign was attempted to see if the costs could be reduced but Audio Devices had decided not to take any further action: they would make do with the existing passenger lift.

Audio Devices began to count the costs of cancelling orders and for the services of the architect, structural engineers and quantity surveyor. These costs came to £25,000. They also decided to resume looking at other solutions to the pressure for space in production.

Chapter Seven

Results of Quantitative Analysis

1. Introduction

The results of the analysis have been split into two chapters (see Table 7.1). This chapter uses quantitative data generated from the coding of individual turns at speaking during meetings held to discuss the proposed lift and goods area at Audio Devices.

Learning style can be defined as a tendency to choose one kind of thinking over others. It is usually conceived as a property of individuals. Analyses that answer questions about individuals and their use of learning styles are presented first. These analyses focused on the degree to which learning styles were stable within the project team members. They examined how the learning styles associated with each individual, measured by examining their speech, compared with learning style measured by the Learning Style Inventory, outlined in Chapter 5. They also examined the extent to which an individual's use of learning style progressed from divergence through to accommodation during discussions.

This is followed by analyses that examined the learning styles used by the group as a whole. They explored the idea that the learning style of an individual while engaged in discussion may be partly dependent on the learning style of the people they are talking with and the subject of that discussion. These analyses examined the evidence for regular changes in the use of learning style during a discussion. The project was formed by the separate meetings where the lift was discussed. The project was also comprised of the discussion of the various 'subjects' that constituted the design of a lift. The discussion of these 'subjects' often took place over several meetings. The data was examined to see how the group's use of learning styles progressed from divergence through to accommodation within meetings and within subjects.

Table 7.1 Outline of Analysis Chapters

Chapter 7: Analysis Using Quantitative Data

Individual as the unit of analysis

1. Comparison of learning style measured by Learning Style Inventory and learning styles used in their speech during this project.
2. Variability in the use of learning style measured by their speech-in-use.

Group as the unit of analysis

Progression from divergence through to accommodation in the learning styles used in conversation:

1. Over the entire project.
2. By meeting.
3. By subject.

4. Further analysis of learning style progression by subject

Chapter 8: Analysis Using Quantitative Data and Transcripts

Three subjects were examined in more detail.

1. Location of Lift on Building (subject number 2)
2. Lift Performance (subject number 3)
3. Lift Appearance (subject number 4)

Chapter 8 builds on the analysis in this chapter by focusing on three subjects discussed during the project. The focus on particular subjects allowed an assessment of the relationship between learning style and knowledge and, in particular, the circumstances where there seemed to be a progression through a learning cycle. The quantitative analyses of this chapter were augmented by a close examination of the transcripts and the use of talkograms to look for patterns in the use of learning style and the relationship between individual contributions and group learning style.

Several terms are used in the results and discussion chapters and it is useful to define them here:

Discussion	Conversation among members of the project team. This usually refers to conversations that were recorded, transcribed and coded. Sections of conversation were often grouped together from different meetings. These amalgamations are also referred to as 'discussions'.
Project / Design	Refers to the entire design of the goods area and lift studied here. It excludes discussions about tendering for contracts and costs. It also excludes discussions about the movement of Marketing to their new premises.
Subject	Elements of the project that emerged as themes during the discussions. The subject matter of the discussions was defined by reference to particular features of the design, each of which was usually discussed separately: for example, lift control and operation, or placement of the scissor lift.
Meeting	In the following chapters, a meeting refers to a pre-arranged discussion held at Audio Devices where the researcher was present and the discussion was recorded. Brief minutes were taken. On the whole, they were pre-arranged so that Ian could be present.[7]
Project Team / Group	Bob, John, Bruce and David from Audio Devices and Ian, the architect. Occasionally, one or more team members would not be present in the meetings (see Table 5.3) but those present are still referred to as a project team or group.
Participant / Individual	Refers to a member of the project team.
Turn	An individual's turn at speaking. Longer turns at speaking were weighted and 'turn' refers to a weighted turn unless specified otherwise. See Chapter 5 for more detail.
Turn Position	Refers to the position of a turn within a discussion. A turn with a weight of two would occupy two consecutive positions.
Learning Style	One of the four learning styles identified by Kolb (1984). Unless specifically referring to results of the Learning Style Inventory, 'learning style' and 'use of a learning style' refers to turns coded to a particular learning style: hence 'conversational learning style'.
Consistency	Refers to the proportion of turns in a discussion using the same learning style as the previous turn in the discussion. There can be consistency within a collection of an individual's turns at speaking within a group's discussion.
Progression	Refers to the changing use of learning style in the following order: divergence, assimilation, convergence and accommodation. Regular and consistent use of learning style with progression in the order indicated leads to a 'strong learning cycle'.

[7] Apart, from Meeting 4 on 29 March (see Table 5.3) when only Bob and I were present.

2. Analysis Taking Individual Participants as the Units of Analysis

Two sources of data were used here. The first source was the data set created by coding the discussions that took place during the lift project. The second source of data was generated through responses to the Learning Style Inventory (LSI).

The LSI identifies the relative strengths of tendencies within individuals to use one learning mode or another. For instance, it examines whether they emphasise abstract conceptualisation more than the other three learning modes in their individual approach to learning. The questionnaire is filled in by respondents and relies on their understanding of how they consciously make choices and decisions.

An important question here was whether the data from the coded discussions were matched by the results from the LSI. The discussion data extended over a period of time and this allowed further questions about the variation in the use of conversational learning style over time.

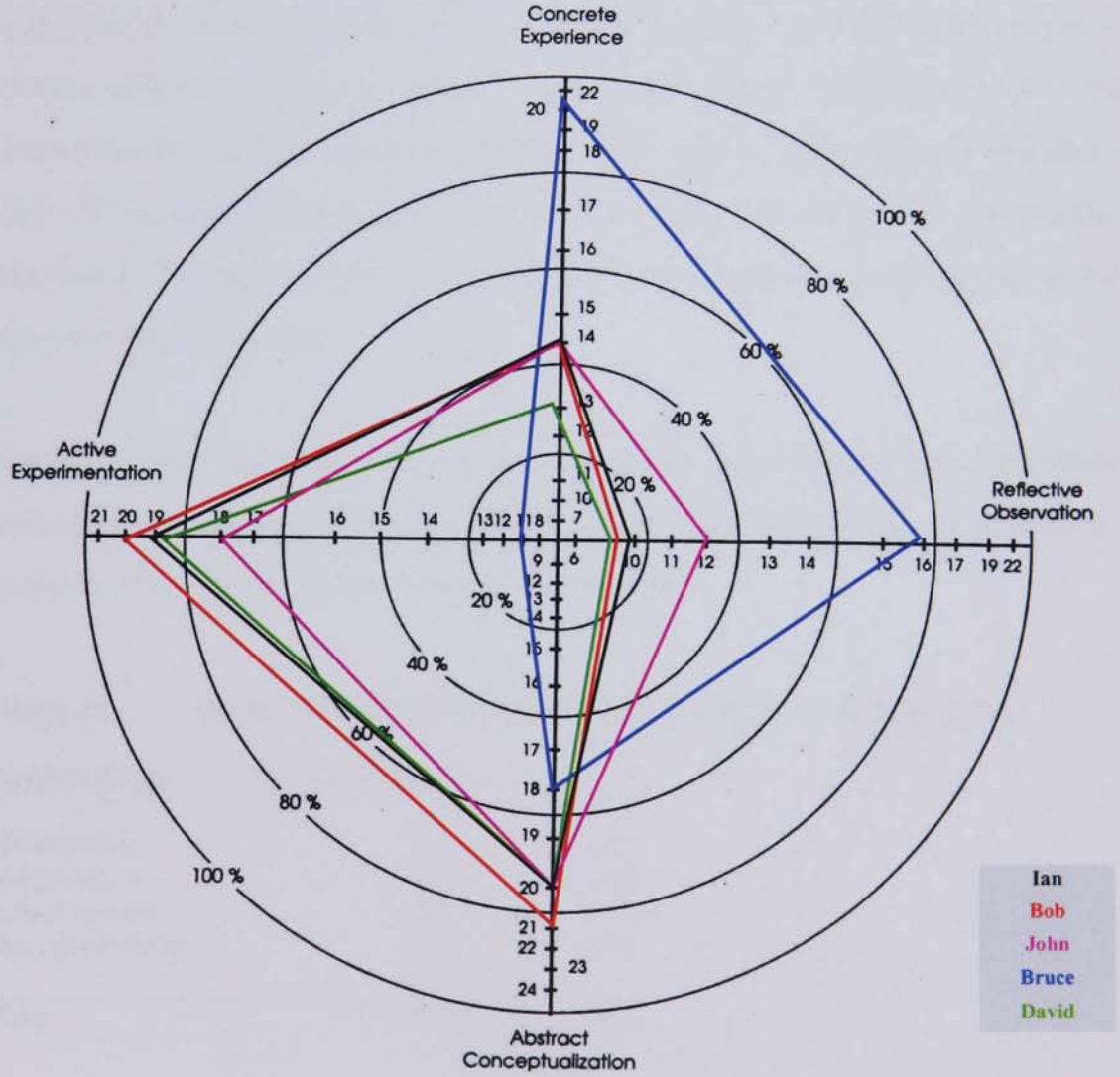
These research questions generated further sub-questions:

- What did the Learning Style Inventory say about the participants' learning styles? Were the results clear?
- What learning styles did individuals use in their discussions? Were the results clear?
- Did the two sources agree?
- How consistent were the learning styles used by individuals in their discussions? Did individuals activate their tendencies to think in a particular way so strongly that we can see these tendencies clearly through all their turns at speaking? Or was there variation in their use of learning styles during discussions?
- If individuals varied their use of learning style in discussions, did it follow a predictable pattern moving from divergence, through assimilation and convergence to accommodation?

2.1. Comparison of Two Sources of Data on Individual Learning Styles

The results from the Learning Style Inventory were clear (see Figure 7.1). All the participants, except Bruce had a tendency to prefer a convergent learning style. Their preferred modes of learning emphasised abstract conceptualisation and active experimentation. These modes of learning in combination lead to a convergent style of learning characterised by the use of abstract models and logic to actively influence people or situations. John's scores on the LSI showed that he was a little more reflective than the others in the convergent group.

Figure 7.1 Learning Styles of Key Project Participants



On the other hand, Bruce, the financial director, preferred a divergent way of tackling problems. This style is formed by the tendency to use the opposite modes of learning to convergence: concrete experience transformed by reflective observation. This style of learning is characterised by the use of intuition and open-mindedness used in a thoughtful way.

Table 7.2 shows the distribution of turns at speaking by the learning style of those turns over the whole project. Firstly, we can see that the turns were fairly evenly distributed between the learning styles.

The most common style used in discussions was assimilation. Assimilation shares the rational and logical elements of convergence but is oriented to reflection, implying thoughtfulness and integrity rather than an impulse to action. The least common style of turn among this group was accommodation. Participants used an assimilative style twice as often as an accommodative style. Accommodation is associated with a trial and error approach with an emphasis on action and intuition. Participants used a reflective orientation, as opposed to an active orientation, for two out of every three turns.

We might have expected to see many more turns classified as convergent because the results of the Learning Style Inventory showed strong convergent tendencies among the participants. However, only 19% of turns were classified as convergent.

Table 7.2 Number of Turns at Speaking Coded to the Four Learning Styles

Learning Style	Number of Turns	%
Divergence	814	29%
Assimilation	978	35%
Convergence	545	19%
Accommodation	478	17%
Total	2815	100%

The number of turns by learning style for each participant is shown in Table 7.3. The first thing to notice about this table is that it shows that each person contributed a different number of turns to the discussions during the course of the project.

Table 7.3 Participants' Turns at Speaking Coded to the Four Learning Styles

	Divergence		Assimilation		Convergence		Accommodation			
Person	N	%	N	%	N	%	N	%	Total N	Total %
Ian	287	22%	**496**	**37%**	328	25%	212	16%	1323	100%
Bob	**249**	**33%**	227	30%	114	15%	160	21%	750	100%
John	178	35%	**193**	**38%**	73	14%	69	13%	513	100%
Bruce	**88**	**49%**	50	28%	20	11%	20	11%	178	100%
David	8	32%	5	20%	3	12%	**9**	**36%**	25	100%
Others	4	15%	7	27%	7	27%	8	31%	26	100%
Total	814	29%	978	35%	545	19%	478	17%	2815	100%

Note: Figures in **bold** show which learning style each participant used most frequently. 'Others' include the researcher (n=23) who attended all ten meetings and Jack (n=3), a structural engineer who attended Meeting 10, 3 July.

Ian did much of the talking. He was the architect and as such he was the outsider and the gatekeeper to the structural engineers, planning authorities and contractors. He was also the expert in design with plenty of practical experience. He reported this activity and was the person to whom most people addressed their questions and suggestions. This explains why he contributed nearly half of all the turns in the project.

Bob chaired the meetings and was the person from Audio Devices with the formal responsibility for co-ordinating the project. He also had the longest relationship with Ian and had worked closely with him in the construction of their existing building. Bob contributed the second largest number of turns.

John talked almost as much as Bob. He was the key user of the redesigned goods area and lift and managed the staff who would use it. He was the main beneficiary of the changes to the internal layout of the building in terms of space. He was also charged with producing the plans for the reconfigured workspaces as a result of the staff moves.

David attended six out of the ten meetings examined here. As the managing director he would decide how the company's money was spent. Perhaps unusually, he barely spoke. This allowed other participants to enter the discussion. However, he did contribute at a couple of key moments. On one occasion he said that they should choose the larger lift from several options available because it met their needs (Meeting 1, 26 February). On another occasion he suggested that one way to assess whether the lift was worthwhile was to think of the long-term value of the building (Meeting 7, 8 May). Hence his contribution was coded to the more tacit learning styles. However, David had very few turns at speaking so it was difficult to see if his contribution varied over time or subjects.

As noted earlier, the Learning Style Inventory, which is purposefully designed to tease out differences between individuals, showed unambiguously that all participants tended to prefer a convergent style of learning, except for Bruce who clearly preferred a divergent style. However, the learning styles used in discussions differed substantially from the results using the LSI.

Firstly, whereas the results from the LSI identified strong tendencies to use a particular learning style tendency, individuals used the full range of learning styles in their discussions.

Secondly, only Bruce's conversational learning style coincided with his scores on the questionnaire; none of the others had a predominantly convergent learning style. See Table 7.4 for a comparison of conversational learning style and LSI results.

Table 7.4 Comparison of Conversational Learning Style and LSI Results

Person	Most frequently used learning style in discussions	Second most frequently used learning style in discussions	Results from Learning Style Inventory
Ian	Assimilation	Convergence	Convergence
Bob	Divergence	Assimilation	Convergence
John	Assimilation	Divergence	Convergence
Bruce	Divergence	Assimilative	Divergence
David	Accommodation	Divergence	Convergence

There were substantial differences in the results from the two data sources. Ian and John's speech was mostly assimilative which at least shares a rational and logical dimension with convergence. Bruce's speech showed a clear pattern of divergence which also coincided with his Learning Style Inventory scores. Bob's speech was predominantly divergent which was the opposite of the style indicated by the LSI, although he used an assimilative style almost as often.

The implications of these findings are discussed in Chapter 9. However, the differences may be accounted for by a combination of the nature of the subject that they were discussing and the role that each person took in relation to the others during their discussions. For example, later results show that Ian's conversational style was the nearest to the convergent learning style measured using the LSI. Bob took a more reflective attitude and was more open-minded and exploratory, perhaps in response to Ian's position.

2.2. Variability of Individual Conversational Learning Style Over Time

We have already seen that the learning styles used in discussion were different from the learning styles measured by the LSI. Data from discussions about the goods area were collected over a period of time so the data was used to examine the extent to which individuals used different learning styles over time.

The turns at speaking for each of the four most talkative people were divided into four groups by the order in which they took them. That is, each person's turns were divided into quartiles and the proportions coded to each learning style were calculated (see Table 7.5). This table was used to see how consistent individuals were in their use of conversational learning styles. It showed whether the pattern of learning styles that each person used stayed the same over the whole project or whether it changed.

Table 7.5 Learning Style of Turns by Participant & Project Quartile in Which They Occurred

	Divergent		Assimilative		Convergent		Accommodative			
Ian	N	%	N	%	N	%	N	%	Total N	Total %
1/4	106	32%	**157**	**47%**	44	13%	24	7%	331	100%
2/4	92	28%	**113**	**34%**	67	20%	59	18%	331	100%
3/4	42	13%	95	29%	**122**	**37%**	71	22%	330	100%
4/4	47	14%	**131**	**40%**	95	29%	58	18%	331	100%
Total	287	22%	**496**	**37%**	328	25%	212	16%	1323	100%

	Divergent		Assimilative		Convergent		Accommodative			
Bob	N	%	N	%	N	%	N	%	Total N	Total %
1/4	**82**	**44%**	64	34%	10	5%	32	17%	188	100%
2/4	**52**	**28%**	51	27%	35	19%	49	26%	187	100%
3/4	56	30%	**57**	**30%**	34	18%	41	22%	188	100%
4/4	**59**	**32%**	55	29%	35	19%	38	20%	187	100%
Total	**249**	**33%**	227	30%	114	15%	160	21%	750	100%

	Divergent		Assimilative		Convergent		Accommodative			
John	N	%	N	%	N	%	N	%	Total N	Total %
1/4	**73**	**57%**	37	29%	6	5%	12	9%	128	100%
2/4	52	40%	**53**	**41%**	16	12%	8	6%	129	100%
3/4	27	21%	**40**	**31%**	29	23%	32	25%	128	100%
4/4	26	20%	**63**	**49%**	22	17%	17	13%	128	100%
Total	178	35%	**193**	**38%**	73	14%	69	13%	513	100%

	Divergent		Assimilative		Convergent		Accommodative			
Bruce	N	%	N	%	N	%	N	%	Total N	Total %
1/4	**28**	**62%**	9	20%	4	9%	4	9%	45	100%
2/4	**29**	**66%**	9	20%	5	11%	1	2%	44	100%
3/4	**22**	**49%**	10	22%	6	13%	7	16%	45	100%
4/4	9	20%	**22**	**50%**	5	11%	8	18%	44	100%
Total	**88**	**49%**	50	28%	20	11%	20	11%	178	100%
All People	814	29%	978	35%	545	19%	478	17%	2,815	100%

Note: Figures in **bold** show which learning style each participant used most frequently.

The results showed that there was some consistency in the learning styles used by participants over the course of their involvement in the design of the goods area. Each person used their most dominant learning style in three out of the four quartiles. Ian, for example, used an assimilative style more frequently than any other style for three out of the four quartiles (see figures in bold). There was some variability because there was always one quartile of the project where they would use a different style more frequently. Ian, for example, used convergence more frequently in the third quartile of his turns at speaking.

However, in these quartiles the learning style that people used always shared one learning mode with their preferred style. Ian's most commonly used learning style in each quartile shared the learning mode of abstract conceptualisation. Thus, his most common learning style in each quartile shared comprehension, emphasising his use of logic and rationality. Bob, John and Bruce varied in their use of divergence and assimilation which shared the learning mode of reflective observation, emphasising thoughtfulness. Nobody switched between the opposing learning styles of divergence and convergence or assimilation and accommodation.

These shifts in the most commonly used learning style in each quartile hide other changes in the distribution of turns by learning style over the four quartiles. For example, Ian and John moved away from using a divergent style after the first two quartiles and everybody made greater use of accommodation after the first quartile. Bob showed the most consistent pattern in the use of learning styles in his speech.

In summary, participants in the project showed some consistency in their use of learning styles over all their turns at speaking but they moved away from their most common learning style at different points in the discussion. The results showing that the actual use of language did not match the scores on the Learning Style Inventory were further compounded by the fact that the participants used different styles of language at different times in their discussions.

Someone who consistently used one learning style whenever he spoke would have a small proportion of changes in learning style between his turns. Table 7.6 shows the degree of

consistency between turns for the principal participants. Ian was the person who was most likely to follow a turn in one learning style with another turn in the same learning style: only 40% of his turns at speaking were different from his previous turn. David and Bruce, on the other hand, changed learning style between turns more often than not.

Table 7.6 Consistency in the Use of Learning Style by Participant

Person	Proportion of turns using same style as previous turn	Number of turns
Ian	0.604	1322
Bob	0.525	749
John	0.549	512
Bruce	0.446	177
David	0.208	24
(All People)	(0.606)	(2814)

Note: Data on other participants were not included here because the data was insufficient. Number of turns excludes the first turn because it there was no other turn to compare it with.

However, this consistency seems to be related to the number of turns at speaking. Ian spoke most often and he was also the most consistent. David spoke the least and was the least consistent. Here we can see clearly that each person's use of learning style was not simply an expression of their underlying psychological tendency to use a particular style. Neither was their use of learning style an expression of their tendency to use one particular learning style in discussions. Instead, each use of a particular learning style in discussion was also conditioned by the nature of that discussion and the relationships between the participants. For example, there would have been much discussion between each of David's turns. The learning style he used when he did speak changed according to the discussion taking place at the time.

The results for Bruce are also interesting. His LSI results and the results from the conversational analysis both showed he had a divergent learning style. This agreement might lead us to expect that Bruce was able to express his divergent tendencies more consistently than others. Yet he showed less consistency in his use of learning style.

We have already seen that there is some variability in individuals' use of learning styles in these discussions. One of the questions in this research is to see if there is any evidence that people change the learning style that they use in a predictable way. That is, if individuals change their use of learning style in a predictable pattern moving from divergence, through assimilation and convergence to accommodation. One way to test this was to rank the learning styles and calculate a correlation coefficient between this ranking and the position of the turn in the discussion. Correlation coefficients and significance values were calculated for each person. A high positive correlation would show that people tended to use one learning style after another in the order indicated. A high but negative correlation would show that people tended to use learning styles in the reverse of the order specified above. A correlation close to zero would indicate that there was no pattern. The results are shown in Table 7.7

Table 7.7 Strength of Learning Cycle by Participant

Person	Spearman rank correlation coefficient	One-tailed test of significance
Ian	0.2332	$p<0.0001$
Bob	0.1334	$p=0.0002$
John	0.3099	$p<0.0001$
Bruce	0.2688	$p=0.0003$

The results indicated that John's use of conversational learning styles changed more in the order predicted than Bob's. But, overall, there was only a moderate correlation between learning style and the position of a turn in the discussion for the participants. None of the coefficients was negative which indicated that there was limited evidence for some progression in the order predicted. However, the consistency among individuals in the use of learning styles over each quartile meant that the coefficients were not high. Perhaps there was some limited progression from one style to another in the order predicted but not a full-scale progression through all the styles.

2.3. Summary of Results

- The Learning Style Inventory showed that all the participants, except Bruce, tended to use a convergent learning style. Bruce used a divergent learning style.

- The results from an analysis of the styles these people used in their discussions were very different. Ian and John tended to use an assimilative learning style whilst Bob and Bruce tended to use a divergent learning style. These tendencies were less marked than the results from the LSI.

- There was consistency in the learning styles that they used but there was also some variability over time. Greater variability was seen among those who spoke less often and this indicates that learning style use was often defined by the situation facing them at the time, rather than a uncomplicated expression of learning style tendencies.

- There was some evidence of progression in their use of learning styles over time but it was limited. John's use of learning styles changed more in the order predicted but Bob was more consistent.

3. Analysis Taking Group as the Unit of Analysis

In the first part of this chapter the analysis focused on individual differences in learning style. In the rest of this chapter individual differences are merged together to focus on the group.

Nonaka and Takeuchi (1995) suggested that in 'organisational knowledge creation' groups working on a project change the way that they think, speak and use knowledge according to the stage that a project has reached. The idea behind this is that certain kinds of learning become more appropriate after other kinds of learning have taken place. This was operationalised in this

research by an understanding that learning styles used in discussions indicate the different thought processes and knowledge used.

One of the assumptions of Nonaka and Takeuchi's theory of organisational knowledge creation is that these changes take place within a group. What is left unsaid is the degree to which all individuals in a group change their learning style according to stage of the process or whether individuals with the appropriate learning styles come to the fore at the right time. We have already seen that individuals' use of learning styles in this project was characterised by a mixture of consistency and variability. The question of how and when individuals use one learning style or another is examined in the next chapter in a detailed analysis of three subjects discussed during the project.

However, for the rest of this chapter the focus is on the learning style of the participants working together as a group. The reason that data was collected over the duration of a project was so that the idea of progression through the learning styles could be tested. The data was analysed to see the degree to which learning styles used in speech followed a pattern from divergence, to assimilation, to convergence and finally to accommodation.

The analysis is in four parts. The first part examines the degree to which people changed the learning style of their discussion in the predicted order as the design process progressed to completion.

The second part examines the degree to which this progression occurred separately in each of the ten meetings where the project was discussed. If there was a stronger progression in learning style within the meetings than across the project as a whole then the progression through learning styles may have had more to do with easing the passing of a meeting than the nature of the subjects being discussed in the meetings.

The third part examines the degree to which this progression occurred as the group discussed each 'subject'. The design of the goods area involved the development of several elements that

would eventually be combined in the final design. It was possible that the discussion of these subjects would also show progression through the learning cycle. Effectively, these subjects were sub-projects that together formed the project as whole. Each subject could form a progression in itself as knowledge about the subject was developed. It was also possible that some of these subjects would show a progression through the learning styles where the project would not.

The fourth part extends this subject-level analysis and examines the extent to which progression is a product of a balanced use of learning styles and consistent use of learning styles over short periods of time.

3.1. Learning Style Progression During Project

The design of the lift and goods area was largely complete by the last meeting. The analysis of the project as a whole examined the question of whether the learning style of the discussions moved from divergence through to accommodation as the design process progressed. This idea was tested by dividing the 2,815 turns at speaking into four quartiles, with around 700 turns in each. The learning styles used in each of these four quartiles were examined. If learning styles changed regularly throughout the project we would expect to see mostly divergent discussion in the first quartile, mostly assimilative discussion in the second quartile and so on. Table 7.8 shows the results. Bold type indicates the two most commonly used learning style in each quartile. Shading indicates the expected learning style if the pattern was as predicted.

Table 7.8 Learning Style of Turns by the Quartile of the Project in Which They Occurred

	Divergent		Assimilative		Convergent		Accommodative			
Quartile	N	%	N	%	N	%	N	%	Total N	Total %
1/4	**298**	**42%**	**267**	**38%**	68	10%	71	10%	704	100%
2/4	**238**	**34%**	**225**	**32%**	114	16%	127	18%	704	100%
3/4	133	19%	**201**	**29%**	**203**	**29%**	166	24%	703	100%
4/4	145	21%	**285**	**40%**	**160**	**23%**	**114**	**16%**	704	100%
Total	814	29%	978	35%	545	19%	478	17%	2815	100%

There was some evidence that there was a progression from one learning style to another over the course of the entire goods area design but it was limited. Looking across the first three quartiles of the group's discussion there were steadily fewer divergent turns and more accommodative turns, as predicted. And the first or second most common learning style used in each quartile were the expected learning styles.

However, the evidence for a progression was limited. The expectation was that the discussion would be mostly divergent in the first quartile, mostly assimilative in the second quartile, mostly convergent in the third quartile, and mostly accommodative in the fourth quartile. However, the modal category for each quartile respectively was divergent, divergent, convergent and assimilative. Certainly, there were substantial proportions of turns in categories outside the expected pattern. Perhaps the most important difference to the expected trend was the return to assimilation in the last quartile of the goods area discussion.

A correlation coefficient was calculated that described the strength of the relationship between the position of a turn at speaking in the entire discussion and its learning style. Divergent speech was given a value of one, assimilative speech a value of two, convergent speech a value of three and accommodative speech was given a value of four. The expectation was that there should be more divergent turns in the early parts of the discussion and more convergent turns in the later parts. The correlation coefficient for the 2,815 turns studied here was 0.214 ($p<0.0001$). There was a positive relationship between turn number and style so that learning style progressed in the order indicated as the design proceeded. The relationship was significant but the small size of the coefficient suggested that there were also other reasons for the use of particular learning styles at any particular point in the discussion.

3.2. Learning Style Progression Within Each Meeting

The division of the project discussion into quartiles disguised some of the variability in the learning styles used in that discussion. Another way of looking at the data was to see which learning style was most commonly used in each meeting of the project team.[8]

Table 7.9 Learning Style by Meeting

Meeting	Divergent	Assimilative	Convergent	Accommodative	Grand Total	Total N of Turns
1	**45%**	**37%**	9%	10%	100%	422
2	**28%**	**42%**	15%	15%	100%	171
3	**42%**	**29%**	13%	16%	100%	396
4	0%	11%	**57%**	**32%**	100%	28
5	20%	**35%**	**24%**	20%	100%	282
6	**27%**	**33%**	26%	14%	100%	352
7	10%	**25%**	**42%**	22%	100%	173
8	19%	**29%**	**28%**	24%	100%	415
9	**21%**	**43%**	20%	16%	100%	471
10	10%	**41%**	**37%**	12%	100%	105
Total	27%	34%	22%	17%	100%	2815

Note: The figures in **bold** show the two most commonly used learning styles in each meeting.

Table 7.9 displays the greater variation in the use of learning styles that we can see in a more fine-grained approach. As we saw in the previous table, there was a slight drift from the use of divergence to the use of convergence. As before, the variation outside of the expected pattern was caused by something other than the stage of the project as a whole.

This division of the discussion into meetings allowed examination of the degree to which progression from divergence to accommodation occurred separately within each of the ten meetings. If there was a stronger progression in learning style within the meetings than across the project as a whole then the progression through learning styles would have had more to do with easing the passing of a meeting than the nature of the subjects being discussed in the

[8] Table 5.3 in Chapter 5 shows how turns were distributed by meeting and subject.

meetings. Conversely, if the division by meeting disguised or reduced the strength of learning style progression then other factors would have greater explanatory power.

The results here answered the question of whether the style of communication moved from divergence through to accommodation during each meeting, regardless of the subjects discussed. Correlation coefficients were calculated for the relationship between the position of a turn within a meeting and the learning style of that turn. A high positive correlation would show that people tended to use one learning style after another in the order indicated. A high but negative correlation would show that people tended to use learning styles in the reverse of the order specified above. A correlation close to zero would indicate that there was no pattern. Table 7.10 shows the correlation coefficients for each meeting.

Table 7.10 Correlation Between Position of a Turn Within a Meeting and Learning Style

Meeting	Correlation (r)	Significance (p)	N of Turns
1 §	-0.0368	0.4508	422
2	0.6371	<0.0001	171
3	0.1512	0.0026	396
4	0.4970	0.0071	28
5	0.3632	<0.0001	282
6	0.3702	<0.0001	352
7 §	-0.1229	0.1073	173
8 §	-0.0244	0.6197	415
9	0.1428	0.0019	471
10 §	-0.4883	<0.0001	105

These results show considerable variation in the use of the different learning styles within meetings. Three of the ten meetings had a significance value of more than 0.05. Not surprisingly, these three meetings had very low correlation coefficients. One further meeting had a strong negative correlation. I was looking for evidence of a positive correlation. Therefore, this meeting also counted against the expectation that there was a relationship. These four meetings (highlighted with a §) either had an assumed zero correlation or a negative correlation between the position of a turn in a meeting and learning style. This left six meetings out of the

original ten where the coefficient was positive and the probability value was less than 0.05. In four out of ten meetings the correlation coefficients were higher than that found over the entire discussion of the goods area (r=0.214).

Looking at these figures overall, it seemed that more often than not progression through the learning styles in individual meetings was less than that through the project as a whole. There was little evidence that there were conversational learning cycles taking place within meetings. This implied that there were other, stronger explanations for changes in the uses of learning style.

3.3. Learning Style Progression by Subject

The design of the goods area involved the development of several elements that would eventually be combined in the final design. Very often these elements would be discussed independently from each other and these discussions often took place over several meetings.[9] For example, discussion of how fast the lift went would be separate from discussion of how it would look when finished. I created a list of these subjects by going through the data identifying the separate elements of the goods area that were discussed. These subjects were often recognised as particular features of the design requiring separate discussion by the participants and knowledge about them also developed somewhat independently of other subjects.

This part of the analysis examines the degree to which the learning style used by the group changed as they discussed each subject. It uses the conversational learning style data and also draws on my understanding of how these subjects were discussed.

Subjects were often discussed over several meetings and they were developed at different points during the project. One of the reasons for assuming that there was a progression through the learning styles over an entire project is that knowledge and expertise change as the project is discussed. One learning style develops from the previous learning style as people build on

the knowledge used and created using that previous learning style. It is this accumulation of experience and knowledge and the shift from one learning style to another that characterises the stage of a task.

It was possible that the discussion of the different subjects would show progression through the learning cycle in addition to progression over the project as a whole. Effectively, these subjects were thought of as sub-projects that together formed the project. Each subject could form a progression in itself. It was also possible that some of these subjects would show a stronger progression through the learning styles than the project as a whole. In this case the analysis would allow further informed investigation of how and when this took place.

See Table 7.11 for a description of the fifteen subjects that formed the discussion examined here. Broadly, subjects one to six covered discussion of the lift, subjects seven to nine covered the scissor lift, subjects ten to twelve covered the loading platform and subjects thirteen to fifteen covered other issues to do with the goods in/out area.

Some subjects required greater use of one learning style compared to other subjects. The use of a particular learning style depended on how easy a subject was to resolve or on the knowledge and expertise that participants already had on that subject. For example, if participants already had experience of a particular subject and understood it both logically and intuitively they might quickly move to a convergent style of discussion and make a decision about it. Alternatively, a problem may have proved to be difficult to solve logically because of insufficient explicit knowledge and participants could have focused on a more experiential, open-minded style of talking such as divergence.

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[9] Table 5.3 in Chapter 5 shows how turns were distributed by meeting and subject.

Table 7.11 Subjects Discussed as Part of the Design of the Goods Area and Lift

Subject		Description
1	Type Of Lift	The group discussed the various sizes and types of lift available in relation to their needs. They answered the following questions: Was the lift to be built inside the existing building or on the side of the building? Would it need to take passengers? How big did it need to be? They then chose a full-size goods lift that could take passengers as well as a full pallet load.
2	Lift Location On Building	Discussed the best location for the lift in relation to the use of space internally in relation to the stores and the existing structure of the building.
3	Lift Performance	The group discussed how fast the lift would move and the time taken to respond to calling the lift. Ian's attitude was that they take as long as they take and the others should accept that. The others in the group thought about lifts and pushed Ian to try and get the lift company to meet their needs. Ian did talk to the lift company but they did not provide any better performance. Ian asked the rest to accept the performance of the lift as it came.
4	Lift Appearance	The group discussed how the lift shaft would integrate aesthetically with the rest of the building including dummy windows around the top of the lift shaft. They also discussed what kind of door they wanted on the outside of the lift and what material and colour they wanted on the floor of the lift.
5	Lift Machinery, Plant Room, Ducts Across Roadway	The group discussed where the machinery for the lift would be housed. Once they had decided they could put it into an existing plant house across the roadway they discussed the implications for the shower room in the plant house and how the pipes and wires would cross the road.
6	Lift Control and Operation	The group discussed the details of how the lift would operate: how to prevent unauthorised access and allow authorised access to the lift doors outside. They thought through what the experience of using the lift would be like including what buttons would be available and which doors would open when.
7	Scissor Lift Placement	The level of the ground floor was higher than the roadway outside. A scissor lift or moving platform was needed to bring goods from the roadway up to the level of the loading platform, the lift and the floor level inside. This discussion centred around the best location for the scissor lift in relation to the lift and goods in/out doors and the ease of use of the loading bay area.
8	Scissor Lift Type and Size	The group discussed of what a scissor lift was and the size needed to raise goods from the roadway up to the loading bay platform and lift and goods in/out doors.
9	Scissor Lift Specification, Operation & Gates	Ian presented the others with pictures and specifications of scissor lifts. The group discussed several ways that the scissor lift might be used. They interpreted the specifications and tried to come up with explanations for the restrictions that they found. The key restrictions were the safety balustrades and gates around the edge of the scissor lift.
10	Loading Platform Shape and Function	The group very quickly decided to have a larger loading bay than their existing one, particularly as they needed to wheel into an external lift shaft. They spent some time discussing the extent and shape of this platform, including reporting experiments with a pallet lift and talking about how much room would be left in the roadway past it.
11	Loading Platform Ramps and Steps	At the time of meetings there was simply a ramp and some steps leading up to the goods in/out doors. The addition of a loading platform covering a much bigger area prompted discussion of where a ramp and steps would be put in the new arrangement.
12	Loading Platform Balustrading	Ian, the architect, argued that a new larger loading platform needed balustrading around its edge to stop people from falling off. The rest of the group resisted this suggestion because the platform was not very high and because it would interfere with loading and unloading.
13	Canopies, Lighting	At the third meeting Bob introduced the idea of a canopy which would protect the loading platform from the worst of the weather. There would also be one around by the back door. The founder of the business had suggested that they have one some time previously. They discussed the extent of it and how it would look and fit in with the emerging plans.
14	Type of Doors	Doors entered the discussion of the design of the goods area in several ways. Firstly, the existing goods in/out doors had to be moved to make way for the new lift shaft. Secondly, the rear doors were too big and blew around in the wind. Thirdly, John was unhappy with the current state of the rear doors as one dragged on the ground.
15	Drainage	The group discussed the drains that ran underneath the existing goods in/out area. The drains had to be changed because of the new loading platform above them and the group was concerned not to end up with too many restrictive hole covers above the drains.

It was informative to examine the different learning styles used by the group as they discussed each subject (see Table 7.12). We can see that when deciding the location of the lift on the building (Subject 2) and choosing the kind of scissor lift that they wanted (Subject 8) participants tended to use more divergent styles of talking. These subjects were discussed early on in the project and participants were drawing on concrete and unformed experiences to help them decide what they wanted.

Table 7.12 Learning Style by Subject

Subject	Divergent	Assimilative	Convergent	Accommodative	Total	Total N
1	25%	**36%**	15%	24%	100%	264
2	**40%**	26%	15%	18%	100%	151
3	22%	27%	20%	**31%**	100%	236
4	28%	**30%**	21%	22%	100%	254
5	31%	**44%**	14%	11%	100%	140
6	21%	**31%**	**37%**	10%	100%	67
7	**43%**	**42%**	4%	11%	100%	113
8	**46%**	**41%**	8%	5%	100%	74
9	24%	**48%**	24%	4%	100%	294
10	25%	**44%**	21%	10%	100%	176
11	**40%**	21%	23%	16%	100%	129
12	**31%**	**34%**	15%	21%	100%	357
13	**32%**	**33%**	23%	13%	100%	203
14	22%	**33%**	27%	18%	100%	308
15	**37%**	20%	14%	29%	100%	49
All Subjects	29%	**35%**	19%	17%	100%	2815

Notes: Bold figures indicate that participants used one learning style for more than 30% of the turns in a subject

In contrast, when participants discussed how the lift would work in practice (Subject 6) the group used many more convergent turns. This was because of the focus on action and practice and the experimentation with the explicit plans and conceptual models of the lift that had been developed previously. Also, this discussion came later on in the project.

These results began to provide a picture of how each subject was discussed. This picture was informed by my understanding of the prior knowledge about each subject by the participants, how the subjects were inter-dependent in the overall project, and whether they were discussed early or late on in the project. This kind of analysis is taken up in the next chapter.

One further question was whether the discussions of these different subjects showed progression, through the learning cycle, in addition to progression over the project as a whole. The rationale for this division by subject was two-fold: firstly, each subject could act as a small project in itself; secondly, progression in conversational style over the project as a whole could be disguised by the staggered and fragmented discussion of subjects within the project.

The second point needs further elaboration. The project was divided into fifteen separate subjects. On the whole, subjects were discussed one at a time. This reflects the often linear and sequential nature of language. However, not all the discussion of these subjects started in Meeting 1 (26 February) and ended in Meeting 10 (3 July). The group discussed some subjects at the beginning of the project, in the first few meetings, and other subjects towards the end of the project. Even if the group changed their style of discussion regularly and consistently through each subject in the order expected, this staggering would reduce the visibility of this effect. In operational terms the staggering and fragmenting of subject discussions would reduce the size of the correlation coefficient over the project as a whole.

One way of thinking about this is to create an imaginary data set. Imagine that all the discussion about the project was divided into two and that all the subjects discussed progress neatly through the learning styles. Each subject would show a correlation coefficient of 1.0 . Imagine further that discussions about half of the subjects are started at the beginning and the rest are started half-way through. In this situation the correlation coefficient would be about 0.5. That is, in spite of a regular progression in conversational style for each subject the overall effect for the project as a whole would not be as strong.

The research question was refined as follows. If there was weaker evidence of progression in conversational style within the subjects than across the project as a whole (as we saw with the analysis of separate meetings) then the project would be the most appropriate focus for studying that progression. This would pose problems for the whole idea of a regular change in learning style because the progression within subjects was low and the coefficient for the project as a whole was not especially high.

If there was stronger evidence of progression in learning style within each of these subjects than across the project as a whole then it would suggest that the staggered start for each of these subjects reduced the strength of the progress over the project as a whole. This would imply that progression was more easily found in the subjects than in the project as a whole. Again, correlation coefficients were calculated to determine the strength of progression through the learning styles within the discussion of each subject (see Table 7.13).

Table 7.13 Association Between Turn Position and Learning Style Within Subjects

	Subject	r	n	p	Summary
1	Type of lift	0.3907	264	<0.0001	No clear pattern.
2	Lift location on building	0.4035	151	<0.0001	High correlation but divergent in the middle.
3	Lift performance	0.6418	236	<0.0001	Shows a fairly steady progression from one style to another but variety of styles used at any time.
4 §	Lift appearance	0.0374	254	0.5527	No pattern across all meetings at all. Within meetings learning styles made some progression.
5 §	Lift machinery, plant room, ducts	0.0485	140	0.5689	No convergent or accommodative turns.
6	Lift control & operation	0.2726	67	0.0256	No clear pattern
7 §	Scissor lift placement	0.0790	113	0.4506	Mostly divergence & assimilation
8	Scissor lift type, size	0.2279	74	0.0509	Mostly divergence & assimilation
9	Scissor lift spec, operation, gates	0.3342	294	<0.0001	Progression to turn 136 out of 294, no clear pattern after.
10	Loading platform shape, function	0.1901	176	0.0115	No clear pattern
11	Loading platform ramps, steps	0.3502	129	<0.0001	No clear pattern
12	Loading platform balustrading	0.3319	357	<0.0001	Can see progression within meetings.
13	Canopies, lighting	0.2427	203	0.0005	Progression to 97 out of 203, assimilation & convergence after.
14	Type of doors	0.1300	308	0.0225	No pattern across all meetings at all. Within meetings learning styles made some progression. Not from turn 244-308.
15	Drainage	0.7574	49	<0.0001	Shows a fairly steady progression from one style to another but variety of styles used at any time.

Notes: r = Spearman rank correlation coefficient, n = number of turns in a subject, p = significance value.

Three out of the fifteen subjects identified here had p-values higher than 0.05. This means that we cannot be confident that the correlation coefficient was positive. Indeed in these three subjects (highlighted with a §) the correlation coefficients were close to zero. The other twelve subjects all had positive and significant correlation coefficients. This indicated that, at the very least, there was some evidence that over the course of the discussion on each subject there was some movement in the use of one learning style to another in the direction predicted. Of the fifteen subjects, ten had significant correlation coefficients that were higher than that for the project as a whole (r=0.214).

These results show that there was stronger evidence of progression in learning style within each of these subjects than across the project. This suggested that the staggered start for each of these subjects reduced the strength of the progress seen over the project as a whole. This would imply that progression was more easily found within subject discussions.

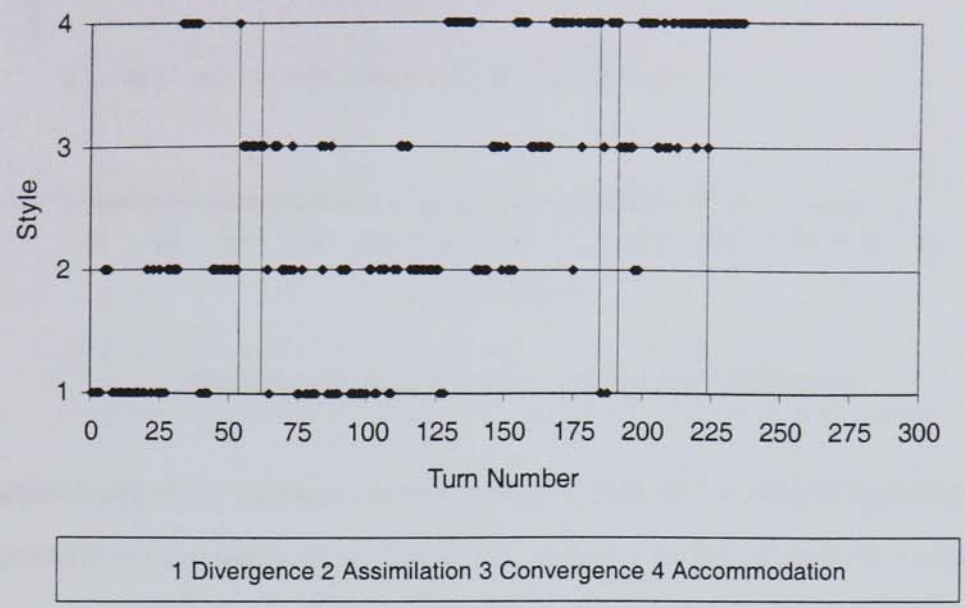
The size of the correlation coefficients showed that there was a moderately strong association between the position in the discussion and conversational learning style. That is, as discussions about these subjects progressed, the conversational learning style moved through the sequence of divergence, assimilation, convergence and accommodation. Thus, there was some support for the idea that people choose conversational learning styles that depend on the use of the previous learning style.

Correlation coefficients were useful for summarising the variability in the use of learning styles when looking for learning style progression. However, they also discard a great deal of the turn-by-turn changes in learning style. Talkograms for each subject were produced from the same data and were used to see whether the associations identified above were visible when displayed graphically. The results of this graphical analysis are briefly summarised in the last column of Table 7.13.

Subject 3, where the group discussed the performance of the lift, had the highest correlation. In this subject there was a clear movement from a divergent conversational style through to

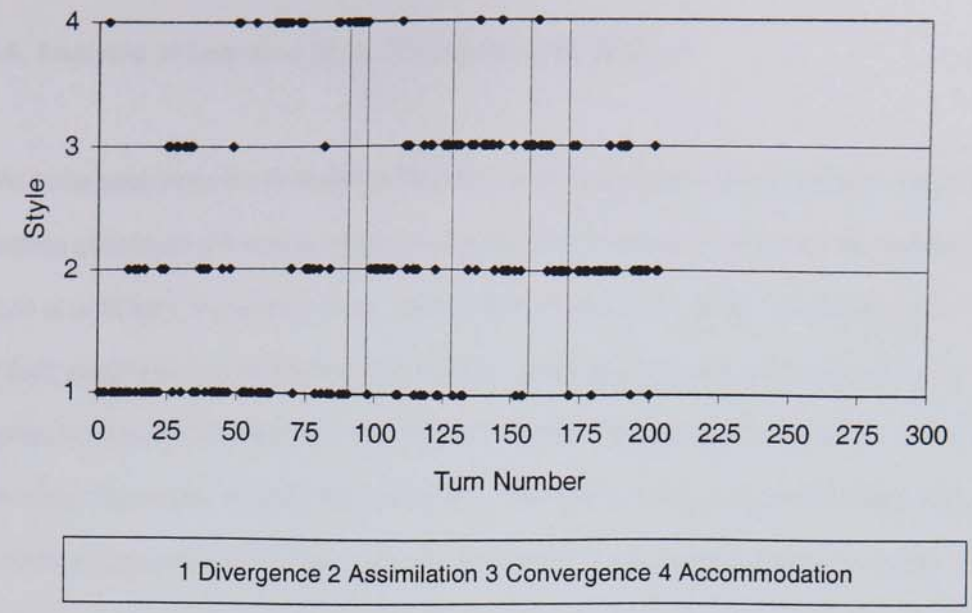
accommodation. The talkogram also showed that the group used a variety of conversational learning styles at any point in time (see Figure 7.2).

Figure 7.2 Subject 3: Lift Performance Talkogram



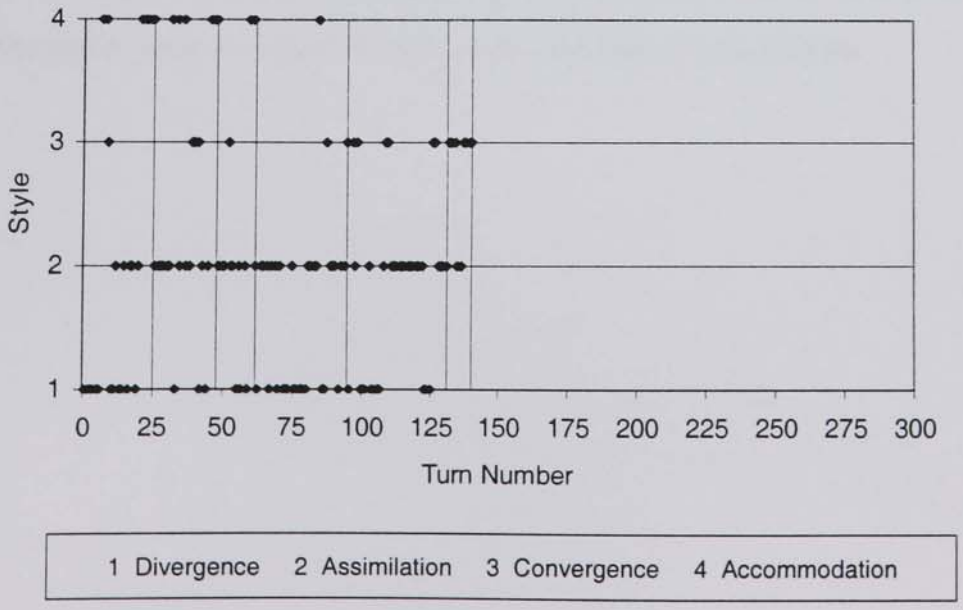
In Subject 13, the group discussed the design of the canopies to be built over the new loading bay area to protect them from the weather. This subject had a positive correlation but it was lower than the correlation for Subject 3. The talkogram showed that, initially, there was strong use of divergence and this was followed by assimilation (see Figure 7.3). However, use of convergence seemed to be truncated and the lack of accommodation towards the end of these discussions meant that the group ended the discussion using assimilation.

Figure 7.3 Subject 13: Canopies and Lighting Talkogram



Subject 5 was one of the three subjects where the correlation coefficient was close to zero. The discussion of this subject centred around the location of the lift machinery in a plant house across the roadway and how the ducts could be integrated into existing service trenches. The talkogram shows that this discussion was characterised almost entirely by the reflective learning styles of divergence and assimilation (see Figure 7.4). The lack of convergence and accommodation meant that there was no progression through a learning cycle.

Figure 7.4 Subject 5: Lift Machinery, Plant Room, Ducts Across Roadway



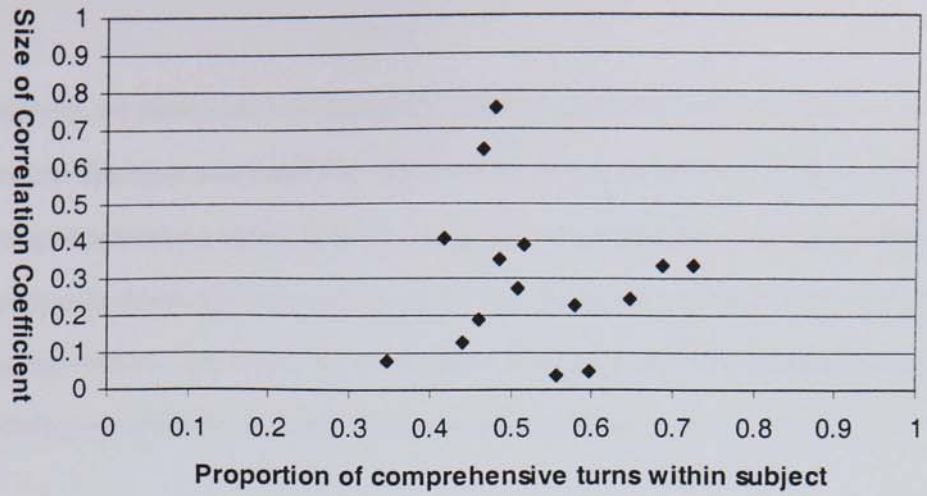
3.4. Analysis of Learning Style Progression by Subject

We have seen how the strength of learning style progression within each subject varied. This section examines the extent to which progression is a product of particular patterns of learning style use. Firstly, the work of Kolb (Kolb, 1984; Kolb et al., 2002) and Nonaka and Takeuchi (1995) suggests that a balance in the use of learning styles about the two axes of apprehension-comprehension and reflection-action can generate better and more integrated learning. We examine whether a balance in the use of learning styles in these discussions led to a stronger progression in learning style. Secondly, we have seen how the use of learning style at a turn-by-turn level can be highly variable. We examine whether turn-by-turn consistency in the use of learning styles within each subject was related to progression in learning style.

3.4.1. Learning Style Progression as a Product of Balanced Use of Learning Styles

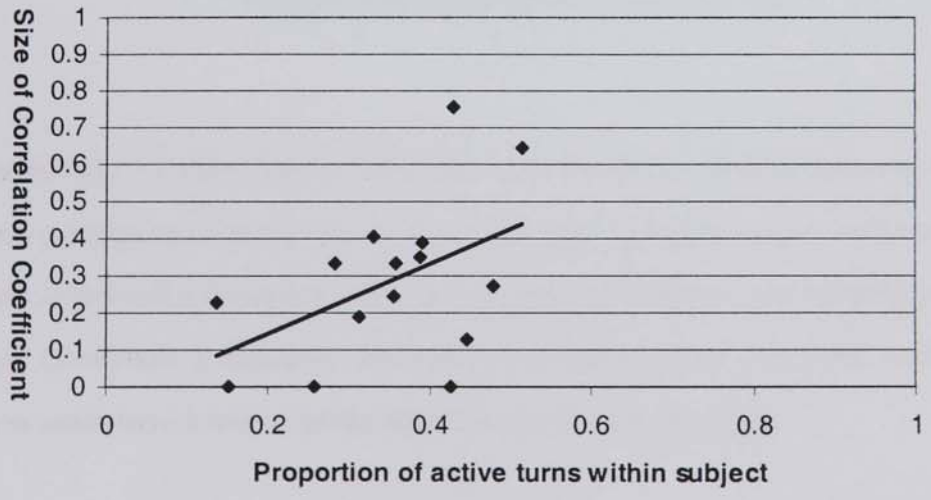
Kolb et al. (2002) argue that a balance is needed between apprehension and comprehension. If this is the case then the optimum proportion of comprehensive turns in a discussion would be half. A chart was plotted of the proportion of comprehensive turns in a subject and the resulting progression through the learning cycle (Figure 7.5). It showed that although most subjects do seem to have a balance between apprehension and comprehension, there is no discernible advantage in terms of a strong learning cycle in subjects with that balance.

Figure 7.5 **Scatterplot of Proportion of Comprehensive Turns Against Strength of Conversational Learning Cycle by Subject**



Over the whole project, participants tended to use reflective learning styles more frequently than active turns. Kolb et al. (2002) argue that a balance is needed between reflection and action. If this is the case then the optimum proportion of active turns in a discussion might be half of all turns. A chart looking at the proportion of active turns in a subject and the resulting progression through the learning cycle shows some evidence that this relationship exists for this project (Figure 7.6). The cycle was stronger the more a discussion balanced reflective and active turns.

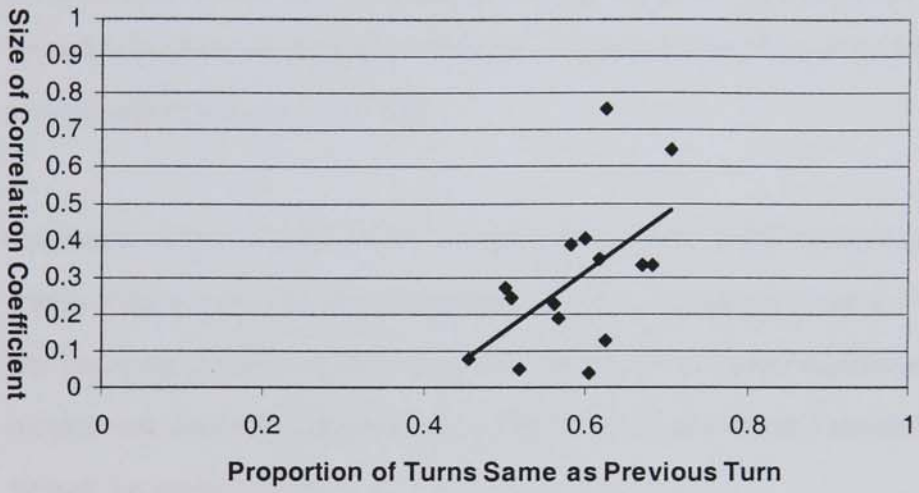
Figure 7.6 **Scatterplot of Proportion of Active Turns Against Strength of Conversational Learning Cycle by Subject**



3.4.2. Learning Style Progression as a Product of Turn-by-Turn Consistency in the Use of Learning Style

Secondly, we have seen how the use of learning style at a turn-by-turn level can be highly variable. We have also seen that over the course of a subject there can be a progression through the learning styles. Even in subjects where this progression was quite strong participants would still use a variety of learning styles over several turns. A chart was plotted to examine whether turn-by-turn consistency in the use of learning styles within each subject was related to progression in learning style (see Figure 7.7).

Figure 7.7 **Scatterplot of Consistency in Learning Style Between Turns Against Strength of Learning Cycle by Subject**



Interestingly, the chart showed that progression through the learning styles was stronger the more participants tended to follow a turn in one learning style by a turn using the same learning style. In terms of a talkogram, this would be seen as clusters of turns using the same learning style. Conversely, a discussion where the use of learning styles was highly variable between turns would have a weaker progression through the learning cycle.

3.5. Summary

- There was a positive relationship between conversational learning style and turn number so that discussions moved through a learning cycle the design progressed. The small size of the coefficient suggested that there were also other reasons for the use of particular learning styles at any particular point in the discussion.

- The presence of a strong positive correlation for most subjects indicated that the group tended to use a more divergent approach as they began to discuss a subject and then moved through all the other styles.

- The correlations for the subjects that comprised the project showed more progression than for the project as a whole. This suggests that the staggered and fragmented discussion of the subjects obscured progression through the whole project. That, or the boundaries of the project were too narrow or too wide.

- Discussions of the subjects were balanced in the number of apprehensive and comprehensive turns. Greater balance did not mean stronger progression through the learning cycle. However, subject discussion tended to be more reflective than active and subjects with greater balance between reflection and action showed stronger progression through the learning cycle.

- The group used a variety of learning styles at any point in their discussions, even when the progression through the learning styles was clear. However, the progression through the learning cycle was stronger when a turn using one learning style tended to be followed by a turn using the same learning style.

4. Chapter Summary

The analysis using quantitative data provided useful answers to some of the questions this research was investigating. The results showed that there were several factors or variables affecting the use of conversational learning style in this project. The quantitative analysis studied each of these separately so that each pattern uncovered also prompted further questions.

For instance, each **individual's** use of learning styles in their discussions with the other participants showed some consistency but also some variability. As a **group**, the discussion changed over the course of the **project** showing less use of divergence and greater use of convergence and accommodation, but the pattern was not entirely clear. At the group level, conversational learning style **progression** through a learning cycle was strongest within discussion of the various **subjects** that comprised the project. This progression through the learning cycle was **stronger** if there was a **balance** in the use of reflective and active turns, and if participants tended to use the same learning style **consistently** over short sequences of turns.

Chapter Eight

Results of Qualitative Analysis of Three Subjects

1. Introduction

This chapter comprises the second part of the analysis. It builds on the results from the last chapter by expanding the quantitative analysis and augmenting these results by a detailed analysis of the transcripts that were used to produce the quantitative data. This extended and more interpretative analysis allowed consideration of individual and group use of learning styles simultaneously as well as the interaction of status and solidarity with the knowledge required to complete the task.

As we have seen already, the discussion about the design of the lift and goods area was divided into fifteen subjects (see Table 7.11 in Chapter 7 for a summary of each subject). This division proved useful as it distinguished between subjects with more or less predictable changes in learning style.

Three subjects are examined in this chapter. The decision to focus on three subjects was partly practical. It took a long time to analyse data in depth. In addition, the focus on subjects rather than meetings allowed an analysis of the existing expertise and developing knowledge of the group as they discussed a subject over several meetings. Table 8.1 outlines how the three subjects were chosen. An over-riding concern was to see why discussion of one subject would show progression in learning styles whereas discussion of another subject would not.

Table 8.1 Choice of Subjects for Extended Analysis

Subject 2 Location of Lift on Building	This subject was chosen because of its importance to the project as a whole. Other elements of the goods area design, such as the location of the scissor lift, ramp and steps, depended on this discussion. It was discussed early on in the project and the group used more divergent learning style turns than usual. This subject showed the third strongest progression through the learning styles.
Subject 3 Lift Performance	This subject was chosen because it was an autonomous subject with seemingly few connections to other subjects. It was interesting because there was a split between Ian and Audio Devices in the attitude to this subject. The discussion of this subject was more accommodative than any other which emphasised greater use of feeling. Use of accommodation could also suggest successful closure of a discussion. This subject also showed the clearest progression through the learning styles.
Subject 4 Lift Appearance	This subject was chosen because discussion of this subject showed no progression through the learning styles and yet each learning style was used fairly evenly. It was used as a counter-factual case to see how and when some of the ideas tested in this research were not supported.

The analysis of these three subjects is structured as follows: firstly, the content of the subject is summarised along with the principal characteristics of the learning styles used in the discussion; secondly, a précis of the discussion is presented that focuses on each participant's contribution and the nature of the interaction between those contributions; this is followed by an analysis that focuses on the relationship between learning style and the knowledge that was developed through the discussion; finally, this detailed understanding of the styles used in a subject was analysed using the five dialectics identified by Kolb et al. (2002) as fundamental to the idea of conversation as experiential learning (see Table 8.2).

Table 8.2 Dialectics for Understanding Conversation as Experiential Learning

1.1 Apprehension and comprehension	Good conversation balances direct experience and theory, unconscious & conscious, tacit & explicit knowing.
1.2 Intention/reflection and extension/action	Good conversation balances doing and seeing, acting and thinking. Balance between action and reflection.
2 Linear time and cyclical time	Good conversation is not too linear (discourse) or cyclical (recourse).
3 Status and solidarity	Good conversation is not too dominated by rigid hierarchy or pathological heterarchy.
4 Individuality and relationality	Good conversation is not too dominated by individual or group experiences.

Whereas the quantitative analysis in the last chapter took the data and summarised all the variation in tables and figures, a more detailed and grounded analysis was needed to understand several factors at once. The transcripts contained much of the life and detail of the discussions and were examined to see how the particular distribution of turns came about. For example, as I examined a transcript I could see what was happening turn by turn and got a much better feel for what each person was trying to achieve with their turn at speaking. Appendices 5 to 7 contain the transcripts for Subjects 2 to 4 respectively. These transcripts are annotated with the learning style coded for each turn. This data was further reduced by summarising short sections of the discussions and writing a commentary on the learning styles used by the participants. These summaries and commentaries were used for the précis and analyses referred to above. Appendices 8 and 9 present this data reduction for Subjects 2 and 3 respectively. However, as we shall see below, discussion of the appearance of the lift (Subject 4) varied substantially between meetings. As a consequence, shorter sections of this discussion were studied individually and the reduction of data for this subject was not needed.

The different learning styles used in the discussions were displayed using talkograms. These were useful because they connected the detail of the transcript to an overview of a sequence of turns. They also aided the process of data reduction by displaying sequences of turns with consistent or widely varying use of learning styles. However, each subject also had very different properties: tables and statistics were used as they were needed to explore the differing natures of these subjects.

The analysis that follows demonstrates how a detailed analysis can inform a view of how people actually use learning styles in conversation. It shows how learning style relates to what people know about a subject and the importance that they attach to the knowledge that they use.

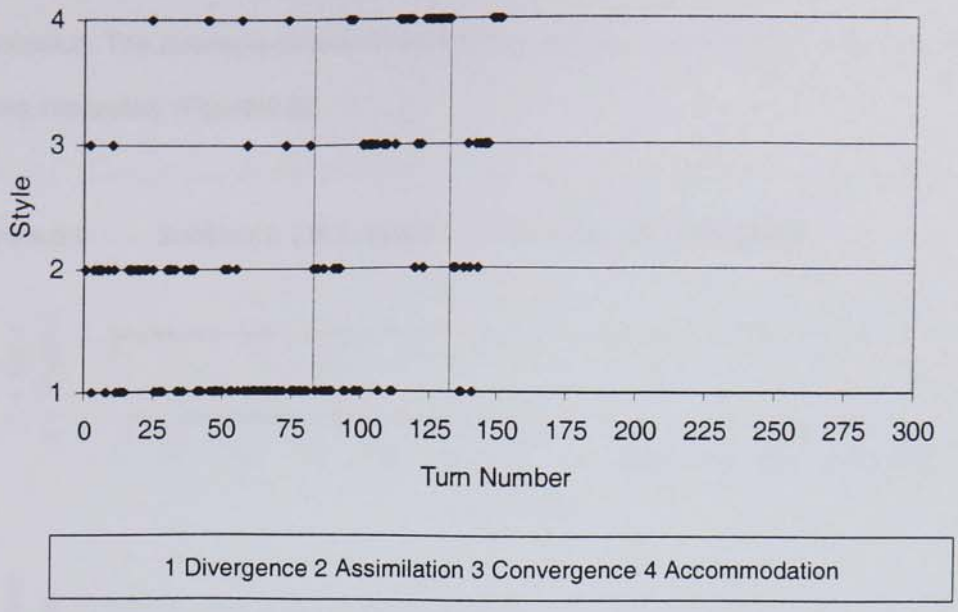
2. Subject 2: Lift Location on Building

This subject was discussed for a total of 151 turns over three meetings. When this subject came up for discussion participants talked about the best location for the lift on the building. They talked about the use of space internally, the existing structure of the building and how they wanted the goods area to work outside. These decisions were made fairly early on in the project. See Figure 8.1 to see what the existing goods area looked like from the outside.

Figure 8.1 Photo of Existing Goods Area (View From the Rear of the Building)

Although there was a fairly strong correlation between the position of a turn and the learning style of that turn for this subject there was not a simple progression from divergence through to accommodation. The talkogram (see Figure 8.2) shows the learning style of all the turns for this subject. The vertical lines on the talkogram illustrate that this subject was discussed at three meetings. The turn number axis shows the position of each turn within the discussion of the subject.

Figure 8.2 Subject 2: Lift Location on Building Talkogram



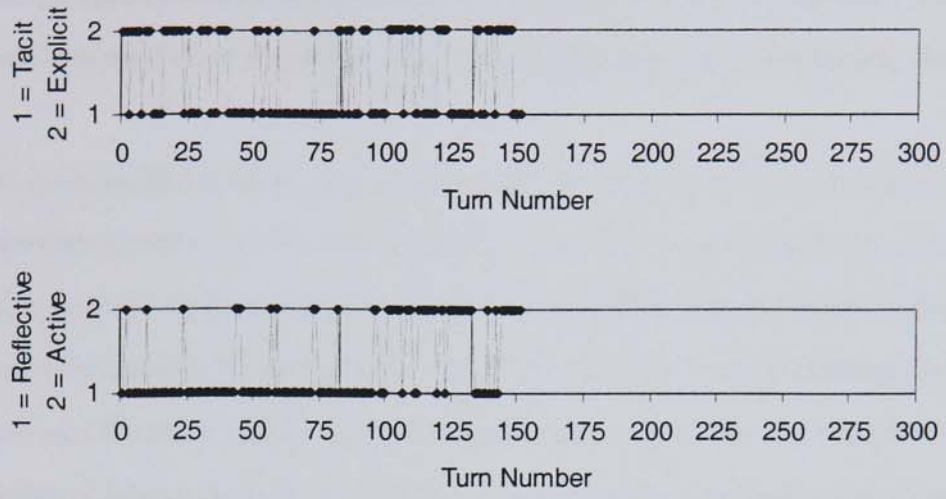
The discussion of this subject in the first meeting did not show progression from divergence to accommodation. The group began their discussion by using predominantly assimilative turns. This emphasised a logical and reflective approach. Part of the way through these discussions they began to use more divergent language. This showed a movement from a logical to a more intuitive and experience-based approach. There was no progression through the learning styles in the first meeting. The discussions in the following two meetings showed greater progression from divergence to accommodation. The correlations for the discussions by meeting supported this view (see Table 8.3).

Table 8.3 Subject 2, Lift Location on Building: Strength of Learning Cycle by Meeting

Meeting	Number of Turns	Correlation	Significance
1	83	-0.3026	0.0054
2	50	0.7093	p<0.0001
5	18	0.8395	p<0.0001
Whole subject	151	0.4035	p<0.0001

As noted above, there were very few convergent and accommodative turns in the first meeting. Thus, the participants used largely reflective turns until two-thirds of the way through the discussion. The picture is clearer when looking at the two dimensions underlying the learning styles separately (Figure 8.3).

Figure 8.3 Subject 2, Lift Location on Building: 3D Talkogram



However, it was only possible to understand this pattern by examining what actually happened in the discussion of this subject. Below is a summary of the discussions that the group had about the lift's location on the building.

2.1. Précis of Subject 2

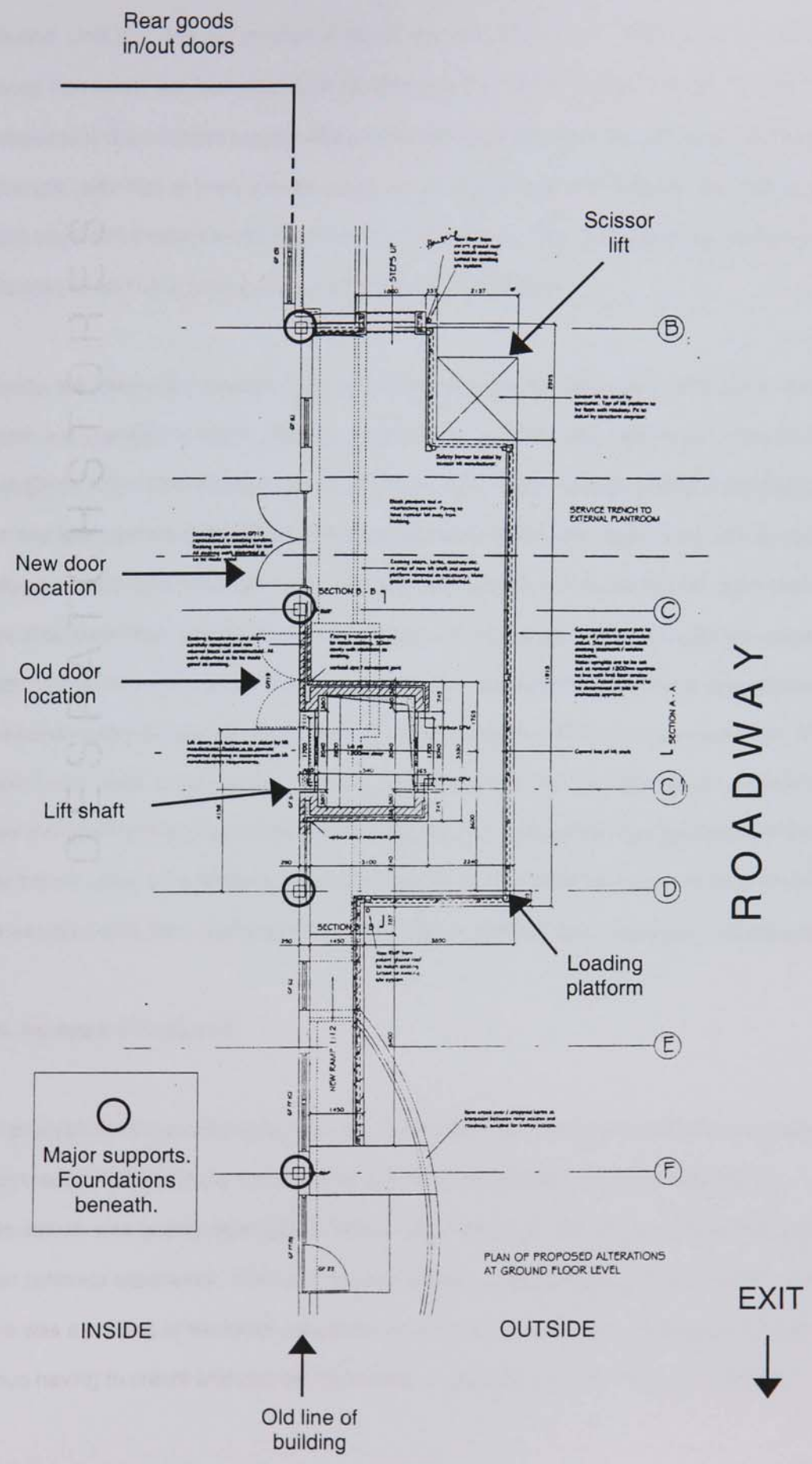
The group had already decided to have a full-size goods lift and to build it on the outside of the existing structure. The group now had to decide where to put the new lift on the existing building. The decision depended on the use of the goods areas inside and the existing structure of the building. They all agreed that the lift would have to be next to the current stores area but Ian said that it would need to occupy a position between the main footings and supports for the building. This gave the group the choice of two 'bays', the spaces between the main supports. Making the choice was a complex process. Ian's choice of location for the lift meant that the goods in/out doors would have had to move. John wanted to make sure that it was easy to move goods in and out from both the new lift and the doors.

John knew best how the goods in/out area worked and how he wanted it to work after the lift was built. He was also responsible for plans to reorganise the location of staff and equipment inside the building. Ian knew more about how the structure constrained their choices. He also had his own ideas about what could be done with the existing doors, which they still needed, and the size and shape of the loading platform. Ian also wanted Audio Devices to decide if they were going to proceed and, if so, where they wanted the lift so that drawings could be prepared. Once they decided on a location, the structural engineers could continue their work.

The group started to discuss the location of the lift in the first meeting. Ian explained that the preferred location for the lift shaft (between points B and C on Figure 8.4) would not work because of the ducts below ground level. His proposal was that the lift should be nearer the front of the building between points C and D and the doors moved to between points D and F. John said that this would be very inconvenient for the movement of goods given the way he wanted to use the space inside. Part of the problem was the location of the proposed scissor lift to bring goods up from road level.

Ian and John both stuck to their positions. Ian could not have the lift over the ducts. John could not have the doors further away from the stores area. Ian came up with several solutions by changing the location of the scissor lift, and the ramps and steps of the loading bay. Each time John would reject his suggestions. Eventually, John started coming up with ideas of his own. It was only when John was given the opportunity to talk at greater length about the new internal layout and his needs, and when he took that opportunity, that Ian came up with a solution that all agreed on. This is the solution presented in Figure 8.4.

Figure 8.4 Plan for Lift and Loading Bay Area at Audio Devices



This subject was raised four times in the first meeting and the group did not find a solution until the end. Until that time the location of the lift was only discussed in the context of the other issues that had to be dealt with, such as choosing the kind of lift they wanted. The participants needed to know a certain amount about what the others knew or thought about this issue. For example, John had to learn that Ian could not put the lift over the ducts and Ian had to learn that John could not accept the resulting location of the doors. They had opposing needs and they also had to learn how strongly the others felt about this issue.

Finally, the issue was resolved when Ian started playing with the various arrangements of lift, doors and loading bay again. John spoke but Ian tried to get there before him because he thought he knew what the problem was already. John began to assert himself by talking over Ian and saying more explicitly what the problem was. David, who spoke very little anyway, stepped in to support John and said: 'It's less flexible. He's got his personnel down there. It would be better than doing it the other way around.' At this point Bob changed the subject slightly. After this John was able to have a long turn at speaking in which he described what he wanted to achieve with the internal layout. Ian managed to ask him an open question: 'If there wasn't a lift, John, where would ... Where's your ideal position for these double doors? Where they are now? Is that what you're saying?' He became more gentle and appreciative than he had before. John said where he wanted the doors. Ian saw that he could still have the lift where he wanted it and John would have the best position for his doors. The issue was resolved.

2.2. Analysis of Subject 2

An analysis of the learning styles used in speech helped to understand how this discussion progressed. The first three times this subject was discussed (in the first meeting) the discussions was largely assimilative. That is, participants tended to use abstract thought rather than concrete experience. They also tended to use a reflective rather than an active orientation. This was a product of the wider discussion in which this subject was embedded. It involved the group having to create and use mental models of what the lift and loading area would be like.

They would have been using internal mental images which implies reflection rather than action. And they were externalising these models in the form of a plan. Thus the initial discussions about the location of the lift took on this assimilative orientation.

It was in the last and longest discussion of this subject in the first meeting that different styles began to emerge. It began differently with people using more divergent styles of talking. The discussion was still reflective but they had switched from using abstract, logical thought to a more apprehensive style which generated a more open and creative orientation. Ian attempted to move John to a decision by pressurising him with assimilative and convergent turns. However, David helped by supporting John and restating John's concerns. Bob also stepped in and suggested that Ian's plans of the internal layout were out of date. This had the effect of implying that John knew best and took the pressure out of the situation by 'blaming' the plans. John could now lay out his plans. He verbalised his tacit knowledge and this was more divergent. John was working on drawing plans for the new internal layout but a lot of that knowledge was still in his head. He had to dig into his tacit and non-verbalised knowledge of his plans. This led to an open and more thoughtful question from Ian, which was divergent too, and this opened up a space in the discussion for John to say where he did want the doors. Ian accepted John's solution saying 'Well that doesn't give me a problem'. There was greater use of divergent turns towards the end of this meeting (see also Figure 8.2).

The discussion started with a logical and imagistic orientation implying an assimilative learning style. It moved to a period of divergence before quickly moving through convergence to accommodation.

The last section, where the issue was resolved, was built on the explicit understanding of the situation that had been built up over the last three attempts to resolve this issue. Up to this time, the participants had come to understand each other's position on an abstract way but not in a concrete, intuitive way. That concreteness was needed to allow John to verbalise previously unarticulated knowledge of the new internal layout of the building. Bob and David had to form a wall by John to protect him from Ian's logic and urge to be decisive.

Interestingly, as soon as Ian agreed to John's new suggestion Bruce came up with another one. Bruce asked if they could do without the doors at all and use the lift instead. Bob and David understood this creative idea, showing divergence. But John and Ian criticised it almost immediately, showing joint assimilative activity and a shift for John from divergence. Ian summarised the decision, moving toward a more active orientation. John opened up word play on the ducts which had caused the problem in the first place:

John: Although you've got the ducting.
Bob: [laughs]
Ian: Oh yeah. Because I've got the double duct [pronounces 't' carefully, signalling joke]. Haven't I? You know, I've got the two ducts.
John: Yes, the double duct.
Ian: Not double Dutch, double ducts. [sound of plan] Here, Bob's kindly.
John: That's where all these ducts [meaning ducks] have come from.

This joking showed that John was happy with the decision implying accommodation[10] and the wish to socialise because accommodation can be used as an opportunity to internalise action to see how it feels. In this group context it was used to signal satisfaction that the conversation had gone well. The subject was then closed for the meeting.

This subject was raised again in a later meeting between Ian and Bob (Meeting 2, 26 February). John, Bruce and David were not present. It was raised five times in this meeting. The first two times Bob rehearsed some of the discussion that took place in the previous meeting as he seemed to have forgotten what was discussed. Ian reminded him of their discussions and faithfully represented John's views. The last three times that it was discussed involved Ian pushing to confirm that the decision on lift location had been made. His turns were convergent because he was pushing for a decision, implying an active orientation, and because the decision was based on an agreed plan, which implied abstract conceptualisation. Bob would not confirm the decision until he had met the others in the group from Audio Devices. Instead, Bob

[10] These short exchanges were not recorded by the talkogram because, with good reason, they were coded to Subject 6 (lift control and operation) and Subject 7 (scissor lift placement). Their connection with Subject 2 (location of lift on building) was only picked up in this analysis.

responded to this pressure by making jokes and talking informally off the subject. These turns were accommodative and signalled to Ian that the subject was closed for now.

For Ian, the decision on lift location was also tied up with a decision by Audio Devices to proceed with the project. Ian didn't want to open up the prospect of cancelling the project at this point by mentioning it explicitly and so used the decision on lift location as a proxy. Although he was looking for a decision from Bob, Bob had declined and Ian was not in a position to force the issue. So, when Bob started the accommodative turns Ian joined in.

Finally, the location of the lift and doors on the building were discussed briefly in Meeting 5 (5 April). Ian raised the subject and asked John to say very clearly if the location of the lift was correct. John confirmed the decision. This bit of convergent activity was followed by a few accommodative turns.

2.3. Conversation as Experiential Learning

Kolb et al. (2002) say that conversation can lead to experiential learning if the participants find a balance on five key issues. The discussion over where to put the lift on Audio Devices' building can be understood in these terms.

Apprehension and Comprehension

A balance between apprehension and comprehension is demonstrated by an equal distribution of turns using concrete experience and abstract conceptualisation. In this discussion 58% of turns were apprehensive and 42% of turns were comprehensive. There was regular switching between the two modes.

The tendency towards apprehension signalled the greater use of unarticulated knowledge and open questioning needed when participants found it difficult to resolve this issue. The use of

accommodation to assess how they felt about their decisions was no more marked than their discussion of other subjects.

Participants used more comprehensive and logical thought for the first few short discussions that they had on the subject. During these shorter episodes participants continued to use their logical and imagistic style needed to manipulate their mental models of how the whole loading bay area was developing. A rough sketch that externalised those models was not produced until after the second meeting. Until then their models were held mentally. It was only when the longer discussion began, that eventually brought the issue to a resolution, that participants moved away from using comprehension.

Intention/Reflection and Extension/Action

There was little balance between reflection and action because the discussion of this subject was largely reflective until the end. There was only a little switching between the use of reflective and active turns. This reflective stance combined with a mixture of apprehension and comprehension leads to greater perceptual adaptive complexity: that is, a greater ability to create alternative meaning and observation schemes.

Participants used reflective observation more than active experimentation because they were still developing their conceptual models of what the lift would look like and how it would work. They were thoughtful rather than decisive. They discussed the issue in order to make a decision but they had to integrate several different elements into an overall plan. At the same time, they had to reflect on their past experience of how this area had worked and stay close to the reasons for changing it. The emphasis on reflection early on indicates that they needed to change and manipulate concepts before firming them up and putting them into practice.

However, participants used a more active orientation towards the end of the discussion. Particularly when Ian was pushing to confirm the position of the lift and asking Audio Devices to make a decision.

Linear Time and Cyclical Time

Discourse: Ian provided the discursive impulse in the discussion of this subject. He saw the location of the lift as crucial to making further progress in the planning of the whole project. To some extent he saw the discussion of how the lift area would work as just details that could be worked out later. In the later meeting he pushed Bob quite hard to come to a decision.

Recourse: However, Ian's discursive impulse was tempered by his involvement in the recursive, iterative nature of the discussion by the people from Audio Devices. The movement from the initial assimilative style to a more divergent style, for the group as a whole, indicated a step back to first principles and thinking about the reasons for wanting the lift in the first place.

Discourse and recourse combined: Discussion of the location of the lift recurred throughout the first meeting as other subjects were resolved. For instance, the location of the lift also affected the group's choices about the shape of the raised loading area and the placing of the proposed scissor lift, the steps and the ramp. These issues were interdependent but as soon as one started to become resolved the others became easier to solve as well.

Status and Solidarity

One of the defining features of this group was the practised air of informality in the meetings. The formal roles of the participants (described in Chapter 6) were understood but only exercised in a slight way. In practice, the group worked together as a team. There was neither rigid hierarchy nor pathological heterarchy. The atmosphere was enabling rather than disabling.

However, there was an operational status and a hierarchy of sorts. In particular, credence was given to those who had the best knowledge and experience on a particular subject. Thus, the main contributors were those who knew most: Ian, Bob and John. The group worked in a fairly meritocratic way.

Formal status was exercised at one point in the discussions of this subject. As John was trying again to explain how he saw the internal layout of the building, and to say what he wanted to achieve, Ian was still trying to work through the arguments as they had been presented previously. John tried to talk over Ian. David restated what John had said to reinforce his contribution. With his status as managing director his word was to be respected, particularly as he generally said so little. Bob also worked to protect John by changing the subject. He took the pressure off John and gently told Ian that his understanding of what was needed may be wrong. Bob and David temporarily, but effectively, reduced Ian's conversational space through their solidarity with John.

Individuality and Relationality

The discussion around this subject was more divergent and less assimilative than other subjects. This was true for Ian's turns too (see Table 8.4). This was surprising given that he seemed to be more categorical and active, implying convergence, in his orientation from the analysis of the transcripts. All the participants were more divergent than usual because they were coming up with solutions in a uncertain and fluid situation in the first few meetings of the project. Indeed, this seemed clear from the emphasis on divergence in Bob and John's turns at speaking, both of whom were more divergent than usual.

Table 8.4 Subject 2, Lift Location on Building: Learning Style by Person

Person		Divergent	Assimilative	Convergent	Accommodative	Grand Total
Ian	N	**25**	24	17	11	77
	%	**32%**	31%	22%	14%	100%
Bob	N	**19**	5	3	12	39
	%	**49%**	13%	8%	31%	100%
John	N	**16**	11	3	4	34
	%	**47%**	32%	9%	12%	100%
Others	N	1				1
	%	100%	0%	0%	0%	100%
Total N		**61**	40	23	27	151
Total %		**40%**	26%	15%	18%	100%

Note: Figures in **bold** indicate the most commonly used learning style for each participant.

However, a comparison between participants showed that both Bob and John were more divergent than Ian. This repeats their relative use of divergence over the project as a whole: Bob and John tended to use a divergent style more often than Ian.

Bob was also more accommodative than usual. He contributed more to the internalisation of these decisions and showed more emphasis on getting a feeling for how things were going than on logic and decisiveness.

According to Kolb et al. (2002), good conversation needs a blend of different areas of expertise. Part of that expertise and experience should be shared among the group but there should also be expertise that is unique and based on individual experience.

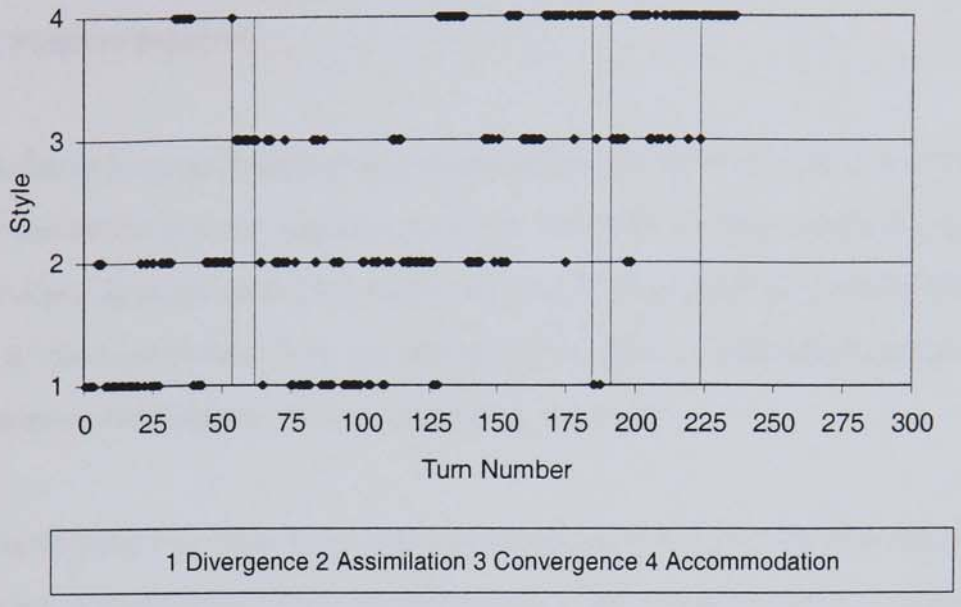
In this discussion it was safe to say that nobody had experience of how the goods lift was going to work at Audio Devices and, in this, they shared identity as a group. They all had to draw on past experiences and these may not have had direct relevance to this discussion. However, John had the experience of using the existing loading bay and had talked to his staff about what worked. He also had growing but unarticulated knowledge of how the internal layout would work. Ian had the expertise to know what would work in terms of building the outside area. Bob knew some of what John knew and David and Bruce probably knew very little on this subject. Thus, there was little shared experience that people could draw on to resolve this discussion. John and Ian's expertise was individual and different.

3. Subject 3: Lift Performance

The discussion of lift performance showed one of the highest correlations between position of a turn in a subject and the learning styles of those turns. We also saw that that the discussion of this subject involved more active experimentation than other subjects. In particular, participants used accommodative turns much more frequently than usual. The discussion about this subject was examined in greater detail to see how this pattern developed.

The talkogram of the discussion about the performance of the lift (see Figure 8.5) shows the learning style of each turn. The vertical lines on the talkogram show that this subject was discussed at six meetings.

Figure 8.5 Subject 3, Lift Performance: Talkogram



The talkogram shows how the data for this subject produced a high correlation. At the beginning of the subject peoples' turns were often divergent. As the discussion progressed there were more assimilative and then convergent turns and at the end of the discussion there were more accommodative turns. This progression occurred through all the meetings where it was discussed and indicates that there was continuity: each time the subject was left in one meeting, it would be picked up by participants the next time it was discussed. However, in any short span of turns, participants used a variety of styles.

The subject of lift performance was focused around how quickly the lift would respond to being called. John was particularly interested in this subject and was always the person who raised it in discussion. Ian's attitude, based on his experience in the commissioning of lifts, was that lifts were often a problem but there was little you could do to improve the situation as there was less

competition in the market than there used to be. He thought that John and the others needed to accept this as inevitable. Nevertheless, the others in the group pushed Ian to try and get the lift company to meet their needs. Ian did talk to the lift company but they could not provide any better performance. Ian asked the rest to accept that this was the reality of the situation and to accept the performance of the lift as it came. Eventually, John and the others did accept this and made jokes about buying a slow lift.

3.1. Précis of Subject 3

The discussion about lift performance started (Meeting 3, 20 March) with John and Bob asking Ian how fast the lift would respond to a call. Ian replied that the specification that Audio Devices had written would be used. John was not put off by this and pressed the point, asking how long the lift took to prime itself. Then both Bob and John quickly, and alternately, recounted their experience and judgement of their current lift as 'hopeless'.

Ian understood their concerns and Bob suggested that all hydraulic lifts have to build pressure first but John continued to press Ian that this was a major issue for users. Ian suggested that it just felt like a long time but did offer to find out about the speed of response from a lift company.

The subject changed slightly to talk about drawing up of plans but then Ian recounted his experience that there were very few lift manufacturers anymore and implied that it was not possible to choose a faster one. Bob commented dryly that lack of competition meant that manufacturers 'try and keep it slow'. He showed he was more concerned with speed than with constraints on choice. Ian implied that the choice of a lift was driven by the realities of what was available rather than what they wanted. Ian recounted his personal experience of lifts, saying:

> 'I don't know what it is about lifts. I mean, we've just, I've just been finishing off some flats across the road and they've spent a lot of money on the lift and that's not right.'
>
> and
>
> 'no matter how much money you spend on these things, they can't get it right'.

At this point Bob, Ian and John started to discuss the main problems with hydraulic lifts and looked for mechanical and logical explanations. Ian had the final turn in this meeting when he said that they could have a direct motor lift but that it was much more expensive.

There were just a few turns on the performance on the lift in Meeting 5 (5 April). John raised the subject but Bob and Ian decisively reduced the prospectiveness of the discussion by putting John off and changing the subject.

The subject was raised by John again in Meeting 6 (24 April) and, this time, it was discussed at greater length. Ian said he would be meeting someone from the lift company in a few days. So, after a few turns spent defining the problem again, John, Bob and Ian started using metaphors and jokes to describe the experience of slow response times. John likened their existing lift to an old person's stair lift. Bob says 'Ready, steady [pause] go'. Ian was not amused and started to say that 'slowness' was all in the eye of the beholder. Bob responded to this but John wouldn't accept it and said: 'It's not something we should just ignore.' Ian said he would ask the lift company. John exaggerated the problem, to get an effect, when he said that without action the lift might take fifteen minutes.

Ian rose to this and then challenged Audio Devices. He asked them if they had ever timed their lift. Bruce left the meeting at that point to go and time the response time of their lift. This made Ian sit up and the remaining participants immediately began to discuss the rules for assessing the results of the experiment. When Bruce returned with a measured time the group discussed the results. Ian acknowledged that lifts could be a problem. Bob suggested that the ratio of delay before the lift moved to the speed of the lift when moving was universal. John agreed.

Ian then prompted Bob and John to talk about how they felt about their current lift. This led them to discuss the history of their present lift and their past experiences. They talked about how they felt about their existing lift in the light of their recent discussion.

In Meeting 8 (29 May) Ian told the story of his meeting with a person from the lift company and how he had raised Audio Devices' concerns about slow response time. Ian said that the lift company person 'looked at me as though I've got three heads, you know'. Ian told them that the response time was standard but in a way which was vivid and experiential rather than dry or logical. Bob mirrored Ian, indicating his acceptance. John was quiet whereas before he would have protested. Ian also reported that he had experimented with lifts he had been in since their last meeting. These turns had the effect of bolstering their feeling that all lifts were the same. Crucially, John made a joke about it indicating his acceptance of this state of affairs:

> Ian: You get a sort of reaction. You press the button and you hear ... you start to hear a noise of some sort but it ...
> John: It's a speaker behind the door to make you think something's happening.
> [Ian laughs. Bob laughs]

Lift performance was mentioned briefly, and for the last time, in Meeting 9 (19 June) when the group was examining a detailed specification of the lift from the lift company.John, Ian, Bob and Bruce all made jokes about the name of the lift ('Express').

3.2. Analysis of Subject 3

John and Bob raised the subject of lift performance. After a few turns defining the subject, John and Bob described their personal experiences of using their current lift in a rapid and emotional way. This showed divergence: they were expressing their needs and raised the prospectiveness of the discussion by leaving the solution open to further discussion.

The discussion moved to assimilation as Bob started to talking about the mechanics of hydraulic lifts. Bob wanted to understand 'slowness' in scientific, logical turns. Ian's response was to use his experience to argue that there was little that could be done. The emphasis on practical reality rather than getting an elegant solution implied active experimentation.
This was accommodative because he was communicating to Audio Devices his schema; the way he had internalised his attempt get a good lift. Ian and Bob discussed what a lift should be like and moved into further assimilative discussion of how lifts worked mechanically before the subject was closed for this meeting.

John raised the subject in Meeting 5 (5 April) but there were just a few turns because Bob and Ian decisively put John off and changed the subject. Thus, this section was convergent.

The subject was raised by John again in Meeting 6 (24 April) and, this time, it was discussed at greater length. After a few assimilative turns spent refining the problem again, John and Bob started using metaphors and jokes to describe the experience of slow response times. This open and inventive attitude was divergent and it told Ian what they felt about slow lifts. These were some of the last divergent turns in the discussion of this subject. Ian was not amused and started to say that 'slowness' was all in the eye of the beholder.

Ian started a stretch of assimilative turns by challenging those from Audio Devices on how long they really did have to wait. Ian was thinking about how to quantify the slowness of their existing lift which is a feature of abstract conceptualisation. Bruce left the meeting at that point to go and time the response time of their lift. Bruce's action was convergent because he was actively conducting an experiment. The remaining participants used an assimilative style as they defined the rules for assessing the results of the experiment logically and thoughtfully. When Bruce returned with a measured time the group discussed the results with a mixture of assimilation and convergence. The key to both of these styles is abstract conceptualisation. The group integrated the explicit knowledge provided by Bruce into their theoretical and logical models of how lifts worked. When Bob suggested that the ratio of delay before the lift moved to the speed of the lift when moving was universal they used a logical, mathematical concept that allowed them to feel okay about the response time. This was the last time assimilative turns were used in this discussion in any number: discussion about how lifts were constructed in relation to the type of lift they had chosen was more practical. This mixture of practical and logical thought is typical of convergence.

Ian, Bob and John then talked about the history of their present lift. This shift back to experience and away from theory was a shift towards apprehension and the use of tacit knowledge. They talked about how they felt about their existing lift now that they had discussed it. They tried this

by using their new schema which said that they could ask for better performance but should realise that the request would have little effect. This refinement of the schema based on action, or expected action, indicated internalisation and a move to an accommodative style.

The accommodation to this new understanding continued into Meeting 8 (29 May) where Ian told the story of his meeting with someone from the lift company. His vivid recollection of the meeting with the lift company and his recent experiences with lifts meant that he was using accommodation.

The effect of the changing schema about lift performance could be seen when it was mentioned briefly, and for the last time, in Meeting 9 (19 June). All these turns were accommodative as John, Ian, Bob and Bruce all made jokes about the name of the lift.

3.3. Conversation as Experiential Learning

This section examines how the discussion about lift performance can be understood in terms of the five key issues in conversational learning raised by Kolb et al. (2002).

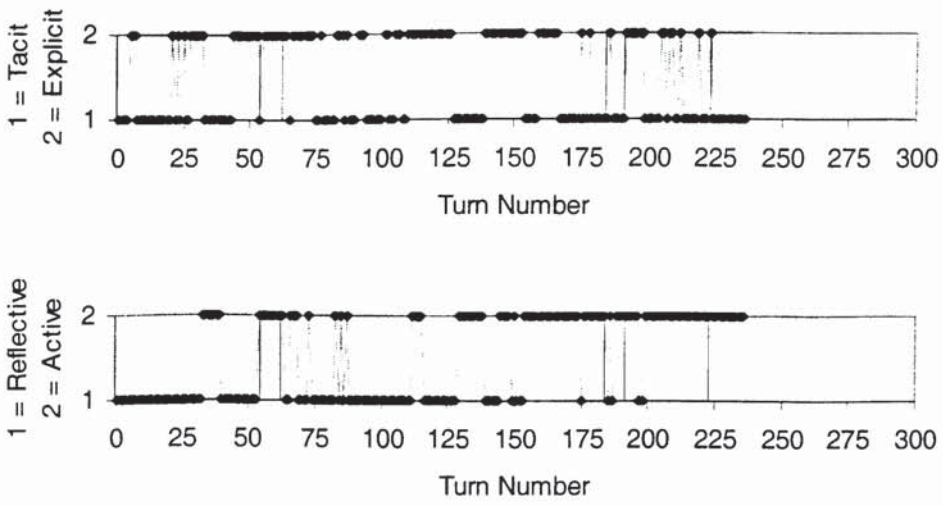
Apprehension and Comprehension

There was an even balance between tacit and explicit knowing over the whole subject. There were slightly more turns emphasising tacit understanding in the first and last quartiles of the subject and less in the middle (see Table 8.5). There was also regular switching between the use of apprehensive and comprehensive knowing (see Figure 8.6).

Table 8.5 Subject 3, Lift Performance: Learning Style by Quartile

	Concrete	Abstract	Total	Reflective	Active	Total
1st quartile	57%	43%	100%	79%	21%	100%
2nd quartile	39%	61%	100%	73%	27%	100%
3rd quartile	45%	55%	100%	37%	63%	100%
4th quartile	73%	27%	100%	7%	93%	100%
Total	53%	47%	100%	49%	51%	100%

Figure 8.6 Subject 3, Lift Performance: 3D Talkogram



The principal use of tacit knowing in this subject was where the participants recounted their anecdotal and concrete experiences of using lifts or made jokes to feel okay about the lack of effect their actions had had. Bob and John recounted anecdotal and concrete experiences of using their existing lift to show how slow they felt it was. Ian used tacit knowledge when he told Audio Devices about what the lift company thought of their request for a quicker response and when he recounted his own experiences of lift performance. There was more accommodative activity in this meeting than in any other. This was to internalise their lack of success, and feel okay about the results despite the strength of feeling that something should be done.

More explicit and abstract thought was used when the group attempted to understand why a lift might be slow to respond and when they thought about the mechanics of how they worked. This included their experiment to time the lift and make their experience of 'slowness' explicit in the form of numbers.

Intention/Reflection and Extension/Action

There was a balance between reflective and active transformation of experience over the whole subject but this was the most active subject of them all. However, the first half of the discussion

was predominantly reflective whilst the second half was more active (again, see Table 8.5 and Figure 8.6).

The discussion of lift performance was more reflective to start with as John and Bob reflected on their past experience and worked out how to express their needs (both tacitly and explicitly) for better lift performance. Ian was predisposed to be convergent based on his past activity with commissioning lifts but he recognised John and Bob's wishes.

The discussion became increasingly characterised by active experimentation as Ian recounted his visit to the lift company asking for a quicker response time and as Bruce went to time Audio Devices' existing lift. Gradually, the group realised that their actions would not change the response time: that is, despite expressing their wishes they had to accept that the lift would not be as quick to respond as they wanted. They internalised the results of their actions (accommodation) by using stories to integrate them into their existing schemata and by making jokes.

Linear Time and Cyclical Time

Discourse: It was John who raised this subject each time it was discussed. Each time, Ian's conversational strategy was to respond by saying that he had already agreed an explicit specification with Audio Devices and that the lift would meet the specification. He wanted John and Bob to accept this and allow the subject to end because of his experience that little could be done to improve the lift's response time.

Recourse: However, John and Bob would not allow the subject to be closed in this way. They wanted some resolution to their need for better response times. Each time the subject was raised by John, they increased the prospectiveness of the discussion, making it more open (except Meeting 5 on 5 April).

Balance between discourse and recourse: Ian was right about the limited potential for improving response time. John and Bob, though, had changed Ian's preferred course of action which was to not investigate further: Ian had talked to the lift company about response time. John, in particular, felt that it was important to do something about it. The recursive nature of the discussion enabled him to understand the situation and then feel better about it through accommodation.

Status and Solidarity

If Ian had been in charge in these meetings, lift performance would not have been discussed as much as it was. On each occasion he initially relied on a role as an advocate for Audio Devices with a brief agreed with Audio Devices. He wanted them to rely on his expertise.

However, John would not allow this and decided to represent himself and others who had complained to him about their existing lift. John sometimes presented himself as a disgruntled user.

They had different views and Bob played a careful role as a friend to both. Bob supported John when he raised the subject and mirrored Ian and saw his point of view when Ian was explaining something.

Ian saw Bruce as holding the purse strings and there was a little tension between them. Ian was careful to be polite. Bruce did not say much but did go off to time the lift which made Ian sit up and stopped him saying that the slowness was all in their minds. David contributed little to this discussion. The support of Bob and Bruce helped John to keep this subject open.

Individuality and Relationality

Ian used accommodative turns in his speech much more than he usually did because he spent some time recalling his experiences of commissioning lifts and of talking to the lift company (see

Table 8.6). He was telling Audio Devices how it was that there was little that could be done to improve the response time of the lift. He used his own experiences and told stories to indicate how he had come to this view. This helped those at Audio Devices to integrate that knowledge into their existing schemata.

Table 8.6 Subject 3, Lift Performance: Learning Style by Person

Person		Divergent	Assimilative	Convergent	Accommodative	Grand Total
Ian	N	15	29	24	**37**	105
	%	14%	28%	23%	**35%**	100%
Bob	N	12	**20**	14	16	62
	%	19%	**32%**	23%	26%	100%
John	N	**22**	10	7	17	56
	%	**39%**	18%	13%	30%	100%
Bruce	N	3	**4**	2	3	12
	%	25%	**33%**	17%	25%	100%
Others	N				1	1
	%	0%	0%	0%	100%	100%
Total N		52	63	47	**74**	236
Total %		22%	27%	20%	**31%**	100%

Note: Figures in **bold** indicate the most commonly used learning style for each participant.

Bob used much fewer divergent turns than usual using all the other styles more frequently. He tended to try and find mechanical and logical explanations for why lifts have slow response times. He also brought the discussion to a close in Meeting 5 (5 April) and negotiated the end of the subject, with John's silence, in Meeting 8 (29 May). This accounts for his increased use of a convergent style.

John's turns at speaking were as divergent as usual. He raised the issue for discussion and provided the motivation for it. He talked quite a lot about his experience of 'slowness' and what kind of lift they needed.

Ordinarily, John tended to use a lot of assimilative turns but on this subject he used more accommodative turns instead. His existing schema was that their current lift was too slow to respond and that something should be done to make the new lift faster. He used accommodation to integrate his new understanding that little could be done into this schema.

Where he might have discussed the mechanics of why lifts had slow response times, as Bob did, he spoke more on how he felt about their inability to do anything about the problem.

There were two constituencies here. John, Bob, Bruce and David were part of Audio Devices. Ian was part of a separate constituency that spread outside of the meeting to his firm of architects and all the other people and lifts he had encountered. He had the expertise and experience of construction. And he had a good history with Audio Devices. However, whilst at Audio Devices his position was as an outsider brought in to do a job for them. Audio Devices' shared and verbalised experience was that their current lift was too slow to respond.

Ian was separate but not isolated. Bob was the bridge between Audio Devices and Ian. This was shown by his conversational position between John and Ian. John felt affinity with users of the lift. However, there was little evidence that group affinities over-rode interpersonal relations, apart from when Bob agreed with John that the existing lift was slow and Bruce went to test the lift to challenge Ian's assertion that the 'slowness' was all in their minds.

4. Subject 4: Lift Appearance

The discussion of this subject was notable because it was one of the three subjects which had a zero correlation and a non-significant relationship between turn and learning style. It was important to study this subject further to see if there were any patterns in the use of learning styles or any explanation for why no relationship was found.

The distribution of turns between learning styles for this subject hardly differed at all from the distribution of styles over the whole project. In the discussions about the location of the lift (Subject 2) we saw heightened use of divergent styles of talking. In this subject, however, participants were using the normal variety of learning styles and yet there was no obvious progression through the subject (see Table 8.7).

Table 8.7 Subject 4, Lift Appearance: Learning Styles Used

	Subject 4		All Subjects	
Learning Style	N	%	N	%
Divergent	70	28%	814	29%
Assimilative	76	30%	978	35%
Convergent	53	21%	545	19%
Accommodative	55	22%	478	17%
Total	254	100%	2815	100%

The discussions that fell into this subject were connected by their focus on the aesthetic features of the lift. The group discussed how the lift shaft would blend in with the rest of the building. The group discussed the use of dummy windows around the top of the lift shaft. They also discussed what kind of door they wanted on the outside of the lift and what material and colour they wanted on the floor of the lift (see Table 8.8).

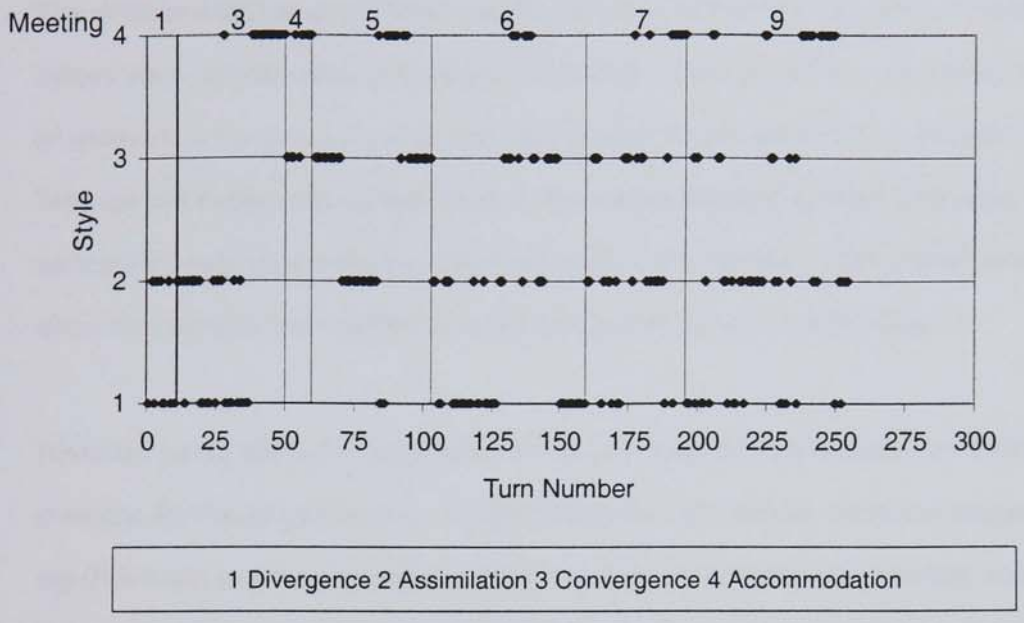
Table 8.8 Subjects Discussed Within Subject 4, Lift Appearance

Meeting	Subjects Discussed
1	Outside door of lift, concertina or sliding, colour.
3	Outside door of lift, concertina or sliding, colour.
4	Putting a clock in lift tower.
5	Putting dummy windows in the top of the lift tower. Safety of sliding outside door of lift.
6	Finding the contractor to do the work on the windows. What the contractor does.
7	Material for the floor of the lift.
9	The roof of the lift tower was not separate. It was connected to existing roof by a dormer.

The rationale for bringing these separate discussions into this subject was that they shared a concern for what the lift would look like when it was built. I thought this subject would be interesting because it was important to Bob and John and to Audio Devices more generally. Their premises were built to Audio Devices' own high specification. Bob took some pride in the quality of the office environment and people on the factory floor kept things tidy and neat because they knew that John thought it was important. The subject was also relevant because Ian recognised that Audio Devices liked things to be well done and referred to this during the project. I got the impression that Ian thought that Audio Devices were a bit picky at times and that he sometimes got a bit fed up with it.

However, the talkogram for this subject showed very scattered use of learning styles over the whole subject (see Figure 8.7). In contrast to many other subjects there was very little clustering of turns, particularly in the second half. There were fewer stretches of conversation where a single learning style was used. However, there seemed to be some progression in learning styles within the separate discussions that constituted the subject.

Figure 8.7 Subject 4, Lift Appearance: Talkogram



Indeed, the group discussed this subject in seven meetings and in many of these meetings the correlation coefficients were high, positive and significant. This implied that, within meetings, there was at least some progression from one style to another and that it was in the expected direction but that over the subject as a whole there was no progression from divergent to accommodative turns (see Table 8.9).

Table 8.9 Subject 4, Lift Appearance: Strength of Learning Cycle by Meeting

Meeting	Number of Turns	Correlation	Significance
1	11	0.0000	p=1.0000
3	39	0.5897	p=0.0001
4	10	0.7817	p=0.0076
5	43	0.2831	p=0.0658
6	53	0.1358	p=0.3184
7	36	0.3377	p=0.0440
9	59	0.3165	p=0.0146
Whole subject	255	0.0374	p=0.5527

The simplest explanation for these results is that the discussions that were collated for this subject were different and un-related to each other. Thus, individually they showed some progression in the use of learning style, but together they showed no progression. This may be because this subject was defined more by the researcher than by the participants. For example, participants may have linked the discussions about the lift doors in this subject with discussions about the changes they needed to the existing goods in/out doors (Subject 14).

However, we do see some progression in the use of learning styles within the individual meetings for this subject. Indeed, a higher proportion of meetings within this subject had significant and positive correlation coefficients (6 out of 9) than for the average subject (31 out of 74). This implies that the discussions in each meeting within this subject were separate and autonomous.

This subject was chosen for analysis because of its low correlation coefficient and for its normal distribution of turns by learning style. One reason for a lack of progression within the subject as a whole was because each separate meeting was a discrete subject. Thus, it is not appropriate to present an analysis for the subject as a whole. Two of the discussions that comprised this subject were chosen for further analysis based on their low correlation coefficients.

4.1. Discussion of Subject 4 in Meetings 1 and 3

The discussions about the outside door of the lift centred on whether they wanted a concertina or a sliding door and on the colour. This discussion took place in Meeting 1 (20 February) and Meeting 3 (20 March). The discussion of this subject in meeting 1 had a correlation coefficient of zero and a significance value of one. The discussion in meeting 3 had a correlation coefficient of 0.5897 and was significant at the $p<0.01$ level.

4.1.1. Précis of Subject 4 in Meetings 1 and 3: Outside door of lift

The discussion in Meeting 1 (26 February) started with Bruce who asked what the door would look like. Ian replied that it would be a concertina style of door. John said that this would not be appropriate internally where it would open on to an office environment. Ian said that they could choose what kind of door they wanted. Bruce then made it clear that he had meant the external door. Ian said, again, that it would be a concertina style of door and Bruce asked if would be secure and if it would have a utilitarian colour. Ian replied that they could have what they wanted but they would have to pay for extra colour or less basic doors.

This discussion was picked up again in Meeting 3 (20 March). Bruce asked again about the door of the lift and Bob and John acknowledged that this was a subject they recognised. Ian said that he had asked the lift company and they thought that they could put in a sliding door internally but that a concertina door was better externally. Bob agreed and then said that 'we are interested to know if we can have a prettier door' which indicated that they had discussed this outside of the formal meetings since Meeting 1 (26 February). Ian said that it could be blended into the rest of the building. John said it should be 'Black' and Bob agreed. Ian said that it was not quite as simple as that and that it would need a particular number code.

The discussion moved on slightly and then John, Ian and Bob entered a period of socialisation, talking off the subject of the lift altogether, talking about window tax and driving licences.

4.1.2. Analysis of Subject 4 in Meetings 1 and 3: Outside door of lift

The discussion of this subject was uncontentious and was not marked by any particular divisions in interest or particular difficulties to understand or overcome. Mostly, the interaction consisted of alternating between questions on behalf of Audio Devices followed by an answer from Ian. It was characterised by an open questioning in a divergent style and the supplying of information by Ian in an assimilative style. In addition, those from Audio Devices would express what they wanted from the lift. However, these statements didn't have the character of direct requests or decisions in a convergent style. Rather, they were intended as guides for action for Ian. There was an expectation rather than an explicit direction that Ian would implement that action outside the meetings.

One of the most startling things about this discussion was the lack of convergence (see Table 8.10). Without the last period of accommodation, this discussion would have been almost entirely composed of divergent and assimilative turns.

Table 8.10 Learning Styles Used in Subject 4, Lift Appearance, Meetings 1 and 3

Learning Style	Number of Turns	Percentage
Divergent	19	38%
Assimilation	17	34%
Convergent	0	0%
Accommodative	14	28%
All Styles	50	100%

4.1.3. Conversation as Experiential Learning in Subject 4, Meetings 1 and 3.

The discussion about the door of the lift was understood using the five dialectics identified by Kolb et al. (2002).

Apprehension and Comprehension

There was a regular switching between apprehension and comprehension as participants expressed what kind of doors they wanted and Ian responded by providing factual information or saying he would find out. The switching process took place but it was not strong.

Intention/Reflection and Extension/Action

The discussion was very largely reflective because there was little need to be decisive, to test decisions and knowledge in the external world at the time of this discussion. The expectation was that Ian would initiate the necessary action on his own accord.

Linear Time and Cyclical Time

We saw above that the correlation coefficient for the discussion of this subject in Meeting 1 was zero. However, we have seen that the discussion in Meetings 1 and 3 links up very well. When, the two meetings are combined the correlation coefficient was 0.5547 ($p<0.0001$). This indicates some linearity. However, the only active turns in this discussion were those accommodative turns in the off-subject discussion at the end of this section.

Status and Solidarity

There was little sign of hierarchy in this discussion, except that Ian had greater knowledge and potential to act through his contacts with the lift company.

Individuality and Relationality

Audio Devices do concern themselves with keeping the premises looking 'nice' and this is a conscious part of their identity. They all seem to hold this attitude, implying relationality.

4.2. Discussion of Subject 4 in Meeting 6

The discussion of Subject 4 that took place in Meeting 6 (24 April) was about the dummy windows that they were going to have around the top of the lift shaft to make it blend in with the rest of the building. It had a small correlation coefficient and a significance value of 0.3184. That is, we could not say that there was any progression through the learning styles when this subject was discussed in this meeting (see Figure 8.7 above).

This discussion was examined to see what patterns there were, if any, in the use of particular learning styles when there seemed to be very little progression in learning style.

4.2.1. Précis of Subject 4 in Meeting 6: Windows, Glass & Contractors

Before this discussion began, the group was discussing what needed to be done with the construction of the lift shaft. They had already agreed to Ian's suggestion to blend the lift shaft in with the rest of the building by continuing the windows around the shaft. Dummy windows were needed and Ian said that they would need a separate contractor to work on them.

Bob said he was worried that the windows could take a long time to fit. Ian explained that the manufacturer only made the sections; separate contractors made the windows from the sections and fitted them. Bob said he 'didn't get a very warm feeling' when he had dealt with them. Ian responded by asking him if they wanted to move to a different system. Bob quickly corrected that idea and said he was just worried about time.

Bruce picked up on this as a problem. Bob took this as a cue to investigate the detailed specification of the glass in the windows. Ian was careful and said that it would look the same as the existing windows rather than being the same glass, and that it would not need any 'insulation values'.

Bruce continued by questioning Ian about whether there would be a delay and whether Audio Devices should order the windows early in the project. Ian blew his cheeks out and said that the contractors usually made windows to fit by taking on-site measurements. Bob shadowed Ian here. Ian said windows can't be ordered early but that the job was simple. Bruce criticised this way of doing it but Bob was more conciliatory saying that they were only worried about the time it was going to take. Bruce took this up by recalling previous experiences where windows caused delays. Ian countered this by saying that they could get into legal difficulties if the windows didn't fit and Audio Devices were responsible. Bruce again argued that it could take a long time. Ian responded by explaining the probable sequence of events more clearly. Despite the apparent conflict Bruce's final solution was actually very close to what Ian proposed.

Bob immediately started to wonder who did their windows originally. Ian said they probably didn't exist anymore because these companies came and went. Bob said it was easier to find a contractor if you had a big job rather than their smaller-sized job. David agreed with him. Bob ended up by raising the possibility that a building firm he knew could come up with some ideas.

4.2.2. Analysis of Subject 4 in Meeting 6: Windows, Glass & Contractors

The first third of this discussion was mostly divergent (see Figure 8.7). Bob and Bruce jumped from question to question as they tried to work out how the window contractors would do the work. Although Bob and Bruce pushed the discussion along with their questions, Ian's answers provided the direction and were a mixture of divergence and assimilation.

Once the group moved on to talk about finding a contractor to make and fit the windows the participants stopped using divergent turns. The discussion allowed Audio Devices to find out how and when the contractors would fit their work into the overall lift construction given their concern that it might take a long time. The remaining discussion was typified by a mixture of assimilative, convergent and accommodative turns in no particular order. We see here a process of casting about using bits of logical thought here and past experience there.

It was difficult to know how to code the last few turns of this meeting. I chose to code them as divergent because it seemed that Bob was open-mindedly looking for new solutions to this problem and Ian did not have any definite answers.

4.2.3. Conversation as Experiential Learning in Subject 4, Meeting 6

The discussion about the dummy windows around the lift shaft was understood using the five dialectics identified by Kolb et al. (2002).

Apprehension and Comprehension, Reflection and Action

The initial emphasis on divergence gave way to a real mixture of learning styles. In many other discussions one person's turn using a particular learning style would be followed by another person using the same style. However, in this discussion the learning style used in the discussion would change from turn to turn. In terms of the talkogram (see Figure 8.7) there were few clusters of turns with the same learning style.

Cyclical Time and Linear Time

Learning styles did not progress through a cycle because there was a lack of consistency in their use. Yet the discussion had the effect of making Ian aware that Audio Devices were keen not to let the windows delay completion of the project. In effect, the discussion allowed Bob and Bruce to draw on their experience and express their needs to Ian. However, the action was going to be left in Ian's hands and this was some way off at the time.

Status and Solidarity

In terms of status and solidarity, Ian knew how windows fitted into the construction process and had had dealings with window contractors. Audio Devices showed solidarity in raising the issue

of potential delays. However, most comments and questions were directed towards Ian because he knew how this would work. Bob and Bruce recognised Ian's status as the expert.

Individuality and Relationality

This discussion seemed to be characterised more by individuality and interpersonal relations than intergroup relations. For example, Ian used his personal experience of how windows are put into buildings and the how contractors operated. Bruce used his personal experience of fitting windows to a previous building too.

4.3. Summary of Analysis of Subject 4

This subject was chosen because it appeared that there was no progression through the learning styles when it was being discussed. It drew together several discussions about how the lift would blend into the existing building.

Part of the reason for the lack of progression was that it was defined more by the researcher than by the participants and the discussions that comprised the subject did not form a coherent whole.

Whereas the subject as a whole did not progress through the learning styles, most of the individual discussions that comprised this subject did show progression.

Two sections of this subject were chosen for more detailed analysis (Meetings 1 and 3, and Meeting 6). They were chosen to see if there was something different about these 'aesthetic' discussions and because the second section showed very little progression through the learning styles.

In both sections, Audio Devices expressed what they wanted from Ian. However, these statements didn't have the character of direct requests or decisions in a convergent style.

Rather, they served more as guides for action. There was an expectation, rather than an explicit demand, that Ian would implement that action outside the meetings and that the action was some way off.

In the second section (Meeting 6, 24 April) there was little sign of progression through the learning styles. There was a grasping of experience through apprehension and comprehension but there seemed to be little determined transformation of that experience through either consistent action or reflection. This was described as a process of 'casting about': learning styles often changed turn-by-turn. The discussion did lead to greater understanding by Audio Devices, and Ian understood their concerns but there was a lack of focus and linearity.

This also highlights the role for active transformation of experience through convergence and accommodation in completing the learning cycle. However, this is not to say that there should have been greater use of these learning styles in this situation. The way that the participants used a mixture of learning styles, after initial divergence, may have been because the use of action was not appropriate at that time. The action they were envisaging was some way off at this point in the project. Perhaps the group was not ready. Perhaps the group did not have all the necessary knowledge.

5. Chapter Summary

This section highlights some of the key findings of the extended analysis presented in this chapter.

The discussion about the location of the lift on the building (Subject 2) showed very clearly how the learning styles that the participants used in their conversation could be determined both by the nature of the subject they discussed and their use of learning style in relation to one another. The discussion of this subject was more divergent than usual because it occurred early on in the project and the situation was open and fluid. After an initial period of assimilation, the

group had to return to divergence in order find a solution that met all their needs. Each participant used more divergent styles than usual. This emphasises how they used learning styles relationally, as a group.

However, over the project as a whole, Bob and John tended to use divergence more often than Ian. Despite the increase in the use of divergence by each member, within this subject, Bob and John retained their relatively higher use of divergence when compared to Ian. The usual differences in their learning style tendencies were maintained.

Of all the subjects studied, the discussion about the performance of the lift (Subject 3) showed the strongest progression in the use of learning style from divergence through to accommodation. Over the project as a whole there were two reflective turns for every active turn because the group were developing plans rather than implementing them. This subject showed a much more even balance in active and reflective learning styles which may have contributed to the full progression in the use of learning styles. The higher than normal emphasis on action was caused by the group pushing the lift company to improve the response time of the lift. Unfortunately, this action was unsuccessful and the high level of accommodation indicates that efforts were made to get used to the idea. Here we can see progression through learning styles with tacit and explicit knowledge transformed by both reflection and action.

The discussion about the appearance of the lift and the windows (Subject 4) showed no progression through the learning styles. A closer analysis showed that this subject was comprised of discussions that did not link together. There was progression within these separate discussions but not over the whole subject.

One of these discussions showed no progression through the learning styles. There was greater variability in the use of learning styles: learning styles often changed turn-by-turn. The discussion did lead to greater understanding by Audio Devices, and Ian understood their concerns but there was a lack of focus and linearity. There was a grasping of experience through apprehension and comprehension but there seemed to be little determined

transformation of that experience through either consistent and concerted action or reflection. It may have been that there was no need to concentrate attention on this subject at that time.

Chapter Nine

Discussion

1. Introduction

This research has examined the discussions that took place over ten meetings among a group of people working on a project to design a lift and goods area for their premises. Using work on experiential and conversational learning (Kolb, 1984; Kolb et al., 2002), analytical methods were developed that allowed exploration of knowledge creation processes in a group. The data was analysed to answer research questions relating to the use of learning styles and knowledge in the design process. More specifically, the analysis focused on the role of tacit and practical knowledge, the importance of context to knowledge creation, and the bridge between individual and social explanation for knowledge creation. This chapter interprets the results in relation to these questions and discusses the implications in light of what the literature says about them:

Throughout this research five themes have been used that identify the key issues in relation to knowledge and learning through interaction:

- Apprehension and comprehension
- Intention/reflection and extension/action
- Individuality and relationality
- Linear time and cyclical time
- Status and solidarity (Kolb et al., 2002)

The first two themes, based on the fundamental cognitive processes identified in Chapter 3, were used to describe the link between knowledge and learning. This, in turn, led to the development of methods for investigating the processes of knowledge creation. In this chapter

the theme of individuality and relationality is tackled first by examining the individual and group nature of learning styles in interaction. Secondly, the theme of linear and cyclical time is discussed by examining what the results say about knowledge produced in conversation, the strength of learning cycles and balance in the use of learning styles. Thirdly, the theme of status and solidarity is addressed by looking at some of the social and contextual conditions that supported or disrupted interactive learning. The potential for future research is addressed in each section.

The final section of this chapter addresses the methods used, their strengths and limitations, and considers opportunities for their use in further research.

2. Individuality and Relationality: Individual and Group Use of Learning Styles

This section explores the tension and movement between individuality and relationality in relation to conversation, learning and interaction. In this research it was explored by examining the individual and group nature of learning styles in interaction.

2.1. Situational Factors and the Influence on Conversational Learning Styles

Kolb's (1984) experiential learning theory is mainly focused on individuals and their predominant learning style. Kolb argues that an individual's learning style is formed by several factors: personality, education, career, job and current task situation. Each of these factors can have a different effect on overall learning style. Job and current task situation have a stronger but more situation-specific effect on learning style. He devised the Learning Style Inventory (LSI) to measure an individual's conscious understanding of his or her tendencies to prefer one learning style over another. Each participant in the design project completed the questionnaire and the results showed clearly that all the participants tended to use a convergent learning style, except for Bruce who tended to use a divergent style (see Figure 7.1)

The learning styles used in the discussions during the project were also measured by examining the learning styles that each participant used in his speech. These results showed that the most common learning styles used in speech were different to those identified by the Learning Style Inventory, and, further, that each participant tended to use a variety of styles (see Table 7.3).

What this shows is that the Learning Style Inventory identifies the effect of the more psychological and less situation-specific factors on learning style. The education and early careers of the participants aligned well with their responses to the LSI (Table 9.1). For instance, Kolb (1984) showed that engineers tend to have a convergent learning style when measured using the LSI because of their practical and logical orientation. He did not present results on the usual learning style for architects, but Ian's stated preference that he liked 'to build things' signifies an active rather than a reflective orientation.

Table 9.1 LSI Results Compared With Education and Career

	Ian	Bob	John	Bruce	David
Learning Style (LSI)	Convergent	Convergent	Convergent	Divergent	Convergent
Education	Architect	Electrical Engineer	Electronic Engineer	Anthropology	Maths
Training	Architect	Engineer	Engineer	Accountant	Engineer
Job	Architect	Technical Director	Production Director	Financial Director	Managing Director

Note: other participants were not included here because they did not complete the LSI

The results for Bruce were interesting. His education in anthropology signified a divergent learning style and, indeed, this was what the results from the LSI indicated. However, his career as an accountant suggested a psychological learning style characterised by strong abstract conceptualisation and a mixture of action and reflection. The results from an analysis of his conversational learning style showed a preference for using a divergent learning style (see Table 7.3).

The results from an analysis of the learning styles used in the discussions differed substantially from this picture (Table 9.2). They showed that participants' conversational learning styles

tended to be assimilative and divergent. These learning styles share a reflective orientation which is at odds with the active orientation of the LSI results.

Table 9.2 LSI Results Compared With Conversational Learning Style

	Ian	Bob	John	Bruce	David
Learning Style (LSI)	Convergent	Convergent	Convergent	Divergent	Convergent
Conversational Learning Style	Assimilative	Divergent & Assimilative	Assimilative & Divergent	Divergent	Accommodative & Divergent

Note: The results for the researcher and one other participant who spoke for only three turns are not included here.

The learning styles the participants used in conversation were determined by the nature of their discussions on the design project. The tendency towards reflection was a result of their activities to think about what they wanted, to come up with new ideas and arrangements, to mentally manipulate those ideas and express them in the form of a coherent plan. The project was characterised by design rather than implementation which emphasises reflective, observing skills rather than action.

These findings suggest that conversational learning style is more strongly affected by situation-specific factors, such as engagement with the task in hand, than individual psychological factors. This supports the finding of Carlsson et al. (1979) who said that 'It has been our observation that for many individuals learning style preference is highly situational' (p.44, Footnote 9).

2.2. Individual and Group Effects on Conversational Learning

In his original formulation of experiential learning theory Kolb (1984) focused on individual adaptation to the world. There was little recognition that learning style could be a product of relationships between people. However, more recently Kolb et al. (2002) have argued that conversational learning is more likely to take place where there is a balance between individuality and relationality: that is, when 'an individual maintains a sense of self while at the same time is aware of, and open to influence of others' (p.14). In Chapter 7, the quantitative

data was used to examine the degree to which relationality affected conversational learning style.

Despite the tendency towards reflective learning styles over the project as a whole, each individual used a variety of learning styles, often over a very short period of time. The consistency with which each participant followed one of his turns using one learning style with another using the same learning style was measured. The results showed that consistency was strongly related to the overall number of turns that each person had at speaking (Table 9.3). Furthermore, there was less consistency in each individual's turns at speaking than between turns in group discussions.

Table 9.3 Individual Consistency in the Use of Learning Styles in Conversation

Person	Proportion of turns using same style as previous turn	Number of turns
Ian	0.604	1322
Bob	0.525	749
John	0.549	512
Bruce	0.446	177
David	0.208	24
(All People)	(0.606)	(2814)

Note: Data on other participants were not included here because there was insufficient data. Number of turns excludes the first turn because it there was no other turn to compare it with.

The tendency of an individual to use a certain learning style, regardless of what other people were saying, was weaker than the tendency to use a similar learning style to the previous speaker. This suggested that conversational learning styles were determined by the group's engagement with the task and the participants' engagement with each other. In other words, learning styles were task-specific and relational.

This finding was supported by the results for Bruce. In contrast to the other participants, he tended to use a divergent conversational learning style and his LSI results showed a divergent learning style too. Given that the project discussions tended to be reflective we might have expected him to show stronger use of divergence than the other participants and greater consistency between his turns. The results showed that his conversational learning style was

clearly divergent, and more so than the other participants, because nearly half of his turns at speaking used this learning style. However, he used this learning style less consistently than other participants. This suggests a strong relational component to his use of learning styles in the discussions studied here.

The closer textual analysis of particular subjects that came up for discussion in Chapter 8 showed still further complexity because there were some consistent differences between participants' conversational learning styles and they were mixed with these task-dependent and relational effects. For example, the discussion about the location of the lift on the building (Subject 2) showed that individual members of the group *all* used more divergent styles than usual. This emphasised how they used learning styles relationally, as a group, because they needed to develop greater divergent knowledge. In addition, however, Bob and John generally tended to use divergence more often than Ian. Despite the increase in the use of divergence by each member in this subject, Bob and John still retained their relatively higher use of divergence when compared to Ian. Thus, each person kept to their position in relation to the others but all shifted towards divergence because the task called for it.

In contrast, when participants discussed the performance of the lift (Subject 3) they showed a marked shift away from their usual patterns. There was a kind of division of labour in terms of the kinds of knowledge they were using as each person took up a position in relation to the other participants in terms of learning style.

The concept of learning style has flourished since it became active in the psychology of the 1960s. Although it is now used in a variety of domains in the social sciences, its psychological origins mean that it is often used as a measure of a psychological trait rather than a flexible mode of adaptation to the world. Kolb's (1984) formulation of learning style made some ground by being sensitive to how individuals do have a history, a persistent tendency to use one learning style based on past experience. And yet, for Kolb, an individual's world does not seem to contain other people. In this study we have seen how an individual's context can have a strong situational effect on learning style. The results from this research show that, at any

moment in time, the task people are engaged in, the learning styles used by the people they are interacting with and the context of that interaction have a strong effect on conversational learning style.

There are three advantages that measuring conversational learning styles has over the Learning Style Inventory. Firstly, conversational learning style is highly situation-specific. It is sensitive to short-term differences in the use of knowledge and in cognitive processing of knowledge. The LSI, on the other hand, measures learning style that develops over the long-term. It seems to measure a persistent tendency towards using certain cognitive psychological processes, rather than shorter-term and more situation-specific influences.

Secondly, the value of measuring learning style from recorded conversations is that we can see how learning styles are used in relation to a task: the participants are not engaged in completing the questionnaire, they are *engaged in their task*. It is useful to measure learning style whilst people are engaged in a task rather than by non-task-specific psychological instruments. The results of the LSI are largely independent of context because the LSI is a standardised instrument designed to be used quickly and easily in many different situations.

Thirdly, an analysis of the fluctuating use of learning styles in conversation allows us to look at the relational aspects of learning style, whereas the LSI is filled in by individuals and it measures individual tendencies. The analysis of individual conversational learning styles showed how participants adopted a similar learning style, or very different styles, and that this is related to task, experience and group relationships.

Nonaka and Takeuchi's (1995) theory of organisational knowledge-creation, in common with much research on innovative teams, tends to focus on groups as they convert knowledge from one type to another. However, they tend to treat groups as a black box (Boden, 1994). By opening the box and looking inside we can see that individuals can sometimes use learning styles in a homogenous way and sometimes take up different positions relative to those of others in the group. Perhaps the most appealing explanations of this phenomenon are those

that would recognise that learning styles are used *intersubjectively*. Kolb et al. (2002) have identified this when they argue that conversational learning should balance individuality and relationality. Better learning takes place when people act both as individuals and as members of a group.

A useful way to think about such learning is using activity theory and the concept of 'zones of proximal development'. A zone of proximal development is a 'region of activity that learners can navigate with aid from a supporting context, including but not limited to people' (Ash, 2002, p.2). The participants in the design project certainly appeared to negotiate their way through the design process. They used their existing knowledge and experience and through conversation developed new knowledge and understanding in areas where there were tensions or discontinuities. This was an interactive process, implying relationality, but each individual had their own areas of certainty and expertise. It is useful to think of conversational learning as taking place in multiple, overlapping zones of proximal development.

It appears that conversational learning styles are also used in ways that align well with ideas on social cognition (Resnick, 1991). Learning can be both cognitive and social. As Zhang (1998) says, the 'representation of a group problem solving task is distributed across individual representations, which jointly represent the abstract structure of task' (p.809).

We can also see this balance between individuality and relationality in knowledge management and organisation studies. The people studied in this project can be seen as a socially-distributed activity system rather than as either individuals or a group (Blackler, 1995; Brown and Duguid, 1991). As Brown and Duguid (1991) say, 'Not only is the learning in this case inseparable from working, but also individual learning is inseparable from collective learning' (p.46).

2.3. Further Research

Conversational learning is an intersubjective process where knowledge is created both individually and collectively. In this research the focus on a single group of people meant that

changes between subjects discussed and the relationship with knowledge could be examined because the participants, project and relationships were kept constant. In addition, the participants had known each other for some time and most were psychologically convergent. It would be interesting to examine a group of people with a greater variety of learning styles to see if they expressed their psychological learning styles more strongly or if they found it more difficult to co-ordinate their knowledge activities.

3. Linear Time and Cyclical Time: Learning Cycles

One of the key questions examined in this research was whether people use learning styles in a cycle during conversation, and, if so, what circumstances lead to a learning cycle. The data was used to examine the proposition that a discussion moves through stages and that particular learning styles are used at each stage. More specifically, it was suggested that groups sometimes start their discussions by using a divergent learning style and move through assimilation and convergence before finishing their discussions using accommodation. Furthermore, it was also suggested that the knowledge used and created whilst working on a task is also related to these stages and to conversational learning style. This was tested by calculating a correlation coefficient between the position of turns in a discussion and the learning style of those turns. Here, participants' use of learning styles was assumed to form a group learning style.

3.1. Most Appropriate Unit of Analysis to Measure Strength of Learning Cycles

The type and nature of the various discussions were examined to see which circumstances led to a stronger learning cycle (see Tables 7.8, 7.10 and 7.13). The results showed that the most useful level of analysis was at the level of the separate subjects discussed during the project. Certainly, these discussions were more likely to show progression in the use of learning styles than the project as a whole, the separate meetings, or at the level of the individual. This supports the findings of Carlsson et al. (1979) and Nonaka and Takeuchi (1995) who studied

product development teams and found that groups can go through several learning cycles within a single project.

Despite the staggered and fragmented nature of the discussion of each subject over several meetings, the group would build on previous discussion of that subject, developing their knowledge of it, and their use of learning style would change as a result. The group still used a variety of learning styles at any point in their conversations, even when the progression through the learning styles was clear. However, the regular changes in the use of learning style within subjects indicated that the learning and knowledge produced in subject discussions sometimes developed in an experiential learning cycle.

One reason why subject was the best level for analysis was that each subject had relevance to the participants. As they discussed a subject they would be aware of the starting point of the discussion and what had been discussed previously. This supports the idea that learning style and knowledge creation are intimately-related: each learning style conditions our interaction with the world and produces knowledge with particular properties and this is intimately related to the content of that knowledge.

We saw how the characteristics of each learning style could be related to a type of knowledge in Chapter 3, Section 4. These results lend support to the contention that the four learning styles correspond to four types of knowledge. The characteristics of these four types of knowledge are outlined in Table 9.4. Furthermore, the results suggest that each knowledge type is associated with a particular stage of a learning cycle. Divergent knowledge was associated with the initial, creative stages of a project where values and needs were expressed and concepts were created. Assimilative knowledge was associated with the generation of a internally coherent and explicit plan. Convergent knowledge was generated by activity to put that plan into action and was practical and related to skills. Accommodative knowledge was generated for the final stages of a project and was comprised of feedback and getting a feeling for how things had gone.

Table 9.4 Characteristics of Four Types of Knowledge Associated with Learning Styles

Accommodative Knowledge	Divergent Knowledge
Accommodative knowledge is tacit knowledge transformed by active experimentation. It is knowledge produced by action. Feedback. Common-sense. Self-evident facts. Learning by doing. Apprenticeship. Stories that create feeling or contain a moral. Post-action sense-making.	Divergent knowledge is tacit knowledge transformed by reflective observation. It is rooted in concrete experiences and perception. Motivation, values and ideals. It is embodied knowledge. It is ambiguous but flexible. Hypotheses, hunches and intuition. Metaphorical.
Convergent Knowledge	**Assimilative Knowledge**
Convergent knowledge is explicit knowledge transformed by active experimentation. It is rooted in abstract conceptualisation but it is practical. Decisions. Technical and operational knowledge. Emphasis on action and practical plans. Extending knowledge into the world.	Assimilative knowledge is explicit knowledge transformed by reflective observation. It is rooted in introspection and intention. It is scientific, coherent. Theory and universal principles. It is often mathematical and quantitative. Long-lasting. Logical argument. Refined and internally consistent. Permanence. Elegant plans.

The results also supported the idea that one kind of knowledge develops from another. The creation and use of one kind of knowledge creates a zone of proximal development in which the next kind of knowledge is developed. It is a springboard which participants use to develop their ideas and understanding of an issue and create new knowledge. This enabled the social scaffolding to be built which supported the movement to new areas of understanding (Ash, 2002).

Here we can see the value of the distinction between cyclical and linear time made by Kolb et al. (2002). They argue that 'learners' ability to *simultaneously* engage in these *two temporal dimensions* will largely determine the depth and quality of learning generated in conversations' (p.11). The development of the group's knowledge of a subject can be seen as a product of linear time whilst the cognitive experiential learning cycles that took place within the subject were subject to cyclical time.

Linear time implies a limit on our ability to move quickly through all the necessary thought processes. Miles and Huberman (1984) consider language and narratives to be largely linear and sequential. Indeed, the participants generally only talked about one subject at a time. The idea of cyclical time, expressed here in learning cycles, can be used to explain how that linear development takes place. However, Kolb (1984) also argues that few of us can use several learning styles simultaneously and, so, the cycle is a useful way of expressing the linear development of subject-specific knowledge whilst moving step-wise through a learning cycle.

Kolb et al. (2002) argue explicitly that a balanced use of learning styles will lead to better or more effective learning. Writers on decision-making (e.g. Argyris, 1979; Mintzberg and Westley, 2001) and creativity (e.g. Leonard and Swap, 1999) can also be seen to argue for this balance. In this research, there was little evidence that greater balance in the proportion of apprehensive versus comprehensive turns led to stronger progression through the learning cycle but most subject discussions were fairly well-balanced (see Figure 7.5). However, subject discussions with a greater balance between reflection and action showed stronger progression through the learning cycle (see Figure 7.6).

This importance of the reflection-action dimension is not recognised as often as the distinction between tacit and explicit knowledge. Nonaka and Takeuchi (1995) argue that aside from the tacit-explicit dimension, it is the sharing of knowledge that drives organisational knowledge-creation. And, as we saw earlier in this chapter, patterns of social interaction and communication are of huge importance. However, we can see some evidence here for the power of reflective and active forms of thought and knowledge. One advantage for the concepts of 'action' and 'reflection' over Nonaka and Takeuchi's 'sharing of knowledge' is that they allow individuals to create knowledge outside of their interactions with others: fundamentally, an individual creates knowledge rather than a group.

The key to reflection and action is Kolb's (1984) argument that they transform knowledge:

> 'The prehension dimension describes the current state of our knowledge of the world - the content of knowledge, if you will - whereas the transformation dimension describes the rates or processes by which that knowledge is changed.'
>
> (Kolb, 1984, pp.101-102, Footnote)

A balance between reflective and active modes of thinking can indicate a balanced engagement with a task or problem. For example, when a plan derived from careful reflection is implemented the new emphasis on action highlights corners that can be cut, tolerances that cannot be met, or difficulties in production. This transformation from reflective explicit knowledge to active explicit knowledge is well understood (Elbow, 1986; Bessant and Francis, 1999; Drummond, 1992).

Perhaps less well understood is how active tacit knowledge is transformed into reflective tacit knowledge because these are largely hidden processes. Tacit knowledge is often seen as a source of hunches, insights and intuition from which new concepts and ideas can be developed. The connection between creativity, reflection and divergence is also well understood (e.g. Leonard and Swap, 1999). However, divergent knowledge has greater power when it stems not only from concrete experiences but also from active experimentation. Trial and error and learning by doing create new experiences and a feeling for how well that particular actions can meet needs. Nonaka and Takeuchi (1995) recognise this when they urge companies to use qualitative and feeling-based measures to assess new products: feedback should not be too quantitative or overly rational. They also argue that tacit knowledge can be transformed from experience to new insights (accommodation to divergence) through socialisation.

This highlights the role of accommodation and post-action sense-making. Mintzberg and Westley (2001) say that decision making is often seen as operating on scientific principles which emphasise abstraction and reflection. They argue that decision-making should also be intuitive and active: this emphasises accommodative skills. Accommodation also seems to be the first step in stopping people from using their Model I strategies (Argyris, 1979) by allowing them to accept feedback. Interestingly, in this research post-action sense-making often occurred when the group were talking *off* the subject. A moment of relaxation or joking allowed

participants to get a feel for how things were going. This sensing function of accommodation sometimes led to further tacit reflection by the participants. Thus, the socialisation was an important marker for changing subjects or re-engaging with subject to go over unresolved points. It was also social in character as it often allowed someone the opportunity to raise an unresolved issue.

Thus, action and reflection are important cognitive and learning processes and contribute to better understanding of knowledge-creation when integrated with analyses using tacit and explicit knowledge.

3.2. Discontinuities in Subject Learning Cycles

We have seen how the discussion of some subjects in this project progressed through a learning cycle. However, there were also a few subjects where no progression took place (see Table 7.13). In addition, participants used a variety of styles over short periods even in subjects where there was a strong progression through a learning cycle.

One explanation for this variability in the use of learning styles was that participants were being personally consistent in their use of learning style regardless of the subject being discussed. However, as we saw above, group consistency was higher than individual consistency.

The remaining variability could also be produced by the participants purposefully using contrasting learning styles to widen the current use of knowledge. This could happen if one person wanted to move the discussion on. There could be a period of flux as participants move from one style to another. Indeed, using Kolb's (1984) arguments about 'integrative complexity', this merging of learning styles would generate further knowledge and drive the process onwards. Also, Carlsson et al. (1979) argue that it is possible to consciously adopt or promote a particular learning style to move discussions through a learning cycle.

In the discussion of lift performance (Subject 3), personal interests and gentle conflict seemed to over-ride group movement on learning style. However, the learning styles used were still very much focused on the subject of the discussion. Each person took up a role but there was still progression in group learning style. This could be quite sophisticated. For example, John only used apprehensive learning styles in this subject but his turns were divergent for first half, then he became quiet and finally he used accommodative turns later on: i.e. he only used tacit learning styles but their use was appropriate to the learning cycle.

In another example, the group's discussion of the location of the lift on the building (Subject 2) started with a period of assimilation but the group eventually had to return to divergence in order to find a solution that met all their needs. This was an example of a temporary reverse in learning cycle. Some of the needs that would have been expressed during a divergent 'stage' had been assumed and the conversation had to return to this stage in order to proceed.

There were also misunderstandings, false trails, unintentional splits in thinking between participants and aborted attempts to change the learning style. These patterns in the use of learning styles form part of the variation seen in these conversations and are harder to explain.

The discussion of the lift's appearance and its aesthetic integration into the building (Subject 4) was one of the subjects where there was little or no progression through the learning styles. There were two reasons for this. Firstly, there was greater variability in the use of learning styles: learning styles often changed turn-by-turn. There seemed to be a lack of focus and linearity to the discussion. There was a grasping of experience through apprehension and comprehension but there seemed to be little determined transformation of that experience through either consistent and concerted action or reflection. It may have been that there was no need to concentrate attention on this subject at that time. Secondly, even though the subject as a whole showed no learning cycle, many of the separate discussions brought together for this subject did show some progression. The subject did not develop linearly or cyclically because the separate discussions were not sufficiently-related.

Overall, the data showed that there was a positive relationship between short-term consistency in the use of learning styles within the group and the strength of the learning cycle. When participants acted in concert, they concentrated their attention on the subject being discussed. The level and type of their knowledge at that time caused them to use a particular learning style. Thus, it can be argued that learning cycles were stronger when the group as a whole was more fully engaged with the subject of the discussion.

3.3. Learning Style Cycle Within the Project

Over the project as a whole there was a positive relationship between learning style and turn number. However, the relationship was not particularly strong. Previously, Nonaka and Takeuchi's (1995) work was used to suggest that particular learning styles were associated with the different stages of a project but this was only partially supported by this data.

One of the clearest progressions through a cycle was when the group discussed the performance of the lift (Subject 3). The learning styles used during the discussion of this subject had a different pattern to those over the project as a whole (Table 9.5). The differences might explain why this subject showed a more complete cycle (correlation coefficient of 0.642) where the project as a whole did not (correlation coefficient of 0.214)

Table 9.5 Learning Styles Used in Discussion of Lift Performance (Subject 4) Compared With Project as a Whole

	Lift Performance		Whole Project	
Learning Style	No. of Turns	%	No. of Turns	%
Divergent	52	22%	814	29%
Assimilative	63	27%	978	35%
Convergent	47	20%	545	19%
Accommodative	74	31%	478	17%
Total	236	100%	2815	100%

Over the whole project the group used twice as many reflective turns as active turns: they tended to use divergent and assimilative learning styles twice as often as convergent and accommodative styles. However, during the discussion of lift performance there was a balance between reflection and action: the group used active styles of learning just as often as reflective styles of learning. Indeed, this subject showed one of the highest uses of active styles of learning. In particular, the group used more accommodative turns than in any other subject.

It could be that the learning styles used by the group during this project only related to the development of the separate subjects that comprised the project. Alternatively, there may be some merit in the project level of analysis but the staggered and fragmented discussion of the subjects across the meetings obscured progression through the whole project.

A further possibility, given the slightly stronger cycles of subjects with greater use of active styles, is that this project was not studied for long enough. The project was halted when projected costs got too high and anecdotal evidence suggests that there was a period of accommodation towards the end once commitment to a contractor was imminent. The active part of this project may have been foreshortened, and the parts of the project examined in this research may well have tended towards reflection as the implementation of the project was not very far advanced.

It is also entirely possible that, more generally, a design project would tend to elicit the use of more reflective learning styles. For example, von Krogh and Roos (1996) argue that organisations need a mixture of divergent and convergent types of conversations and that operational knowledge tends to be convergent. Thus, the participants would use reflective learning styles as they expressed what they wanted in relation to their needs and created a formal plan of the action that they want to take place. They would then use active learning styles as they implemented that plan and judged how well the action met their needs.

3.4. Further Research

Learning cycles were most evident when the subject of the discussion was taken as the unit of analysis. This is because the learning styles used by the participants were closely connected to the knowledge they were using and the knowledge they were creating. Further research could examine more closely what participants knew about a subject before and after they talked about it to specify this relationship more clearly. Further work could also examine situations where the knowledge being used and developed was less explicit (e.g. developing a mission statement or outlining key values) or much more practical (e.g. operational or technical knowledge of a production method).

Similarly, this group appeared to have the time and space for reflection. One could ask whether a group under pressure to produce workable solutions to a problem would be more or less likely to follow a learning cycle.

Lastly, given the flexibility with which individuals used conversational learning styles, it would be interesting to study a group of people with a variety of learning styles to see if the most appropriate people come forward in discussions when the task demanded their particular style of knowledge and experience.

4. Status and Solidarity

Kolb et al. (2002) argue that conversational learning takes place where a group finds a balance between status and solidarity. For them, good conversation take place when a group is neither dominated by rigid hierarchy nor a pathological heterarchy. Many writers in organisational sociology, network theory and innovation associate status with formality, bureaucracy and explicit knowledge and contrast it with solidarity which they associate with informality, organic structures and tacit knowledge. However, some who are sensitive to the value of both status and solidarity argue that there is role for both (e.g. Misztal, 2000; Kickert et al., 1997; Lawrence

and Lorsch, 1969). Some authors (e.g. Chesnais, 1996; Zaltmann, Duncan and Holbeck, 1984) go further and suggest that solidarity is more appropriate for creative situations and the initiation stages of a project, whereas status is more appropriate for operational situations and the implementation stages.

In this research, there was only limited potential to examine how status and solidarity varied during the project because both the formal and informal status systems were relatively stable throughout. The group had a long history of working with each other and their interactions had a friendly and informal atmosphere.

There was some limited evidence that in the early stages of the project, when a divergent learning style was used more often, participants needed to pull together and used similar learning styles. Conversely, later in the project, when more conflicting interests were revealed, participants tended more towards implementing their plans using active styles. The contrasting roles taken up by the participants did not reduce the strength of the overall learning cycle and could be seen as an example of 'creative abrasion' (Leonard and Swap, 1999) where different experiences and interests rub together to create more powerful learning. The inclusion of people with different perspectives into innovating groups is often recognised. For example, Nonaka and Takeuchi (1995) argue that groups need 'requisite variety'. However, we can see here that each individual is also capable of taking on a range of roles. The flexibility of an individual to respond to the task at hand must be taken into account, rather than merely relying on occupation or tests such as the LSI.

The intra-group contrasting of individual learning styles might point to the greater emphasis on status and fixed roles associated with comprehensive learning styles. Thus, a greater emphasis on solidarity may be more appropriate at the initiation of a project whereas a greater emphasis on status may be more appropriate at the implementation stage (Zaltmann, Duncan and Holbeck, 1984; Argyris, 1979).

It has to be acknowledged that these findings were based more on an in-depth understanding of a few subjects rather than on a discrete analysis of every subject. Better operationalisation of status and solidarity and further detailed analysis would be needed to examine these relationships for each subject. For example, it might be appropriate to present participants with an analysis of a discussion and question them about their own motivations, and how they felt about the inter-relationships within the group. This would have the effect of eliciting factors related to status and solidarity whilst, at the same time, contributing to the validation of the results.

Over the whole project, the group operated in a way that did seem to balance status and solidarity. Status was defined on the basis of experience and mutual respect and yet there was also solidarity in the form of mutual understanding. Although the meetings were held formally, and minutes were taken, the atmosphere of the discussions was informal. Ian acknowledged this when he compared these design discussions with his previous experience of discussion that included a contractor:

> If you sat in on a meeting where you've got contractors as well then it's a completely different ball game because they're trying to defend their quarter. And we're trying to protect the client's in a way. So you've got a completely different situation. And even developing something like we've been doing, it's far easier to do it with someone like Bob and his colleagues because I know them very well. And I know ... I know exactly how, well, not how they think, but what they want.
>
> (Meeting 9, 19 June 2001)

Ian's comments support the argument that the design process studied was characterised by solidarity and mutual understanding. It would be expected that, in a situation with different interest groups each 'defending their quarter', the nature of that interaction could change substantially. For instance, mutual understanding might be more difficult and status based on formal roles might become more relevant. Participants might make less use of tacit knowledge and greater use of explicit knowledge such as production drawings and legal contracts.

4.1. Further Research

This research examined conversational learning cycles in a group working informally with occasional activation of more formal status relations. It would be interesting to see how learning

cycles develop in a much more formal, bureaucratic and status-filled situation, perhaps one where there was a 'monologue from the top' (Kolb et al., 2002). Would there be greater use of assimilative and convergent learning styles and an emphasis on explicit knowledge and logic? Alternatively, it would also be interesting to examine a 'pathological heterarchy'. One could ask if discussions in these kind of situations would be more aimless and repetitive, with participants never getting beyond their own personal hunches and common-sense. In addition, it would be interesting to see if, as suspected, learning cycles are less easy to achieve in situations of greater conflict.

5. Discussion of Methods

This section discusses the methods used in this research, how they helped and where they hindered the analysis, and how they might be used in further research.

The development of a coding frame to categorise conversational learning styles was a substantial part of this research (see Table 5.2). A great deal of the literature on knowledge and learning had to be reinterpreted in the light of Kolb's typology of the basic learning processes, both to create a typology of knowledge processes but also because the coding frame had to be applied to conversation.

The resulting coding frame and methods for analysis of conversational learning styles mean that the learning processes underlying knowledge creation can now be measured, as they happen. The methods allow a greater range of analysis, providing insight into dichotomies such as tacit and explicit, individual and group. As we saw earlier, a key feature of the coding frame is the ability to examine learning styles whilst a group is focused on a task. By focusing on participants interacting with each other we can also examine individual and intersubjective uses of learning styles.

The transcription and coding of long conversations takes perseverance. Potter and Wetherell (1987) estimate that the ratio of tape time to transcription time is about one to ten. I would say that the coding of the conversation took at least as much time again. However, the detail that this provides is crucial to understanding moment by moment variations in the use of learning style and this lends the method greater validity. Given this sensitivity it may be useful for relatively short discussions and for single subject discussions and, in conjunction with the Learning Style Inventory, it could also be used as a diagnostic tool for examining group knowledge creation.

The resolution of difficult to code turns requires both an understanding of what the coding frame is trying to capture and an understanding of what the speaking person is saying. This highlights the importance of the coder and his or her understanding of the data. This method uses a high-inference latent coding system (Robson, 1993) and it would benefit from tests for inter-coder reliability.

In this project, there did not seem to be much conflict and there may have been a smaller proportion of these missing turns as a result. However, it is easy to imagine a different situation where participants engage less with the subject of the conversation and engage more with the process or with discussing the roles of the participants. In this situation there may be a higher proportion of missing values.

In terms of data display, the talkogram was a very useful analytical tool. It connected the detail of the transcript to an overview of a sequence of turns. It aided the process of data reduction by displaying sequences of turns with consistent or widely varying use of learning styles. It was particularly useful for the in-depth subject analyses and could be enhanced further by displaying the most commonly used learning style over, say, ten or twenty turns: this would reduce the detail displayed but would help in interpreting trends.

Finally, the ability to measure conversational learning styles was essential for examining some of the learning processes underlying the use and creation of different kinds of knowledge in an

interactive setting. The results had greater utility when analysed using Kolb et al.'s (2002) three other themes of individuality and relationality, linear time and cyclical time and status and solidarity. The instrument is, perhaps, less amenable to issues of status and solidarity where less task-based group processes affect learning, although similar research in different settings may prove this otherwise. However, the in-depth analyses undertaken showed that the method provides new insights into individual and intersubjective uses of learning styles and into the study of processes of knowledge creation.

Chapter Ten

Conclusion

This is one of the first pieces of research to operationalise and explore empirically the concepts promoted by Kolb's latest work (Kolb et al., 2002). It set out to explore the links between knowledge creation and learning. This was achieved by developing links between types of knowledge (Nonaka and Takeuchi, 1995; Blackler, 1995) and the learning styles outlined by Kolb (1984) in experiential learning theory. It sought to develop a coding frame and analytical tools to measure the learning styles used in task-focused conversations. It then examined patterns in the use of these conversational learning styles to see if, and when, cycles of knowledge creation took place.

The guiding themes were described by Kolb et al. (2002) as dialectics: individuality and relationality; circularity and linearity; and status and solidarity. They introduced these concepts into experiential learning because they are less focussed on the individual. Thus, this research has used these concepts to investigate how learning styles are used socially whilst being sensitive to individual difference.

It investigated the balance between individuality and relationality. Learning styles are often considered to be closely related to personality traits. However, like some others (Loo, 1999; Talbot, 1985), this research found that the use of learning styles can be highly variable. Learning styles were used flexibly by participants and with great skill. The qualitative analysis demonstrated the flexibility with which the participants used different styles of learning: sometimes they worked together using the same styles, and on other occasions they took up contrasting positions. Differences in knowledge between participants could drive them to work on filling gaps in their understanding, or they could stall the process.

The most appealing explanations of this phenomenon are those that would recognise that learning styles are used intersubjectively. This would imply that better learning takes place when people act both as individuals and as members of a group. Similarly, this study shows that in order to study this intersubjectivity we must measure both individual and group processes simultaneously.

One of the challenges of this research was to bridge its own dialectic whereby the individualistic, psychological theory of Kolb was put up against the relational and social ideas of knowledge management. This was only achieved by understanding that social practices and patterns of social relations interact with individual learning processes. Indeed, it was found that it was possible to better understand Nonaka and Takeuchi's (1995) theory of organisational knowledge creation by replacing an emphasis on transactions between individuals, groups and organisations with a transformational active-reflective dimension from Kolb's theory.

Discussions of Kolb's experiential learning theory often focus exclusively on the reliability and validity of the Learning Style Inventory. They often assume that learning styles are stable within individuals and ignore the social component of learning. However, the coding frame and analytical methods developed for this research provide an alternative method for examining learning styles. There are several benefits of using a coding frame for categorising conversation in conjunction with qualitative analysis of transcripts:

- The method operationalises the fundamental psychological processes of experiential learning, as long as the learning is verbalised.
- It is not a standardised, individual, seemingly 'context-free' measure like the Learning Style Inventory.
- The method can be used for studying social encounters such as conversations where there is little interference by the researcher.
- The method measures learning styles whilst subjects are occupied on a task: not the learning style of a subject engaged in completing the test.

- The method allows quantitative content analysis of the use of learning styles in conversation.

The analysis presented here compared the results of the coding frame with an in-depth study of the discussions that took place in a design project. This analysis lends support to the idea that the coding frame is a good tool for determining learning styles of speech. 'Talkograms' were developed as a tool for displaying a large amount of highly variable data at one time.

The analyses showed that the use of accommodation had an important role in knowledge creation. But there were fewer instances of accommodation in comparison to the other learning styles. This could be a measurement issue: the use of tacit knowledge is difficult to measure, especially as accommodation seems more likely to occur off-stage. The transformation of tacit knowledge by action and reflection is a complex and important process, and one that is less well understood. Further work will be needed to measure it properly and to assess its impact in cycles of knowledge creation. For instance, this measurement may require some intervention by the researcher to get people to vocalise their inner dialogue.

In addition, the method has only been tested in a single environment. Further work is needed before there can be greater confidence in its validity and reliability. The most important area for future work is to test inter-coder reliability by arranging for several people to code the same section of conversation using the coding frame and comparing the results.

Another theme, the need for a balance of circularity and linearity, was examined in this research by looking for evidence of knowledge cycles. The results showed that learning styles were determined more by the nature of the immediate tasks ('subjects') facing the participants than by the stage of the project or by individual predisposition to use a particular learning style.

One reason why 'subjects' were the best level for analysis was that each subject had relevance to the participants. As they discussed a subject they would be aware of the starting point of the discussion and what had been discussed previously. This implies that approaches that

emphasise social organisation, or learning styles as personality traits, without addressing context and the skilled production of knowledge for a purpose, will only ever provide partial explanations for how knowledge is created.

These results also support the founding idea for this research: that learning style and knowledge creation are intimately-related. Each learning style conditions our interaction with the world and produces knowledge with particular properties and thus learning style is intimately related to the content of that knowledge.

Because this research is effectively a case study, further work is needed to explore how different tasks, such as a highly creative or highly technical tasks, and pre-existing knowledge about those tasks impacts knowledge cycles. However, the results indicated that knowledge cycles were stronger when participants:

- were motivated
- had the willingness and ability to act
- concentrated and engaged with the subject
- were conscious of working on a task that had salience for them
- used similar learning styles for short periods of time.

The key thing about these characteristics is that they have both psychological and social dimensions.

Issues of status and solidarity were a little more difficult to explore in this research. Despite the steady-as-she-goes and co-operative nature of this group, there is some slight evidence that solidarity is more appropriate to apprehensive processes, involving tacit knowledge, and that status is highlighted for comprehensive processes. This would imply that there is a greater emphasis on solidarity at the inception and final evaluation stages of a project. A comparison of several different groups is needed to explore this further. Furthermore, it would be interesting to investigate groups with large status differentials or conflict, and answer questions such as 'How

strong are their knowledge cycles, if any?' or 'Can conflict support and be integrated into the knowledge creation process?'

Finally, the results indicate that perhaps the biggest factor influencing knowledge creation in conversation is the use of action and reflection. They showed support for the idea that the knowledge creation process is better if reflection comes first followed by action. Tacit knowledge is used at the beginning and end of the process and explicit knowledge in between. Thus, the shift from reflection to action most clearly defines movement through the process.

My method and findings indicate that the reflection-action dimension to learning exists and can be measured. Furthermore, this dimension to knowledge creation and learning is often not given the central role it deserves. As mentioned earlier, it appears that the action-reflection dimension could replace Nonaka and Takeuchi's (1995) organisation-individual dimension in organisational knowledge creation.

Despite the burgeoning discussion about the respective roles of tacit and explicit knowledge in recent years, this research suggests that processes of reflection and activity have an equal and complementary role. Reflection and action define the means and rate at which experience and knowledge are transformed into something new. Thus, the tacit-explicit dimension does not stand alone: it can only be understood in combination with the action-reflection dimension.

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Appendix 1

List of Events and Contacts Recorded During Fieldwork

List of Events and Contacts Recorded During Fieldwork

Date	Contact	Record	Trans cribed	People		Subject
Nov 00	Meeting			Bob Ian John Bruce David		Best option identified: a goods lift 2m x 2m, to be built on the side of the building next to goods in/out.
Jan 00				Ian		Initial drawings prepared.
26 Feb	Meeting 1	Tape Minutes	Trans	Bob Ian John Bruce David	AR	Walkway. Lift: needs, decision on size. Canteen.
27 Feb	Meeting	Tape Minutes		Bob John Bruce David	AR	New office building issues. Access control.
"	Chat	Tape	Trans	Bob	AR	Organization structure discussed. Organization charts. Know-how in production. US quality man gives praise. Bob discusses Bruce & money.
9 Mar	Meeting 2	Tape Minutes	Trans	Bob Ian	AR	Walkway. Lift. Canteen.
12 Mar	Meeting	Minutes Email		Bob John David		Walkway. Lift. Canteen.
16 Mar	Note	Sketch		Bob		Bob prepares sketch of his idea of loading bay.
16 Mar	Chat			Bob	AR	Goods lift. Loading bay. Specific issues on lift.
20 Mar	Meeting 3	Tape	Trans	Bob Ian John Bruce David	AR	Lift. Loading bay. Scissor lift.
22 Mar	Note	Sketch		John		John prepares sketch of his idea of loading bay.
29 Mar	Visit			Bob & Contractors	AR	New office: Ceiling tiles & blind quotes. Visit.
"	Chat - Meeting 4	Tape	Trans	Bob	AR	Loading bay. Moving contractors. Famous product. History of problems with building.
5 Apr	Meeting 5	Tape	Trans	Bob Ian John	AR	Lift. Loading bay. Planning.
11 Apr	Meeting	Minutes		Bob Bruce David		Quotes for preparing new office. Little bit on lift.
18 Apr	Presentation	Video	Notes	1st employee		History of company. Interesting stuff on culture.
24 Apr	Meeting 6	Tape Minutes	Trans	Bob Ian John Bruce David	AR	Lift. Planning.
"	Meeting			Bob Ian Andy		Bob's office. Andy = building contractor. I go home.
26 Apr	Note	Email		John to Bob Ian Bruce David	AR	Align canopy and loading bay edge.
2 May	Telephone	Notes		Bob	AR	Can scissor lift use 2 or 3 sides, loading bay, value of Andy & Ian, value of experiencing seeing carpet before buying.
8 May	Meeting 7	Tape Minutes	Trans	Bob Ian John Bruce David	AR	Lift: planning, windows, doors, floor, specs & timing. Scissor lift: loading, position, canopy. New office: walkways, painting, ceiling tiles, windows.
"	Chat	Notes		Bob John	AR	Response and actions to John's email 26 Apr. They think action has happened.
11 May	Note	Email		Bob to Ian	AR	Floor of lift.
16 May	Note	Email		Bob	AR	Painting new office.
29 May	Meeting 8	Tape Minutes	Trans	Bob Ian John	AR	Lift. Planning. Windows. Doors.
"	Interview	Tape	Trans	Bob	AR	Career. Learning style questionnaire.

Date	Contact	Record	Trans cribed	People		Subject
"	Interview	Tape	Trans	John	AR	Career. Learning style questionnaire.
29 May	Visit			Alan Nigel Alex	AR	Introduction to manufacturing.
31 May	Production meeting				AR	Updates and work to do. Training.
"	Observ-ation			Mitch	AR	Observing tester at work.
1 Jun	Production meeting				AR	Updates and work to do. Training.
"	Chat			Dave	AR	Talk about writing testing manual.
6 Jun	Note	Fax		Ian to Bob		Planning approval obtained. Completed drawings. More details to follow.
19 Jun	Meeting 9	Tape Minutes	Trans	Bob Ian Later: John Bruce David	AR	Lift.
"	Interview	Tape	Trans	Ian	AR	Career. Learning style questionnaire.
"	Interview	Tape	Trans	Bruce	AR	Career. Learning style questionnaire.
3 Jul	Meeting 10	Tape	Trans	Bob Ian John Bruce David Jack Jon	AR	Structural engineer (Jack). Quantity surveyor (Jon). Finding tenderers and actual construction.
4 Jul	Note	Email		John	AR	Getting real experience of lorry height and comparing to scissor lift specification.
13 Jul				Ian & QS		Send out tender package.
7 Aug	Meeting	Tape	Trans	Bob Ian John David Eric Jon	AR	Reporting first results of tendering process. Discussion of proposed costings.
"	Chat	Notes		Bob John	AR	Discuss cost vs. needs. Costs too high. Alternative plans unearthed.
? Aug	Note	Letter		Ian to Bob		Revised prices. Jon's mistake: missed out page from tender document.
16 Aug 10:55	Note	Email		Bob To Ian John Bruce David	AR	Booking interviews with two most likely tenderers.
16 Aug	Notes	Bob dictated to me		Bob		Bob's notes to himself regarding lift, price, needs.
16 Aug	Meeting	Tape 17 Aug Bob story		Bob Bruce David (John?)		Bruce presented likely costs: higher than tenderers costs (e.g. architect, etc fees). Took five minutes to decide not to go ahead with lift.
16 Aug 12:32	Note	Email		Bob to Ian John Bruce David	AR	Thinking of cancelling. Want to know cancellation costs & fees. Put on hold? Join the wake tomorrow.
17 Aug	Meeting	Tape	Trans	Bob Ian John Bruce David Eric Jon	AR	Cancellation of lift project has sunk in. Hearty atmosphere thins. Andy's failure to tender discussed. Measured rates not high after all. Ian offers options without lift included. Ian, Eric & Jon try to salvage situation. Bob, John, Bruce & David sympathetic. John may ask for costs on new options. Bob says "shame".
"	Chat	Tape	Trans	Bruce David Bob	AR	Discuss cancellation. Say possibility of further investigation won't happen.
"	Chat	Tape	Trans	Bob Bruce	AR	Discuss cancellation further. Discuss lift project more broadly: success or failure, what Ian thought of it.

Appendix 2

Learning Style Inventory

Name:_____

Learning Style Inventory

This survey is designed to help you describe how you learn – the way you find out about and deal with ideas and situations in your life. Go through the questions and find out what your learning style is.

Different people learn best in different ways. The different ways of learning described in the survey are equally good. The aim is to describe how you learn, not to evaluate your learning ability. You might find it hard to choose the descriptions that best characterise your learning style. Keep in mind that there are no right or wrong answers – all the choices are equally acceptable.

There are nine sets of four descriptions listed in this inventory. Mark the words in each set that are most like you, second most like you, third most like you, and least like you. Put a numeral "4" next to the description that is most like you, a "3" next to the description that is second most like you, a "2" next to the description that is third most like you, and a "1" next to the description that is least like you (4 = **most** like you; 1 = **least** like you). Be sure to assign a different rank number to each of the four words in each set; do not make ties.

Example

eg	4	happy	3	angry	1	fast	2	careful

Some people find it easiest to decide first which word best describes them (4 happy) and then to decide the word that is least like them (1 fast). Then you can give a 3 to that word in the remaining pair that is most like you (3 angry) and a 2 to the word that is left over (2 careful).

1		discriminating		tentative		involved		practical
2		receptive		relevant		analytical		impartial
3		feeling		watching		thinking		doing
4		accepting		risk taker		evaluative		aware
5		intuitive		productive		logical		questioning
6		abstract		observing		concrete		active
7		present-oriented		reflecting		future-oriented		practical
8		experience		observation		conceptualization		experimentation
9		intense		reserved		rational		responsible

Scoring Instructions

The four columns of words correspond to the four learning style scales: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). To compute your scales scores, write your rank numbers in the boxes below only for the designated items. For example, in the third column (AC), you would fill in the rank numbers you have assigned to items 2,3,4,5, 8, and 9. Compute your scales scores by adding the rank numbers for each set of boxes.

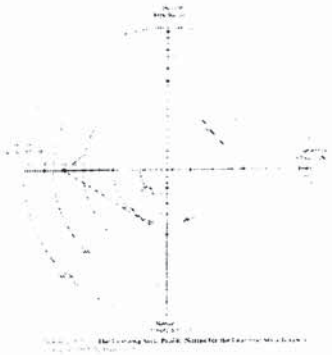
First Column	
Score items	
2	
3	
4	
5	
7	
8	
CE=	

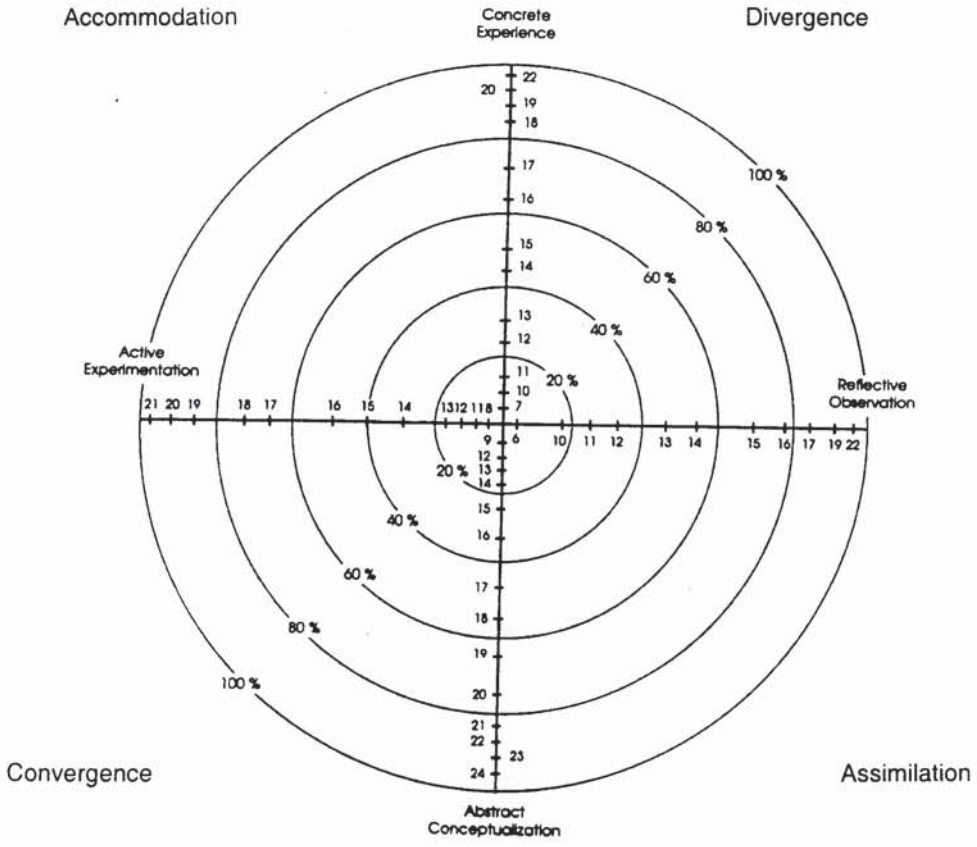
Second Column	
Score items	
1	
3	
6	
7	
8	
9	
RO=	

Third Column	
Score items	
2	
3	
4	
5	
8	
9	
AC=	

Fourth Column	
Score items	
1	
3	
6	
7	
8	
9	
AE=	

Use the target below to find out the meaning of your scores.
By circling the scores on the four scales and connecting them with straight lines you can create a picture of your learning style profile.





(Kolb, 1995, p.51)

Calculate the combination scores below. To compute the two combination scores, subtract CE from AC and subtract RO from AE. Preserve negative signs if they appear. These scores indicate the extent to which you emphasise abstractness over concreteness (AC-CE) and the extent to which you emphasize active experimentation over reflection (AE-RO).

AC - CE

☐ - ☐ =

AE - RO

☐ - ☐ =

Interpreting Learning Styles

The four learning modes combine in a dialectical way to form learning styles: "Most people develop learning styles that emphasize some learning abilities over others" (p.76).

Kolb calls learning styles 'possibility-processing structures' that are 'best thought of as adaptive states or orientations that achieve stability through consistent patterns of transaction with the world' (p.97). Your learning style at any moment is shaped by your personality, subject specialisations in your educational career, the sector in which you work, your current occupation and the specific task you are working on now.

Characteristics of the Basic Learning Styles

Accommodation	Divergence
Strength in doing things, carrying out plans and tasks. Get involved in new experiences. Opportunity-seeking, risk-taking. Action. Suited to situations requiring adaptation to changing situations. If theory and plans do not fit facts, discard plan or theory. Problem-solving by intuition and trial-and-error. Rely heavily on others for information. Not analytic, At ease with people but sometimes described as impatient or pushy. Managers.	Strong in imaginative ability and awareness of meaning and values. View concrete experiences from many perspectives. Organise relationships into a system of meanings. Perform well in brainstorming and generation of alternative ideas and implications. People-oriented. Imaginative. Feeling-oriented. Human Resources
Convergence	**Assimilation**
Problem-solving, decision-making, practical application of ideas. Knowledge focused on specific problems by hypothetical-deductive reasoning. Controlled in expression of emotion. Prefer technical issues, tasks and problems rather than social and interpersonal issues. Engineers.	Strength in inductive reasoning, creating theoretical models. Assimilate disparate observations into integrated explanations. Ideas and abstract concepts, judged by logic and precision. If theory and plan do not fit the facts, disregard or re-examine the facts. Scientists.

Kolb, D. (1984) Experiential Learning: Experience as the Source of Learning and Development, Prentice-Hall, New Jersey.

Thanks for your time. I hope you found it interesting

Appendix 3

First Draft of Coding Frame

This first coding frame was used for meetings 26 February, 9 March and 20 March 2001.

Operationalising Theory of Knowledge Creation for Interpersonal Communication

Accommodation		Divergence	
ilo	Influencing and leading others.	vn	Voicing needs, description of problem or need.
sne, age	Starting new experiences & acting to generate experience.	lom, oq	Listening with an open mind, open questions.
acs	Adaptation to changing situations, intuitive response to new information.	cws	Coming up with solutions, ideas, new arrangements, possibilities, particularly in ambiguous situations.
tae	Trial and error.	iti	Invitations to be imaginative.
qes, tnm	Qualitatively evaluating proposed solutions & getting a feeling of whether needs met.	ft	Future thinking, visioning, expanding needs.
his	Intuitively see how plan or action fits in with previous experiences or history.	re	Reflecting on experience to identify needs.
		mp	View concrete experiences from many perspectives.
		gi	Gathering (appreciating, expanding, offering, receiving but not interpreting) information.
Convergence		**Assimilation**	
cbs	Choosing the best solution.	oi	Organizing (refining, preparing) information.
sg	Setting goals.	bcm	Building conceptual models.
md	Making decisions.	de	Designing experiments.
pai	Practical application of ideas.	aqd	Analyzing quantitative data.
ss	Single solutions.	cs, rs	Comparing solutions, logically evaluating and refining solutions.
diw	Functionality and logic, "does it work?"	ci	Interpretation using logic, or standards or codes, comprehending, classifying.
?eni	Experiment with ideas.	spc	Specifying conditions or limits or parameters.
?tt	Testing theories and ideas (originally from assimilation).		

(File: Operationalising Kolb 2, Main coding frame file: Operationalising Kolb 3b))

Appendix 4

Discussion Time by Subject and Meeting

Discussion Time by Subject & Meeting

Time (mm.ss)		Meeting										
Subject		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
	Lift	35.09	8.46	10.07	1.03	5.82	18.59	7.03	5.37	9.40	0.27	105.57
1	Type of lift	17.19		1.07			3.45		1.12	2.15		25.39
2	Location on building	12.31	5.15			1.03						18.49
3	Performance			4.03		0.40	10.57	0.45	2.01	0.40		19.07
4	Appearance, windows	3.13		3.58	1.03	4.39	4.57	2.28		3.40		24.00
5	Lift machinery, plant room, ducts	2.06	3.31	1.39					2.24	3.45	0.27	13.52
6	Lift control & operation	0.40						4.30				5.10
	Goods in / out	17.86	10.16	25.07	1.52	13.38	10.25	5.77	22.43	25.70	13.47	145.61
	Scissor lift	13.70	2.51	1.70	0.00	0.67	6.40	1.43	0.27	10.48	2.68	39.84
7	Placement	11.19		1.21								12.40
8	Type, size	2.51	2.51	0.31		0.36					0.40	7.30
9	Specification, operation, gates			0.18		0.31	6.40	1.43	0.27	10.48	2.28	22.57
	Loading Platform	4.16	6.00	12.80	1.52	12.26	0.00	0.00	13.12	11.28	0.00	61.14
10	Shape, size, function		6.00	5.28	1.03	5.10						17.42
11	Ramps, steps	4.16		5.37	0.49	0.58				3.04		14.46
12	Balustrading			2.15		6.58			13.12	8.24		30.49
	Other goods in / out	0.00	1.65	10.57	0.00	0.45	3.85	4.34	9.04	3.94	10.79	44.63
13	Canopies, lighting			8.15		0.18	3.40	2.24	0.45	2.33		17.55
14	Type of doors		0.40	2.42		0.27	0.45	2.10	8.46	0.13	9.45	25.30
15	Drainage		1.25						0.13	1.48	1.34	5.01
	Total length of lift discussion	**52.95**	**18.62**	**35.14**	**2.55**	**19.20**	**28.84**	**12.80**	**27.80**	**35.10**	**13.74**	**258.07**
		26 Feb Ian Bob John Bruce David	9 Mar Ian Bob	20 Mar Ian Bob John Bruce David	29 Mar Bob	5 Apr Ian Bob John	24 Apr Ian Bob John Bruce David	8 May Ian Bob John Bruce David	29 May Ian Bob John	19 Jun Ian Bob John Bruce David	3 Jul Ian Bob John Bruce David	

Time estimated from tape counter values with a count of ten taking 45 seconds.

Appendix 5

Annotated Transcript of Discussion of Subject 2, Lift Location on Building

Key to Learning Style Codes in Margin:

A Divergence

B Assimilation

C Convergence

D Accommodation

Codes with numbers, e.g. A11, refer to codes in the coding frame (see Table 5.2 in Chapter 5)

Subject 2: Lift Location on Building

Meeting 1: 26 Feb 2001

A290

	Bruce:	And did this have a gradual height adjustment at this end.
	Ian:	Ummm no. Ummm that would have complicated the issue with the pit, although, given a bit more time I could probably could investigate that further. But I was thinking about having something more adjustable out in the road more.
B		But then I started to get into problems of where we were positioning it with the size that we needed. That's why I was talking to you Bob about moving it up a bit, up a bay even so as to clear the ducts that we've got there at the moment.
B	Bob:	There are two complications. There are the ducts underneath. There's also the requirement not to interfere with the concrete bases on which the whole building is floating.
A	Ian:	So I have to go in the middle of bay really with this sort of lift.
B	John:	What sort of distance do we have to go away from a pillar do we have to be.
Bx2	Ian:	More or less where I've drawn it in the centre. To have a lift of that size, you see, I need a lift shaft which is 2.8 metres deep by 2.640 wide. That's the internal dimension; that's without the structure. [short pause; other look surprised]. Well they're pretty big bases that are underneath the building so we just get that in really. So, to have a lift of that size I've got to centre it on the column ... you know, between the columns.
	Bob:	Now, the only price we've seen is the price of the actual lift mechanics ...

A403

	Bruce:	So anyone could do it.
	Ian:	Well obviously you could secure it so that ...
A		But when you put lift where it is, it interferes really. Well it does interfere with the ducts. That's why I was saying. We'd need to shift the whole thing a bay forward to be able to get the scissor lift in.
B	Bob:	Which wouldn't be that embarrassing as I recall. When we first looked at it. We considered that as one of the likely sites. I mean you [John] hadn't had the time to analyse it further at the time.
C	John:	Well it's
B	Bob:	It's not as nice.
A	John:	No. It's in its preferable space there.
Ax2	Ian:	I'm not sure whether you can get (well I haven't found one; it doesn't mean there isn't one) you know ... There may be a mobile, I mean that's the other thing, a mobile scissor lift. One that you would keep somewhere else and then when you needed it, you truddled it down. I mean it is possible that someone makes something like that.
A	Bob:	Are we coming opposite the fire escape in this new position. [maps moving] I'm not sure how it looks
B	Ian:	No no ... it's short of that bay.
B	John:	Yes, if you moved it down a bay you would be looking at this space. And that's where we've got ...
B	Ian:	Your zone, I mean, in your store.
X	John:	Ummm.
B	Ian:	Are we talking about your fire escape staircase.
B	John:	Yeah it's opposite.
B	Bob:	Upstairs.
B	Ian:	Oh upstairs I see.
B	John:	Downstairs we've got the AI room here but ...
D	Ian:	But that wouldn't cause too much problem upstairs would it ...
B	Bob:	No, I was just wanted to ... I was try to picture everything ...

X	John:	Well, I ummm
A	Bob:	It would act as a restriction.
A	John:	It's ... yeah ... it's making this bit of space down here smaller. How we divide this up I don't know. Ummm
A	Bob:	Yes it's difficult to keep people together through a lift room.
	[long pause – John thinking]	
	Bob:	Are there ways of achieving it without having to have it in the middle of the road.
	Ian:	What? The scissor lift.
	Bob:	Yeah.
	Ian:	Well yeah I'm sure. I can't ... I'd be very surprised if someone hasn't invented something, a mobile scissor lift. There must be something like a mobile ...

A533

A	John:	If it could be sunk into the ground in the road way.
B	Ian:	Well that ... I could do that if I moved the whole thing one bay forward. I'd be clear of your duct.
B	John:	Oh yeah, that's the problem.
B	Ian:	From where it's shown at the moment I need to come forward a bay with the lift and everything so I can.
B	John:	Well, it doesn't work ...
Ax2	Ian:	Well, I can do it another way. You could leave the lift where it was but you would be extending your loading bay right the way along. And then we've got problems of course with our fire exit door. You know we've got a fire exit.
A	Bob:	It reaches that far?
B	Ian:	Well, it would do if you started moving it forward. Yeah. You see we need a ramp. It's the ramp. It's the ramp. I mean even with what I've drawn it only just comes in now before hitting the fire exit door.
B	John:	I assume that's the same height as it is at the moment.
B	Ian:	Yeah, floor height.
	[pause]	
B	Ian:	We can move the door. But I mean that mucks up all your area and everything doesn't it with all you racking and everything that you need.
A	Bob:	Well, I think it's all going to be re-laid again I'm sure. But it is a pain changing those panels I'm sure. And also having to get permission again.
A	Ian:	Well no it wouldn't be too bad doing that sort of thing.
A	Bob:	There aren't many places to take that. You may not want to stick it on a [indistinguishable]
	Bruce:	What will the door look like.

B183

	Bruce:	So that takes straight money out.
	[pause. plans moving]	
D	Bob:	So it's just the scissor lift. The placement
X	Ian:	The placement.
D	John:	It's how we cope with it.
Ax2	Ian:	There are various options now. We could leave the lift where it is ummm. I can afford to move ... No. I could move. If the double doors were not moved into the next bay but say you moved them ... When I say next bay I mean the other side of the next column. If you moved them further towards gridline B is it?
X	John:	North?
Ax2	Ian:	Yes. No. B isn't it? If you move it along then I will probably have enough room beside ... where the doors are now more or less to get a scissor lift. If I moved those doors there, slightly more here then I will probably be able to get a scissor lift in here with the pad stone with the foundation.
X	John:	Well ...
A	Ian:	If you don't want to move the whole thing you see. The only problem then is I've got the ramp. I'll have to fiddle around with the ramp.
X	John:	Well yeah. Also you've got ... We're ending up with those doors which are feeding into the factory at the top further and further away from ...
A	Ian:	These ones?

B	John:	No. The ones you're talking about moving. You're going to end up all the way down here. Everything that comes in will have to come through that area.
X	Ian:	What about
B	John:	It's almost as though they want to go the other side.
X	Ian:	That's
A	John:	If they are going to have to go that far
B	Ian:	That's another option. The other option is ... I mean the lift.
A	John:	So they go opposite ...
X	Ian:	The lift ... the lift ...
D	Bob:	Particularly if the lift is going to be smaller, you don't need the motor room ...
X	John:	Yeah, the motor room is ...
A	Ian:	We're staying with this size lift aren't we?
X	Bob:	Oh yes, it's just the motor room.
C	Ian:	What about if I moved the lift to there and the doors ...
X	John:	Oh again. Where it happens upstairs as well it's a mess.
A	David:	It's less flexible. He's got his personnel down there. It would be better than doing it the other way around.
A	John:	It's almost as if ... Looking at the long-term ... you know. It's sort of here at the moment.
A	Bob:	Actually, is it out of date this drawing. We've got to be careful. Sorry just on the upstairs because the door isn't where it was.
	?:	Oh these ones.
A	Bob:	Yes. They don't come out here any more. It's like that.
A	John:	They come out this much.
A	Ian:	You changed these did you? Oh right.
A	Bob:	It's the same depths it's just that you haven't got the door there.
A	John:	It's this riser which is ...
A	Ian:	Yeah. It's a typical riser. You don't need a riser that size. It's a classic. Unless you've filled it up with something.
A	Bob:	Oh no no. No.
A	Ian:	It was the classic scenario that you have, you know, on every building. They ask for these huge risers and then nothing goes in them. And this was a real classic in this building. Except for the one down here. That one round there is ...
A	Bob:	[chuckles] ... There's always something like that.
X	Bruce:	This ... the rear entrance then.
A	Ian:	Sorry. The doors around the first floor are around here. That's what they're saying. Bob. Did you say? Around here. Did you say?
X	Bob:	Yes, they're here.
C	Ian:	Yep. Right. So if you did use that section for your use then perhaps the lift would be better that way, wouldn't it?
D	John:	No. That's not going to be dealing with that's ...
Ax4		I was just looking at ... This is the stores area. And at the moment we've got the lift in the middle of this block and the machine room is out there so this is the factory here. Ummm. The goods, you're still going to want to come through this door. So the more we push this down here the longer it's having to go. And the idea was to have finished goods store in this room at the end here and then our sort of packing and collating shipments in this area so that then it moves out up here. Ummm. And it's this sort of space which is currently sitting up here that is very very tight.
A	Ian:	If there wasn't a lift, John, where would ... Where's your ideal position for these double doors? Where they are now? Is that what you're saying?
X	John:	Yeah, pretty much.
A	Ian:	Which is where I've put the lift of course.
A	John:	Yeah, but if you moved those one up [back of building] instead of further and further down it's getting better from my point of view.
C	Ian:	If they came towards the rear. Well that doesn't give me a problem. It just means you are gonna be ramping the other way which we've got plenty of space to do.
B		You've got nothing along there have we?

B261

A	Bruce:	Why do we need to have two doors?
A	Ian:	Errr. Two doors. A pair of doors do you mean?
A	Bob:	Oh. An in and out you mean?
A	Bruce:	No, we've got another one right up here.
A	Ian:	Oh at the top. At the back you mean?
A	David:	Are you wondering why you can't use the lift.
A	?:	Go straight through the lift and continue.
C	John:	Lorries and vans turn up.
Bx2	Ian:	Also, it wouldn't be designed for that. You'd start to get problems with the doors and that. It just wouldn't be designed for that. But I could leave the lift where it is and put the doors to the side and then just have everything this way. I could look at that and I might be able to fiddle around with the scissor lift with it going that way.
D	John:	Although you've got the ducting.
D	Bob:	[laughs]
D	Ian:	Oh yeah. Because I've got the double duct [pronounces "t" carefully, signalling joke]. Haven't I? You know, I've got the two ducts.
D	John:	Yes, the double duct.
D	Ian:	Not double Dutch, double ducts. [sound of plan] Here, Bob's kindly.
D	John:	That's where all these ducts have come from.

Meeting 2: 9 Mar 2001
Present: Bob, Ian and Alec only.

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	Ian:	Right what do you want to talk about first.
	Bob:	As they come.
	Ian:	Lift.
A	Bob:	Lift. John was very interested to know the space, the enormous amount of space you were going to be taking up.
B	Ian:	Well I haven't taken up any space. You know. We had decided to put it on the outside.
A	Bob:	Can we move it as far up one end as possible.
B	Ian:	The lift has stayed where it is. What I've done is moved the doors; up there [plan].
A	Bob:	Right. Yes.
A	Ian:	As I said to you all: that's got to stay there in the middle of a bay. But I mean, you can put it anywhere you like.
A	Bob:	OK. We weren't sure if it could move because of the thing in there.
Bx2	Ian:	I mean it's really got to stay more or less where it is. I mean as it is, Eric has got to nibble away at the foundations. Yeah but he doesn't seem to be worried. But it's the bases which are the issue. So ... But I've moved the door for him.
X	Bob:	Good.
B	Ian:	Alright. Which is obviously no problem at all. Which you can see from the elevation [plan], we've got a panel there so all I'm doing is the doors are going in the bottom of an existing panel.
	Alec:	Where were the original doors.
	Ian:	They were here where the lift it.
	Bob:	Do they have to remain as large double doors.
	Ian:	No. But ... but ...
	Bob:	But that's where they'd go.

94

A	Bob:	Why can't we ... you move stuff down here. Is that still in this?
A	Ian:	Yeah but you ... He doesn't want the lift down there does he? [pause] He doesn't want the lift down here. Cause I suggested that to him
X	Bob:	That's right.
D	Ian:	I said if I could get clear of everything it would make life easier.
D	Bob:	Because we were drawing various things in this section weren't we?

A	Ian:	Yeah. But he didn't want it there down at this end. Did he?
X	Bob:	Right.
A	Ian:	He was back to where we were.
A	Bob:	I don't think we cottoned on just how restricting that was going to be.

201

[pause]

	Bob:	OK I think we can look at that, just try a few alternatives with John to see what he would feel. I'm not quite sure.
	Ian:	It's a question of detail really. I mean ummm What we build with that out there is all a bit. I mean that's not structure or anything.
	Bob:	No, it's not going to upset anybody.
C	Ian:	It's not going to upset. The critical thing is 'Where we are going to put the lift?'
D	Bob:	Can we use the lift? Which is what this is about. [Saying loading bay is key not detail]
C	Ian:	And where we want the doors. Given that, that is the thing that we really need to know to crack on with. I mean the lift in particular because that's where all the structure is.
X	Bob:	Right. OK.
C	Ian:	Of everything, the decisions I need is the lift one even before anything else is decided if we are proceeding because that's the first thing. That's what I need to get to grips with.
X	Bob:	So that's most critical
Cx2	Ian:	[jumping in] I mean everybody knows what's got to be done but it's a question then of detailing it all and for getting it up for building regs and all this sort of thing. Oh and for contractor to price. I mean it's one thing a quantity surveyor pricing something for you.
C	Bob:	Right. I think we can make that decision on Monday. When John comes in. David's in.
X	Ian:	Right.

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C	Ian:	[plans] So the duct despite our discussions the other week. John, still, still that was his favourite position. So you've got it where he wants it. OK?
A	Bob:	He's going to be very interested in the detailing around the ... as you said ...
C	Ian:	Well that obviously I would need to spend some time with him and sit down. When we are actually detailing it then ...
C	Bob:	But I don't see why we shouldn't commit ... Once we've got an idea that we can satisfy requirements there the lift is fixed. Go ahead with that.

303

C	Ian:	So all he's really got to decide is how big does he want it
X	Bob:	The lift.
Ax2	Ian:	I don't need to know that now. No. I meant the ... All I really need. The first thing I need to be told is: "Yes. That is the size of the lift we are definitely going with. That is the position of the lift."
C		Even the doors. Well the doors will be important because of planning, with the elevations that would all be part of it wouldn't it?
X	Bob:	But it's not going to
D	Ian:	But it's not going to be a huge issue. It's the lift more than anything. Obviously it would be nice to do it all at once because you've only got to do the drawing once. Life's not as simple as that is it?
D	Bob:	It is now it's all on computer.
D	Ian:	No comment.
D	Bob:	[laughs]
D	Ian:	No comment.
D	Bob:	[laughs]
X	Ian:	Right. That. Is there anything more on that you wish to know?
X	Bob:	No.

B	Ian:	I mean we priced for the ribbon windows. Those prices include for the ribbon windows on the elevation. [plan] Like so. Going round.
C	Bob:	What I will do, before you go, I will telephone John.
C	Ian:	Oh right. Speak to him.
B	Bob:	In case there's any extra queries. I'll save it up until we go ... been through it.
X	Ian:	Alright.
X	Bob:	Oh so this is ...
D	Ian:	So that's what it would look like. Now obviously there would be like panels in. It's definitely the way to do it.
D	Bob:	No clock. I don't know which face to put it in.
D	Ian:	That price didn't include a clock.
D	Bob:	You said I could have a pendulum clock.
D	Ian:	You could have any clock what you like but tell Bruce that's not in the budget. [laughs] Nor a weather vane.
X	Alec:	Is that the Bob Tallon memorial clock.
X	Bob:	That's right.
D	Ian:	Yeah. That'd be a good idea, Bob, wouldn't it? With the old retirement looming there. You could reuse your ...
D	Bob:	This is your gold watch but you can't have it.
D	Ian:	[laughs] Instead of being given a gold watch, it goes up on the top.
	[pause]	
X	Ian:	Right.
X	Bob:	Yes. Thank you.
X	Ian:	So that's that.

Meeting 5: 5 Apr 2001

B8	Ian:	That back door ... this twelve fifty, where's that come from.
B8	John:	If was off a drawing earlier.
X	Bob:	Do you want the [unclear] the one with the main A line.
	[more rustling]	
A11	Ian:	It's on the [unclear]
A11	John:	[echoes Ian]
B1	Ian:	Yeah that's why I was querying it because it's more than that. Because, I can't move that door. You see, because what I'm doing is I'm just whacking that into the opening that's there.
C3	John:	Oh. Yeah.
B11	Ian:	Obviously I can't come closer because of that column anyway. So, So, that's alright.
A9	John:	I probably took it off here by mistake.
C7	Ian:	So that, ... You're happy
B3	John:	It's about half that.
C7	Ian:	Yeah. You're happy that it's staying where it is, John?
C7	John:	Oh yeah. Yeah.
C11	Ian:	Right.
	[unclear]	
C11	Ian:	You probably used, as you say, the wrong scale.
D8	John:	[unclear]
	[Ian laughs]	
D8	Bob:	Engineer's rule.
	[Ian & Bob laugh]	
D8	Bob:	One long screwdriver [unclear]
D8	John:	Yes.

Appendix 6

Annotated Transcript of Discussion of Subject 3, Lift Performance

Key to Learning Style Codes in Margin:

A Divergence

B Assimilation

C Convergence

D Accommodation

Codes with numbers, e.g. A11, refer to codes in the coding frame (see Table 5.2 in Chapter 5)

Subject 3: Lift Performance

Meeting 3: 20 Mar 2001

A14	John:	One of the things was: How dynamic was the control system?
A15	Ian:	What the scissor lift?
A14	Bob:	No. No. The main lift. How fast was it?
A15	John:	Both actually.
B2	Ian:	Well, you've given me a speed. Haven't you?
X	Bob:	Yes.
B2	Ian:	That's the speed that I've specified to the lift company.
B1	John:	Yes. Well, that might be the sort of travel between floors.
X	Ian:	Yes.
A17	John:	How long do you have to wait for the door to close and the whole thing to pump up and the ...
	[suddenly all very fast]	
A8	Bob:	On this one, when you press the button ...
A8	John:	[interrupts] when you press the button ...
A8	Bob:	... and it thinks about it
A8	John:	... and you go you go
A8	Bob:	whilst it gets its pressure up
A6	Ian:	Oh right, right. [laughs]
A7	Bob:	And then it says right we're off now.
A9	John:	It's hopeless.
A15	Ian:	What make of lift did we put in there?
A15	Bob:	Who knows.
A15	John:	Schindler.
X	Ian:	[unclear] It started it's life bit as.
X	John:	[unclear]
A9	Ian:	It wasn't that was it? They went bust or something didn't they? Can you remember. Right. Yep. Well, I forget.
	[small pause]	
X	John:	Yeah, I mean ...
B2	Bob:	They all have that characteristic. They don't stay at full pressure.
A17	John:	From a user point of view it's ... it's ... it's a major issue. And the other thing about it is the [unclear].
B12	Ian:	Well. They're not rapid. What speed do they go. They're fairly ...
A7	John:	Like a tail lift.
B12	Ian:	... sort of slow. That sort of speed. But then you're only travelling a very short distance, aren't you?
X	John:	yeah.
	[mutterings]	
B9	Ian:	Yeah, I mean I'll find all that out, obviously before we sort of start placing orders.
A17	John:	Yes, I'd like to know what it is.
B9	Ian:	Yes, I mean obviously I'll find out where the nearest locations are for us to go to look at these.
B11	Bob:	You can't detail the lift proper, the building part of it until you know <u>exactly</u> which lift you're using.
B11	Ian:	Well, I can. Because the lift shaft is a standard design.
B11	Bob:	Oh, it's a standard.
B7 D7	Ian:	So, as long as you ... Once you've plumped for yer actual lift size then the actual shaft doesn't matter. In fact, the funny thing is when you contact all these lift companies, the names that you were thinking ...
X	Bob:	Of as a supplier. [follows Ian in next passage, closely reiterating ideas to go along with him]
D6	Ian:	They've all shut. In fact, lots of the names have gone. So you can dial old

D7		telephone numbers from literature of the name and you always seem to get through to the same place [laughs]. Somebody's bought lots of them, or they've amalgamated or something. But I mean lots of these lifts always came from the same source anyway. They just used to put different labels on them. I think there were two or three suppliers
D5	Bob:	[unclear] Who try and keep it slow ... lack of competition.
D6x2	Ian:	I don't know what it is about lifts. I mean, we've just, I've just been finishing off some flats across the road and they've spent a lot of money on the lift and that's not right. It seems no matter how much money you spend on these things, they can't get it right. When you all walk in, every time you add a body bphhh [indicates a drop].
D6	Bob:	This one still does a sort of ... If you're in the basement and three of you get in ... of course it sinks and it has to adjust and that adjustment upsets the first floor so it goes bonk as you step off it.
A9	Ian:	You know with a really good lift it shouldn't move at all. When you stand on it it should just stay still completely.
A15	Bob:	It's got a sensor.
A9	Ian:	[showing he understands quality issue] Yeah, I know, but it should do it in such a way ...
A10	Bob:	That you don't know.
	Ian:	... that you don't know, you don't feel it. I mean it should just stay there.
B10	John:	Why is that? It's a hydraulic thing. Is that two sets of pulleys that pull apart the string.
B10	Bob:	It's got a cantile ... it's a lever.
B10	Ian:	It's a lever thing, isn't it?
B10	Bob:	It's got a pumped cylinder and an arm and it pushes it.
B10	Ian:	It pushes it?
X	John:	Really?
B10	Bob:	It's a very crude mechanical device.
B15	John:	So, it's not dangling from a wire on sets of pulleys and you pull the pulleys apart.
B10	Ian:	When it take up the
B10	Bob:	Oh well it must be
B10	Ian:	There are cables and that. It's not like a lift that is just suspended. Really, ... Well you can still get those sort of lifts but then you're talking about this motor room ...
D5		I mean you're talking about a completely different ball game then.
	[cut off]	
C7	Bruce:	OK so the planning's May week three let's say. Committee.

Meeting 5: 5 Apr 2001

C2	John:	Overall I was concerned that the speed of operation [unclear - in other words .... gates]
C3	Bob:	I think we'll have to take advantage of when you get to a manufacturer.
C3	Ian:	When we've actually got to one ...
C3	Bob:	They can tell us what the practicalities are.
	Ian:	... we can sort it out with them all can't we?
C1	Bob:	How soon can they get back to you?
C1	Ian:	Fairly quickly. Within the month. Have you all booked it. Have you got a programme.
C1	Bob:	I've done a programme. I'll have to get some copies. It's without the lift on it I'm afraid. And the most urgent thing about it was access control.
C1	Ian:	Yes.

C3	John:	Lift speeds.
B2	Ian:	Yeah. Well, you gave me that. And that's what I'm working to. The speed and everything you gave to me. Yeah. What you gave me originally is what I've always been working with.
A14	Bruce:	Is that the same as what we've got?
C3	John:	Well, it's a question of how long it takes to pump up before it actually does anything. What's the actual ...
	Bob:	delay.
	[Ian Bob John all finishing sentence]	
C7	Ian:	I'm meeting the bloke on Friday.
C7	Bob:	Yeah.
B9	Ian:	So, it's the err it's from pressing the button?
B9	John:	Yes.
B9	Ian:	Is that what you mean?
B9	John:	Yeah.
C1	Ian:	Right.
B9	Bob:	Not having been used for ten minutes. [pause] or more.
A15	Bruce:	Is it an electric one.
A15	Ian:	Which?
B7	Bob:	Oh this! Yes. This is instant reaction. It's just that you've got to wait a long ... This has got no delay but a very slow transfer. [Bob laughs]
A6	Bruce:	It might be as quick.
A3	Bob:	It's probably something like going up the stairs.
	[pause]	
A12	John:	I'm not that old yet.
	[laughs]	
A10	John:	We'd could call in at my grandmother's care home.
	[laughter]	
A16	Bob:	Ready, steady [pause] go.
C11	Ian:	[unamused] Right. Well, I'll find out for you. Right.
X	John:	[unclear]
B7	Bob:	I suppose the delay [pause] is when it's getting up to pressure.
C10	Ian:	How long does your passenger ...
A19	John:	Ages.
C3	Ian:	... lift take. Does it?
A8	John:	So I'm told.
A7	Ian:	What do you mean ages though? I mean, is it like watching a kettle boil do you think?
A7	John:	Something like that.
B2	Bob:	It might be five seconds.
B2	Bruce:	Ten seconds.
B2	Bob:	Five or ten seconds.
A7	Ian:	Like you say, it's longer than you think. That's what I was inferring.
A7	John:	Yeah.
A7	Ian:	Yeah.
A7	John:	Yeah. It is.
A8	Bob:	I mean, it's like a PC. You wait five seconds for a reaction on a computer and you think Oh my god! It's not actually ... in terms of the whole transfer.
A17	John:	It's not something that we should just ignore.
A17	Ian:	No. I will ask.
B1	John:	And if it's going to take fifteen minutes ... tough luck.
B7	Ian:	Well, it doesn't take fifteen minutes, does it? I mean this lift shouldn't be any different to a passenger lift.
X	Bob:	This ...
X	Ian:	This ... The lift that we're ... not this
A17	John:	the comments I've had about the one out there is that ...
A17	Ian:	It takes an intermina ...
	John:	... it seems like an age.

B9 Ian: It seems ... Has anyone ever timed it?
B9 Bob: No.
B9 Ian: Well that might be an interesting exercise.
A16 John: No. Too factual.
[Ian laughs]
B8 Bob: [unclear] I'm sure it's a benchmark.
B9 Ian: I mean, how long does it take?
C2 [Bruce goes to time]
C2 Ian: Oh well, now Bruce is going to do it?
C2 [Bob laughs]
C2 Bob: He's gone.
X John: Right he's ...
X Bob: And on the cigarettes and your ...
B1 John: This is always wrong as well. [meaning clock on the wall]
B7x2 Ian: I mean this ... This is always not allowing for the lift of course being at the different level from you. You're meaning perhaps when you get in the lift and press the button then it goes. Is that what you mean?
B7 Bob: Yerr. No, it's fetch time.
B7 John: Yeah.
B7 Bob: Part of which is ...
B7 Ian: Well, fetch time will depend on where it is of course.
X John: Mmm, Mmm.
B10 Ian: If you're at the first.
B10 John: Well, this one sinks down below the floor level and has to err...
B10 Ian: Pump itself up.
B10 John: ... pump itself up.
A8 Ian: This one's never been a success though has it, this lift?
A17 John: No. But that's ...
D8 Ian: What are you doing?
D8 John: Oh well I don't know what it is. I don't wear a watch but I hadn't ...
[Bob laughs]
D8 Ian: Don't you wear a watch?
D8 John: I don't use one.
D8 Ian: You don't use one. What? Ever?
D8 John: Well, if you match that against ...
D8 Ian: How do you know what time it is then, if you never wear a watch. Do you have a sundial?
D8 John: Yeah.
[Ian laughs]
D8 Ian: Well how do you manage on a day like today John then? When it's grey [dissolves into laughter]
D8 John: [mock serious] Well, I was ...
D8 Ian: Are you winding me up or do you never wear a watch? You never ever wear a watch?
D8 John: No. Because there's always a clock somewhere. You see I can see his.
[Bruce re-enters room]
B13 Bruce: I don't know whether it's the best floor, the ground floor. It took ten seconds before the pump started activating.
B13 Ian: From when you pressed the button? Right.
B13 Bruce: It took another twenty seconds to get to the floor. So thirty seconds.
B13 Ian: Right.
B13 Bob: It's a significant proportion of the fetch time.
B13 Ian: Yeah.
[pause]
C4 Ian: Did it sound as if it was moving? the lift? You know. did it sound as if it came from another floor?
C4 Bob: You can tell by the noise.
C4 Bruce: It came from another floor. Whether it came from the basement or up.
C4 Ian: Oh, I see. I beg your pardon. Sorry, Bruce.
B8 Bob: The basement. That's its resting.

C7 Ian: So it was ten secs before you heard anything.
B6 Bob: Thirty seconds in total.
B4 Bruce: It depends when it was last used.
B7 Bob: Yes. If you've just used it it's under pressure. [unclear]
D6 Ian: I don't know what it is about lifts.
X David: [unclear]
D6 Bob: Yes.
D7x2 Ian: I don't know what it is about lifts. You know, it's a ... You have more problems with lifts. I mean, at the one we've got, at the office we're in now, is not very good. Umm. One I've just got in a new block of flats. That's not too bad I must admit actually, now.
D4 Bob: Why aren't they electric?
C5 Ian: Well, it's the ...
C5 Bob: Mechanics.
C5 Ian: ...it's all the mechanics isn't it? You need to have a ... If you don't have a hydraulic bit you've then got to have ...
C5 Bob: Winding gear.
C5 Ian: ... all the winding gear and everything up the top haven't you? That's why ... that's why we tend to go for ... Because usually you haven't got the space at the top.
C5 Bob: I can imagine that the ratio of transfer time to delay in coming is a fixed ...
C5 John: Um. Yes.
[Bob laughs]
C2 Ian: And it's not just the er ... I mean, in your case, I was just thinking, of course, the height for ... for gear would be a problem because we're building our tower up. The problem ...
[Tape stopped, turned over and re-started: Side B]
D1 Ian: I mean,
X John: Yes.
D1 Ian: when I speak to him on Friday umm I will ... I'll come back to you John and let you know, what he says. I mean, this mean lift here has been a particular bugbear hasn't it, from day one.
D1 Bob: Well, no. No it goes through ...
D4 Ian: You've never really been happy with it, really.
D4 Bob: Well, no.
D8 John: You'd have thought it would have got lost in the shaft.
D7 Bob: We could have the same button but the control gear was replaced. And the doors were changed.
B8 [Ian laughs]
[Bob laughs]
D5 Ian: It's something you should have been stronger over with the lift. You shouldn't have left them to err, in hindsight.
D5 Bob: Well, it met the spec.
C5 Ian: I know.
D7 Bob: It went up and down. They said here we are. We went tick. It went up and down.
D1 John: What more do you want?
D6 Ian: Yeah, but none of us had ever heard of it had we? I remember [laughing] at the time we were ... Some chap sort of in his garden wasn't it.
D6 Bob: An Italian control with his north-eastern box and all sorts of things.
D6 Ian: Until our ...
D6 Bob: Our man arrives. There's all the other stuff which shouldn't worry Ian, but if he wants to sit in.
[Discussion moves on to new office building refurbishment]

Meeting 7: 8 May 2001

Ian: I'm having a detailed spess of everything. As soon as I've got it, Bob, I send it to you.
A17 John: What about the speed?
C11 Ian: With the speed, they know your requirements.

A19 [Bob laughs. Ian laughs]
D7 Ian: I even explained to them our scientific exercise last time. Pressing the button and timing it. [laughs] The chap looked at me in total amazement. You know.
X Bruce: [unclear - praying?]
[Ian laughs]
D7 Ian: And he said, well, is five seconds going to make a lot of difference.[laughs] And he was sitting there, I can see him, sitting there seeing how long five seconds was.
D4 The thing is, when you do look, it's longer than you think ...
D4 John: Yeah.
D4 Ian: ... isn't it? So, he did go away deep in thought over this.
[change of subject]
Um. On the scissor lift.
Bob: Oh yeah.
Ian: Remember last time we had this thing where they'd been talking ...

Meeting 8: 29 May 2001

C4 John: How are we doing on speed?
C7 Ian: The ... The speed is what you've asked for.
C4 John: Is it?
C7 Ian: Oh yeah, that's what they were given.
C3 John: What have we you asked for?
[Ian pauses]
B15 Ian: You gave me a gr ... a spess originally, which I passed on to them.
X Bob: I can't find it.
B15 Ian: I've got a copy of it. Not with me but you gave me a little spess to start with.
D5 John: It must have been [unclear]
[John laughs]
D4 Ian: The only thing I do have is they were a bit ... I'm not sure how far I've got over the delay business.
D6x3 You know, the discussion that we had, because he quite astounded when I had this meeting with him and sort of umm. He looked at me as though I've got three heads. You know. And I said, well it seems a long time. When you say to somebody, you know, ten seconds or whatever the case may be it seems a very short time. But when somebody's standing there waiting for it, it's seems an eternity.
D6 Bob: Forever, Hmm.
C7x2 Ian: [laughs] And I said that was what was concerning everybody. So, I don't know. I think. I think it's all fairly standard with lifts, this response time. They say it responds within one or two seconds but it doesn't. It just doesn't. We know that.
D9 Bob: Okay.
C10 Ian: It doesn't work like that does it?
Bob: Hydraulics.
Ian: In fact, ...
Bob: Hmm.
D7x2 Ian: ... since we had the conversation wherever I've gone, wherever I've been using lifts I've been ... I've been measuring it and they're all the same! You know, I found one [unclear] in a really modern expensive building you know where you get this immediate response to the lift.
C10 Bob: The direct motor ones should be instant, because it's electric motors.
D7 Ian: You here a noi ... you know, lots of them react when you press the button. There seems to be then this delay before ...
D2 John: It's probably a slow start.
D2 Bob: Oh yeah.
D7 Ian: You get a sort of reaction. You press the button and you hear ... you start to hear a noise of some sort but it ...
D8 John: It's speaker behind the door to make you think something's happening.
[Ian laughs. Bob laughs]

D4 Ian: I don't know. Funnily ... Even ... I was somewhere in Canary Wharf, you know, with really high speed lifts. But the initial thing does exactly the ... It doesn't make any difference where you were.
C5 Bob: They wouldn't be hydraulic.
D5 Ian: No. They weren't. Not at Canary Wharf. No.
[Bob laughs]
D5 Ian: No. Yeah.
D8 Bob: Rocket assisted?
[change of subject]
Right, what else is there on the lift?
Ian: Umm. Nothing really. I mean err it's all ...
Bob: Oh incidentally, they mentioned that ...

Meeting 9: 19 Jun 2001

D8 John: This an Express Evans lift. [chuckles]
D8 Ian: Especially for you John.
D8 Bruce: [unclear joke]
D8 Ian: We're calling it Express to make him feel better.
D8 John: That's alright.
D8 David: [unclear joke]
D8 Bruce: It might be one of a larger family where there's a slow one.
[laughter]
D8 John: Speedy Doris.
[more laughter]
D8 Ian: They do that, of course, don't they? In the old regiment when you had loads of Joneses or Evanses they had things like that so that ... so you knew which Evans you were talking about, sort of thing.
D8 Bruce: Express Evans
D8 John: [unclear joke]
[Bob laughs]
D8 John: Evans 1.
D8 Bob: Express Dairies.
[change of subject]
Bob: Right. The pathway, I've been trying to chase up.

Appendix 7

Annotated Transcript of Discussion of Subject 4, Lift Appearance

Key to Learning Style Codes in Margin:

A Divergence

B Assimilation

C Convergence

D Accommodation

Codes with numbers, e.g. A11, refer to codes in the coding frame (see Table 5.2 in Chapter 5)

Subject 4: Lift Appearance & Windows

Meeting 1: 20 Feb 2001

A	Bruce:	What will the door look like.
B	Ian:	Well it's just like the door at the moment.
A	Bob:	Which door are you talking about.
B	Bruce:	The lift.
B	Ian:	Ah. Well at the moment I've just been talking purely about a freight lift. So it's a concertina sort of.
A	John:	That's one of the problems when you get upstairs and you're in an office environment.
A	Ian:	We can put in what we want into it.
X	Bruce:	On the internal ... What door are we talking about? This door or this door?
X	Ian:	First floor inside.
X	Bruce:	I meant the outside door.
B	Ian:	Well that would be just a concertina, you know, type door. Steel folding concertina door.
A	Bruce:	Burglar proof.
X	Bob:	Yeah.
A	Bruce:	Colour? Do they look as utilitarian as ...
B	Ian:	Well you can do what you like with them, Bruce. But, obviously the more we do the more money we spend. The basic thing would come with a galvanized door that we would paint. Or powder coated or something.

Meeting 3: 20 Mar 2001

B	Bruce:	The concertina gate.
X	Ian:	Yeah.
B	Bruce:	What finishes are there?
X	Ian:	Well
X	Bob:	Ah yes.
A	John:	Oh yeah, the doors.
Bx2	Ian:	Well, normally they would be powder coated but umm one of the things that they're just checking, they haven't got back to me, but they don't think it's a problem. Inside the door ... you want sliding doors rather than ... They are saying that a concertina door is better externally. But there's not reason why you shouldn't have sliding doors internally.
B	Bruce:	Is it manual.
B	Ian:	No, it's [unclear] electric.
B	Bob:	The only reason I imagine they might not want the door sliding ...
X	John:	Oh
	Bob:	... I was thinking, they'd rather not have sliding doors because they are electric. They gum up if they're outside if the outside ones are electric as well.
X	?:	[unclear] manual.
X	John:	[unclear] ?
A	Ian:	Oh yes. With that detail I'm actually looking into it at the moment with the ...
A	Bob:	Well, we are interested to know if we can have a prettier door.
A	Bruce:	Presumably we'd pick up the [unclear] balcony.
A	Ian:	Oh yeah. I mean everything's got to blend in with the building. All your colouring and everything.
B	John:	Black.
A	Ian:	Black?
B	Bob:	It's quite simple. [laughs]
B	Bruce:	Is it black?

D Ian: Well, it was ...
A Bob: That is.
X Ian: Well. Yeah
A Bob: I suppose it was black.
A Ian: It did have a round number from memory but err... it ... For all intents and
B purposes it was black. But yeah. Obviously, everything will just match. That's the whole idea. It look as though it's always been there.
A Bob: The window frame company are still in existence. They've got that stuff.
B Ian: Well, the [name of company] stuff is still made. Yeah. I mean the sections are still made.
Bruce: Do you know what the lead time is on that?
Ian: It'll be ... What we found down the road it was about ... It fell in with the lift so it shouldn't be a problem. Particularly, umm I mean ... We're gonna reuse the doors and this we're not gonna affect any construction because, obviously, behind those you've got pretty thick block walls anyway. So, ... they really could go on afterwards those. It wouldn't hold up the installation of the lift or anything.
Bruce: Let's not worry then. Just paint them on. It'll save on window tax if they ever ...
[gentle laughing]
A John: They've missed that opportunity.
A Ian: They'll think of it. They'll bring that back. Well, I heard an horrendous thing
A John: They certainly [unclear]
D Ian: It affects at least two of us in this room. Ummm, the common ... EEC are now talking about when you get to fifty ummm having to retake your driving test.
[delayed general laughter]
D Ian: I can see thousands of us with all the bad habits you've picked up over the years.
D Bob: Not like my father. He's never taken a test.
[John laughs, Bob laughs]
D Ian: Yeah he would be too old. They have to now. Is it seventy when you have to? When you get to a certain age now. I thought you did when you got to a certain age now. It's something like seventy isn't it?
D Bob: No. You have to have a ...
D Ian: Oh a medical.
Bob: ... a doctor to say you're alright.
D Ian: I knew something had to happen.
D Alec: My grandfather bought his.
D Ian: What, his driving license?
D Alec: [unclear] bought Post Office.
D Bob: My father having an old one can drive a tank and all sorts of things. He's not limited like ours to bikes and ...
D Ian: Lawnmowers.
D Bob: [unclear] ... He's got the lot.

Meeting 4: 29 Mar 2001

C5x3 Bob: So I drew in ... I drew in the window pattern because that's got some changes on the ends. So that it will look the same as our present design. Pump house not required. That's cut that off. That's over the road. Goods in doors. Are not there but there. That's on my drawing. The lift. Tiled roof to match the building. The roof and the gutter will match. The slope. The guttering.
D8 Who knows where the clock will be?
C3 Alec: It needs to be at the front of the building doesn't it?
D7 Bob: They wouldn't let me have it. Do you know the background to that? It's been an in-joke since the early days. I said we should have a plaque at the front, or a flagpole or something. And I wasn't allowed my way you see.
D4 Alec: Why weren't you allowed that?
D7 Bob: Well [first name], who was the md then didn't fancy it. That was the reason. So, that's why Bruce, who was involved then, brings it up and talks about the Bob [last name] Memorial Clock.

X AR: In a way, the memorial is ...
D8 Bob: Because I'm leaving next year [laughs].

Meeting 5: 5 Apr 2001

C7x3 Ian: Alright? Umm. The other thing that we've decided to do now we've had a look at it, the elevations, is, you know we've got, continuing the ribbon windows at the top? Well, we've decided, I'm not too sure about this [unclear] but it was Gordon's suggestion which was quite clever. Rather than putting brickwork above it, you know it goes up above the eaves, he said keep it as the dummy glazing. He was even on about continuing the band, the fascia around the transom here. So he, umm,
C7 Bob: Glazed above it. I see.
C7 Ian: So that the
C7 Bob: It looks lighter.
Ian: It's looks lighter and also he said if we put brickwork anywhere above eaves level
C7 Bob: So you're not matching yeah.
C7x2 Ian: So, and also it makes the structure easier. We haven't got to support the brickwork or anything. The block work that has got to be built up inside of the lift shaft. George said, if we can put some thick transom up there we could even continue the band of the fascia around the top.
C5 Bob: Yes. That does look better.
B8 John: The difference between the eaves and the
B12 x2 Ian: Ah right. In actual fact the technician has done this wrong because he gave this to them. Those ones are meant to be opening windows and these ones indicate the look a like panels which are glass but you've got walls behind. In actual fact he's done these incorrectly They should all have x's on them.
B8 John: Right. I was just trying to work out [unclear].
B12 Ian: They've drawn that on the paper I think.
B8 John: That's ...
B12 Ian: Oh, that's the hinge of the door. Yeah, that's how you indicate the opening of the door.
B12 Bob: The open bit's the hinge and that's the handle is the v.
B12 Ian: No, it's the other way. You indicate it to the [unclear].
B12 John: So, that one opens and that one doesn't.
B12 Ian: That's correct.
B12 John: And that one isn't.
B12 Ian: That one's not a window at all.
D8 Bob: We should've kept the model you know. We threw it away.
A14 Ian: You threw it away? I know you kept the part of it ...
A4 Bob: I was going to say, did you remember to keep it?
D8 John: It was huge.
D7 Bob: After we built the building so we could check it. We checked the model to see if it was right rather than the other way around.
[John&Ian unclear - talking over each other, fast]
D7 Ian: Didn't it go in the end? That was the whole idea of it, originally.
D8 Bob: It was our idea. It wasn't their idea.
[Bob and Ian laugh]
D8 Ian: And we had a removable basement bit in it. Didn't we?
[Bob & Ian unclear]
C7 Ian: So, we thought it would make it look light.
D6x2 Bob: That's good. That's a similar idea to the, umm, computer wagon down in the [basement]. That was originally designed as all wood and we decided it was a coffin on wheels. So, we made it framed with the cloth, the same as the panels. And it just looked so much better. The same size. That's was Tony's idea.

C11 Bob: Right. The outer door being sliding. The appearance thing.
C11 John: Oh. Yeah, yeah ahh. It's a [unclear - fraction]

C7	Bob:	I'm asking ... I assumed it opened just as wide as Ian said so that it doesn't present any restrictions.
C7	Ian:	Yeah, yeah. No.
C7	Bob:	People tend to have ... Why do they have these big criss cross things. I assume [unclear]
C7	Ian:	Yes.
C4	Bob:	You can't wedge them open. The sliding doors somehow.
C4	John:	Yeah. No.
C4	Bob:	Putting a crow bar in.

Meeting 6: 24 Apr 2001

B12 x2	Ian:	We'll put a moat around there. Umm. Yes. They'll be a bit of in situ concrete, blockwork, brickwork. I mean the specialist stuff, the fenestration, they won't do themselves anyway. They'll bring in somebody to do the [company name]. I'm quite happy about that.
A15	Bob:	I seem to remember [company name] fenestration takes forever.
A3	Ian:	Well, it's not the ... the actual material, [company name], which is the system. Because if you remember you went for one of the top systems. They sponsor Ferrari or something now.
X	Bob:	Oh dear.
B13	Ian:	It's the actual bit they ... It's all let out then to subcontractors. They just buy the sections from [company name]. [company name] don't make it, they just manufacture the sections.
B13	Bob:	Sections.
B13	Ian:	And then they sell it to these approved contractors who buy the stuff, cut it, bolt it together and install it into the buildings. Umm.
A9	Bob:	I've got a bad feeling. I was trying to follow up ...
X	Ian:	Yeah.
A9	Bob:	... something trivial and I didn't get a very warm feeling when dealing with them to put it that way. [laughs]
X	Ian:	I don't think ...
A9	Bob:	That was my last contact with them.
A18	Ian:	We could go over to another system.
A5	Bob:	No no no no. I was thinking about the lead time.
A14	Bruce:	Is that the problem: lead time?
A5	Bob:	Yes, that was why I was wondering.
X	Ian:	Ummm.
A15	Bob:	And glass of course. Does it have to be special or double-glazed? Smokey?
B7	Ian:	It'll be a coloured glass, yeah. Because you don't to be able to look through it.
A14	Bruce:	It could be the same as this I suppose.
A17	Ian:	We want it to look the same as the building.
B2		Umm. It won't have to have any insulation values because of the walls behind it.
A15	Bob:	Sure. Is the thing about it being half-shaded.
A15	Ian:	The glass that we put into the roof, the covered area, I imagine you'd want that to be umm some sort of er shaded glass. You don't just want it to be ...
A15	Bruce:	The canopy.
A17	Ian:	Yeah. I mean that's something we need to look into.
A14	Bruce:	Can we have the same glass as the window.
B10	Ian:	Well, ideally so that it looks similar anyway. It might not be exactly the same spess but certainly to look like it. I mean ideally that would be what I'd recommend so that that it all blends in with the building. Umm.
B12	Bruce:	If we wait for the contractor to be lined up and then ask him to do the fenestration and the glass are we going to miss out on the lead time. Or do we have to order it up front?

C12 x2	Ian:	[blows cheeks] Umm, very difficult to order it up front something like that because before ... They will actually ... They won't ... Although they'll line up the company, etc. that type of thing, they won't start production until the structure's going up. Because they'll take some on-site dimensions.
C12	Bob:	Oh I see.
D7	Ian:	They'll want to make sure to do it after because of the tolerances that contractors [comic pause] use and ...
D7	Bob:	Show me the hole and I'll fill it. Great.
C10	Ian:	It's not quite as easy as that, fenestration. But I mean, remember we're not making any opening windows or anything. I mean, this is all very very simple. It's just ... It's not as if we're making stuff to go into openings.
B9	Bruce:	I would have thought the tolerances, given ... you could take it up with a window sill.
D3	Ian:	Well, I've never known anybody do it yet. It's always seemed to be the way they work.
D5	Bob:	Well, we're only concerned about it really. Time is tight.
D6	Bruce:	I think you're right. I remember when we did the [area name] building it was always the bit that we stuck on.
C1		It just means we're going to have a very long contract period.
C11	Ian:	Yeah. Well, I'll make some enquiries.
B1x2		The problem that we've got to watch is that, of course, if we all start making assumptions and perhaps placing orders, if the thing's not quite right, if it doesn't quite fit we dont' just sort of say to the contractor well it's your problem. It won't be his problem. So, I think we've got to be a bit careful.
B10	Bruce:	If he's going to wait until he's got the brickwork up then actually measure the aperture when he's got the brickwork up ...
C7x3	Ian:	Well, it won't be quite like that. I mean, he'll set ... After he's set it out and it's when he's started the construction. When he ... Remember, we're taking windows out. So, we're going to take some of your existing windows out. And then the structures going to go into it. So, I mean, I'll certainly look into it for you. In which case, we'd be using a nominated sub-contractor.
C7	Bruce:	Well why don't we start from the ... Why don't we start by doing a contract period assuming that we order the windows during the contract but the contractor order the windows and just see how long the contract period is.
C7	Ian:	Okay Bruce. Right.
A15	Bob:	I wonder who did the windows.
A9	Ian:	You'll probably find that they don't exist anymore.
A9	Bob:	Oh.
A9	Ian:	These firms have a terrible habit of ... Although the systems roll on and on and on, the actual firms that do it sort of come and go I'm afraid. That's one of those ...
A9	Bob:	Also, if they're doing the whole building, they don't mind coming up from Yorkshire. But to do six windows [laughs].
A9	David:	That's not a very attractive proposition is it? Yeah.
A1	Bob:	But if I get [full person name] along and show him what we've been thinking of doing.
X	Ian:	Who's that?
X	Bob:	[company name]. He's the chap I deal with.
X	Ian:	Oh right.
A1	Bob:	Umm. I'm sure he'll have some ideas.
A12	Ian:	If he wanted to liaise with me I'm quite happy to come down and see him as well.
A12	Bob:	Oh yeah. Yeah.

B16	Ian:	So, we talked about the thing ... The finish on the floors ... The floor of the lift?
B16	Bob:	Oh. Right.
C1	Ian:	And plenty of decisions there. In fact, you all have to make a decision what finish you want.
C5x2		They suggested that you either have rubber or aluminium chequer. Personally, I would have thought you were probably better off with rubber. The old chequer tends to be a bit noisy and everything doesn't it? So, I would thing it would be like ultra flooring. You know the dimpled ... the dimpled ...
A1	Bob:	Jay mar stuff.
B10	Ian:	That sort of stuff yeah.
X	?:	[unclear - someone says a type]
B10	Ian:	That's another make. That's good. With the pimples. Umm.
B13	John:	[unclear - not as good] If we've got something slightly kinky.
A18	Ian:	Well, we could have ... we could have ...
B7	Bob:	[unclear - plastic]
A6	Ian:	No. We can have what ... We can specify what we like.
A11	John:	You know, I was just thinking something that wasn't black. You think of those cages.
C1	Ian:	We'll make sure it lies flat then.
C1	Bob:	I think we'll find [unclear]
C1	Ian:	They're only ... they're only ...
B13	John:	Yeah, I know
D2	Ian:	for grip. They're supposed to be like if your feet are wet or anything. You don't slip.
C3	John:	Yeah. Well those trolleys going over the lip between two floors is sufficient enough to ...
C6	Ian:	Well it's something to think about if you would rather have a dead smooth surface.
C6	Bruce:	[unclear - suggesting a different surface?]
B2	Ian:	It won't top two square metres.
D5	Bob:	[laughing] It's not the Eiffel Tower.
B2	Ian:	You've only got two square metres so you can put what you like in there.
B2	John:	[unclear joke]
	[chuckling]	
B13	Ian:	You're gonna have a ... I mean, when you trundle into the lift obviously there's gonna be a [bit of noise]
B13	John:	Yeah.
B1	Ian:	It's never gonna be a .... you're never gonna be err
A17	John:	It's just that we're going to be coming out into an office area up top. Like matting. It doesn't have be ...
C10	Ian:	No no. But what someone ... well trolley wheels don't push very well. They sort of dig into it.
D5		But I mean, quite honestly, you're only talking about two square metres so if you wanted to put a terribly expensive thing in then it's gonna ...
A19	Bob:	Antico. White antico.
	[Ian laughs]	
X	Ian:	Umm. I can't think ... I mean that ...
X	Bob:	[unclear]
D7x2	Ian:	Well that's something to ... that I was going to ask you. You don't ... Surely you want more of a utility type of thing don't you? That's what it comes as. Then he said to me, did I want to do anything special. And I said, well no because you're gonna be ... you certainly don't want to have to worry when you hit the wall or something, if you trundle in with a trolley.
D7	[Bob laughs]	
D8	Bob:	You'll find the bullet's in the steak.
	Ian:	Errm. I think that's all on the lift. The ...

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[initially only Ian, Bob and Alec present]

A9	Bob:	The other thing ...
A9	Ian:	Yeah
	Bob:	... that surprised me, at all ... or I misunderstood: the roof to the lift, goes into the roof of the building.
C7	Ian:	It's always done that.
A9	Bob:	It's alright. I'd pictured it ... I don't know.
C7	Ian:	It's like a gable.
X	Bob:	Yeah.
A8	Ian:	It's like a large gable. You might have on your house, I can't remember if you've got any gables on your house.
A9	Bob:	I've got windows sticking up.
B10	Ian:	Well, yeah, this is what this is going to be. It goes to be a very large, you know, dormer. Like a huge dormer.
A14	Bob:	Would it have gained anything ... just out of interest ... if you hadn't done that...
D5	Ian:	It would look weird.
	[pause. Bob laughs]	
D1	Bob:	Okay.
C7	Ian:	It would look weird and it's probably just as easy to do because we can use, because we can use ...
C7	Bob:	Whatever you knock out.
B10 x2	Ian:	That's always an awful little detail. Whereas by doing what we're doing you leave the structure where it is. Well, obviously you take some of the slates off but the structure you won't touch. It will just stay there. And then the new one will just go back to it.
A14	Alec:	What was your misunderstanding?
B2	Ian:	Let's look at an elevation and you can see.
A15	Bob:	The top of the lift of the tower. How did you picture the roof on it?
A15	Alec:	I thought it was a square roof actually.
B10	Bob:	Totally separate to the roof. Yeah. But it isn't. [laughs]
B2	Ian:	It's like that.
A9	Alec:	That's what you thought.
B13	Bob:	Like that.
B13	Alec:	Oh, I see.
B13	Bob:	Okay?
B13	Alec:	Yeah.
B10	Ian:	So, it's like a huge dormer coming out.
B10	Bob:	I agree.
D10	Ian:	It looks to me as far... it doesn't look quite as much as it's been added on.
D10	Bob:	Right, I realize, I see ...
C10 x2	Ian:	Your way ... what you suggested we would have done, obviously, if the whole thing had been much higher. If the whole thing had been much higher and more detached from the roof. If you'd had it here and come clear of it here then you would just have had a roof with sort of four bits on it, going round. A bit like a proper tower.
B12 x2		But I mean, because it terminates where it does the ideal solution for drainage and for all sorts of things we'll bring it back into the roof. So, from the side it will look like that but from the front looking down the side it will look like that.

[now Bruce and David also present]

D7	Bob:	The other thing I said to Ian which was of real interest was I was expecting the top of the lift to go back.
D7	Ian:	I'd always intended to do that.
D7	Bob:	To join the roof.
B1	Ian:	It's like a large sort of dormer really.
B1	Bob:	Those were the only two things that really struck me. [unclear]
	[Ian laughs.]	

D8 Ian: Well, ermm, Bruce wants a clock doesn't he? I mean I haven't put a clock in.
D8 Bob: Yes, where is the clock.
[Ian laughs]
[unclear]
D8 Bob: Now that we've got more room I think we'll have a peel of bells.
[Ian laughs]
D8 Ian: Or a weather vane. You could have a weather vane.

A10 Ian: On the lift.
X Bob: The floor. The internal floor of the lift.
[unclear]
B7 Ian: I think it's quoted for stainless steel inside.
A15 Bob: Is that in the drawings you've got there.
[unclear]
B2 John: [reading] Interior: the floor stainless steel [unclear]
B13 Ian: It's designed for taking [unclear - dogs] basically.

Appendix 8

Summary and Commentary for Subject 2, Location of Lift on Building

Key:

Divergence ⊕

Assimilation ⊕

Convergence ⊕

Accommodation ⊕

Meeting 1, Correlation=-0.177, n=83	
Section 1	
Ian says he had talked to Bob about keeping the lift clear of the underground ducts. Bob outlines the issues: the ducts and avoiding the foundations. John asks about flexibility. Ian specifies the exact size of the lift shaft and that the shaft has to be centred between the bases.	Ian specified the conditions attached to the lift location. ⊕ Bob also specified these conditions. ⊕ John asked for exact dimensions for the tolerance and Ian gave them. ⊕
Section 2	
Ian says he wants to move the lift shaft one bay towards the front of the building because he needs to fit the scissor lift in outside. Bob says that is okay. John says he prefers it where it is. John says that Ian's preference would not work inside the building and explains why. Bob backs John's view.	Ian lays out what he needs to happen. He voices his needs. ⊕ Bob suggested that John needed to analyse the situation further. ⊕ John said what he wants. ⊕ He then explained how it affected operations inside the building. ⊕
Section 3	
John tries to relocate the scissor lift. Ian reminds John that he would need to move the lift one bay forward. John says it doesn't work. Ian tries to make it possible by changing shape of loading bay. He then tries moving the goods in/out doors.	John came up with a solution. ⊕ Ian re-stated the explicit problem. ⊕ John was critical of Ian's solution. ⊕ Ian's comes up with another solution. ⊕ Which is discussed in a logical and theoretical way. Ideas had not developed into action. ⊕
Section 4	
Ian lays out all the options. John says that the problem is still that the doors would be in the wrong position for access inside and explains why. John starts thinking out loud about what he needs, talking through Ian's turns. Ian comes up with a solution moving the lift the way he wants and putting the doors somewhere else. John and David say that it just doesn't work. Bob changes the subject saying that the plans they are using are probably out of date. Ian tries again But this time John talks in greater detail about his plans and what he needs. Ian asks where John does want the doors. John wants them where Ian wants the lift. John says if the doors were further back rather than forward it would be better. Ian say that they can do that. Bruce asks if they could do without doors and use the lift doors instead. John and Ian say no. Ian says he'll have the lift where he wants it and put the doors to the rear. John and Ian word-play with the word ducts.	Ian started convergently but quickly started playing with the various arrangements again. ⊕ John was critical without providing solutions. ⊕ John started coming up with ideas. ⊕ Ian tried to force through another option. ⊕ John and David were being more open here to alternative solutions and also tried to keep Ian quiet. ⊕ Bob diverted Ian and supported John in his knowledge of how things worked inside the building. ⊕ Ian was increasingly convergent. ⊕ John externalised his knowledge. ⊕ Ian suddenly asked an open question, was more gentle and appreciative. ⊕ John then came up with a workable solution. ⊕ Ian that the solution will work practically. ⊕ This was a slightly off-the-wall suggestion. ⊕ John and Ian criticised it. ⊕ Ian presents the solution as a decision that has been made. ⊕ The word-play between John and Ian showed their shared satisfaction with the solution.

Meeting 2, Correlation=0.699, n=50. Bob and Ian only.	
Section 1 Bob half-remembers the conversation from the previous meeting. Ian reminds him.	Bob asked rather open questions. ⊕ Ian re-specified the issues. ⊕
Section 2 While discussing the difficulties of putting the scissor lift above the duct Bob suggests moving the lift further forward.	Bob came up with a solution. ⊕
Ian reminds him that John didn't like that arrangement.	Ian corrected Bob in a human, gentle way. ⊕
Section 3 Ian says the most important decision is where the lift will go.	Ian pushed for decisions to be made. ⊕
Bob corrects him, saying the most important thing is if the lift and loading bay will work.	Bob showed Ian how he would evaluate how well the plans would work. ⊕
Ian says Audio Devices also need to decide where they want the doors.	Ian pushed for decisions to be made. ⊕
Ian pushes for decisions on these issues saying that then further work on the plans can go ahead.	Ian pushed for decisions to be made. ⊕
Section 4 Ian pushes for a decision again	Ian pushed for decisions to be made. ⊕
Section 5 Ian outlines again what decisions he needs.	Ian pushed for decisions to be made. ⊕
Ian opens the possibility that plans may change even after a decision.	Ian showed how he would apprehend changing plans. ⊕
Bob makes a joke about plans on computers being easy to change. Ian says 'No comment'.	This led to rather dry humour between them. ⊕
Bob raises the possibility of a clock in the lift tower. This has been a running joke for ten years. Ian joins in.	This led to the ressurection of an old joke as they tested how they felt about this conversation. ⊕
Meeting 5, Correlation=0.824, n=18 The group are examining new plans of the lift that have been draughted.	
John is comparing measurements on the plans with measurements on his sketch of what he wanted.	Using measurement is a sign of abstract thought. ⊕
As part of this Ian asks John if he is happy with the position of the doors in relation to the lift. John says 'Yes'.	Ian wants John to confirm the decisions made on this subject. ⊕
Bob make a joke about John's measurements using an 'Engineer's rule' or 'One long screwdriver'.	John, Ian and Bob internalise and socialise briefly in the roles of engineers. ⊕

Appendix 9

Summary and Commentary for Subject 3, Lift Performance

Key:

Divergence ⊕

Assimilation ⊕

Convergence ⊕

Accommodation ⊕

Meeting 3, n=54 John and Bob ask Ian how fast the lift is. Ian says he's used the specification that Audio Devices asked for. John presses the point and asks how long it takes to prime itself. Then both John and Bob quickly recount their experience and judgement of their current lift as 'hopeless', raising the prospectiveness of the conversation. Ian responds and asks them for the make of the lift. Bob suggests that all hydraulic lifts have to build pressure first indicating that he understands why it is like that and that it may be out of their control. But John continues to press that it is a major issue for users. Ian responds by saying they are slow but it's not a big problem. Recognising Audio Devices' need, Ian then offers to find out the speed. The subject changes slightly and Ian recounts his experience that there is very little choice of lift manufacturers anymore. He implies that you cannot choose to have a faster one. Bob comments dryly that one result is that manufacturers 'try and keep it slow'. He is concerned with speed not constraints on choice. This prompts Ian to recount his own experience and that 'no matter how much money you spend on these things, they can't get it right.' Then Bob, Ian and John discuss the specific problem that Ian had encountered and the mechanics behind it. Ian has the final turn and says that you can buy direct motor lifts but they are much more expensive. Bruce, who did not say anything on this occasion, cuts off the discussion by changing the subject.	John & Bob asked open questions. ⊕ Ian used a logical argument saying he'd used the speed given to him before. ⊖ John made his need for a short response time clear. ⊕ Bob and John worked together turn-taking here. Again they voiced what they needed. It was more direct, experiential and emotional. ◔ Ian was drawn along with them and prompted them to talk about how their present lift came about. ⊕ Bob became more logical and tried to make discussion move to how lifts worked. ⊖ John seemed to say that he was less interested in how it worked and more interested in making it work faster. ⊕ Ian committed himself to finding out from a manufacturer recognising the importance Audio Devices gave to it. ⊖ Ian switched style to show his understanding of lifts and lift manufacturers by telling a story of how the industry had changed. ⊕ Bob's schema was different to Ian's. But his intervention was still accommodative and showed how he internalised Ian's story. ⊕ Ian continued the accommodative vein by adding further personal experience and the moral of the story. ⊕ This started divergently when they reflected on the experiences they had recounted and generated a concept of what they wanted. ◔ Then their turns became assimilative as they thought through the mechanics of a lift mechanism. ⊖ Ian's final turn was decisive and authoritative. ⊕
Meeting 5, n=8 John voices his concern over the speed of operation of the lift. Bob says that they should wait until they can ask a manufacturer. Ian follows very quickly to reinforce this. Bob asks Ian how long they will take to prepare a quotation for a lift. Ian responds by asking Bob if he had prepared a programme.	All these turns were convergent. The conversation is short and snappy (active experimentation) as well as logical and decisive (abstract conceptualisation). ⊕

Meeting 6, n=122	
John raises subject in an abrupt way. Ian says, again, that he is working to their original specification. Bruce jumps past this and asks if new lift works in the same way as the old lift. John and Bob restate their explicit understanding that the response time is a problem. Ian concurs. Ian says he is meeting the lift man soon and John, Ian and Bob interactively re-specify the problem. In response to Bruce, Bob and John make fun of slow lifts. Ian is not amused and says he will find out. Ian then asks whether their current lift is really as slow as they say or whether it is just their perception. Bob takes his point but John says "It's not something we should just ignore." Ian says he'll ask the lift people about it but then John says it takes fifteen minutes. Ian takes exception and says that their current lift should be like others. John says it is too slow. Ian asks if they have ever actually timed it. John says "No. Too factual". Ian laughs. Bruce leaves the meeting to go and time the lift. Ian defines what would be a valid test. John and Bob specify further what they see as the problem. Ian says that their current lift has not been a success. Ian and John talk then about how John does not wear a watch until Bruce returns. Bruce reports results of his experiment. Bob says that response time is a "significant proportion" of the fetch time. Ian asks Bruce if it came from another floor. Bob specifies more about what the lift does. Ian then acknowledges that lifts can be a problem. Bob asks Ian why and mirrors him as he explains that lifts with winding gear require more building, implying that this is more expensive. Bob then suggests that the ratio of delay before the lift move to the speed of the lift is universal. John agrees. Ian says nothing and does not disillusion them. Ian talks about extra building for winding gear instead. Ian talks about whether Audio Devices have been happy with the lift. Ian, Bob and John then talk about the history of their present lift and their unhappiness with it.	Subject raised without explanation or cues. Ian's position under pressure was to use the idea of a previously agreed plan without going into details. Bruce avoided this abstract approach and related the plan to past experience. John and Bob made problem explicit and measurable. Made understanding explicit and shared. Like combination. Mixture of and . Connected experience of lift to other areas of life. More metaphorical. Ian had a flat demeanour. Ian took the opportunity of this flexibility to ask if it was their perception, implying that they were being illogical. John, Bob and Ian went back to perceptions and used metaphors to voice experience. It seemed as though the subject would end there but then John made an extreme statement that Ian could not let go. Ian threw down the gauntlet in a rhetorical way. But Bruce took up the challenge practically and started experimenting. The conversation became assimilative whilst Bruce was away as John, Ian and Bob thought through what the results might be. This part of the conversation was not explicitly about lift performance and was accommodative. However, the sub-text of talking about John's watch was Ian wondering about John's sense of time. The timings were understood assimilatively. The implications were understood both assimilatively and convergently. and Ian seemed to change tack here to admitting that lifts have problems. He talked of two examples. The discussion of the mechanics of the lift was practical and logical. Bob and John used a logical, mathematical concept to allow them to feel okay about the slowness of lifts and to decide to accept it if they end up with such a lift. This talk of construction is a very practical consideration. Here the group talked about how they felt about their existing lift implying internalisation. They tried this by using their new schema of asking for better performance but perhaps realising that little may happen.

Meeting 7, n=7 John raises the subject again. Ian says the lift company has the specification implying that should be enough but Bob laughs. So Ian recounts the look of amazement on the face of the chap from the lift company at what Audio Devices were asking for and his opinion that the wait time was not important. This is Ian's view too but he shows he knows that it could feel like a long time. Ian ends by saying that the issue is on-going.	Ian tried to close the subject (convergently) by relying on the idea that the specification should be enough. ⊕ But he recognised that Audio Devices wouldn't accept that. He then told the story of what it was like to try and persuade the lift company to make the response time faster. The story and the way he told it was personal and imagistic (concrete experience) and aimed to guide the others to integrate this apprehensive knowledge to their personal schemata. ⊕
Meeting 8, n=32 John raises the subject again and Ian tries to leave the discussion at the level of an agreed and formal plan but John persists. Ian then says he has not resolved the issue of the response time and starts recounting his experience with the lift company again. This time he emphasises how ten seconds can seem like a short or a long time. Bob shadows Ian here by making echoing and supporting turns. John is quiet. So, Ian goes further and says he has been timing lifts wherever he goes and that all lifts are the same. Bob, Ian and John acknowledge that direct motor and hydraulic lifts are different but that all take some time to respond. But the rest of the conversation avoids antagonism and promotes acceptance of this position. John and Bob make jokes about it rather than re-engaging with the subject to push Ian to resolve it.	Ian and John started in a convergent way.⊕ John pushed and Ian resisted. It was a little tense. John was a little sarcastic and showed how he felt about it. ⊕ Ian was accommodative as he told a story with metaphors and with feeling to let Audio Devices know that he understood but that the lift people considered their request strange. ⊕ Ian's speech became more convergent and he became more conclusive. ⊕ Interestingly, Bob supported Ian and John did not argue. Perhaps they had accepted Ian's position. Sensing this, Ian recounted further experiences with lifts. ⊕ The rest of this conversation is mostly accommodative. ⊕ Bob and John join Ian in internalising their experiences around the idea or schema that all lifts have delays. Crucially John made a joke (apprehension) rather than discussing lift mechanics or pushing Ian for further action.
Meeting 9, n=13 John looks through the specification of the lift provided by the lift manufacturer. He thinks the name of the lift is funny because it is called Express Evans. Ian, Bruce and David pick up on the idea that it may be faster in name than in reality, and that the name is to console John. Bruce extends the joke: "It might be one of a larger family where there's a slow one." The word play continues for a few turns.	This section was coded entirely to D8 'Jokes and light-heartedness' as it was entirely accommodative. ⊕ John had resolved to accept that the lift would be slower than he wished after they had tried to get it faster. He raised the subject again but in an ironic way. All of the others took the opportunity to pun with him. Thus, there was mutual understanding of the situation and how John felt about it. They communicated their internalisation of the subject tacitly.