

Studying Human-Centered IT Innovation Using A Grounded Action Learning Approach

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This paper describes how two research methodologies, grounded theory and action learning, were combined to produce a rigorous yet creative and flexible method for field study of a recent IT-based innovation, virtual teams. Essentially, an action learning program was used to train facilitators of virtual teams and generate research data while grounded theory techniques were used to analyze and interpret the data. This paper shows how this combined method can be used to develop local and practical theory for complex, human-centered areas of information technology. The implications of this grounded action learning approach for practice and research in IS will be discussed. Key words: Action Learning, Action Research, Grounded Theory, Virtual Teams, and IS Research

Introduction

This paper describes a research design that used an action learning training program to recruit research participants and generate research data and key aspects of grounded theory methodology to analyze and interpret the data. While action learning allows for a creative and flexible approach to gathering field data, the grounded theory methods promote analytical rigor and validity. The result, grounded action learning, is a symmetrical and harmonious melding of two research methods that has great potential in Information Systems (IS) research to promote local and practical theory development in the highly dynamic situations that occur when people use new information and communication technologies in organizations.

It should be noted here that in addition to exploring the use of particular research methodologies, the paper also recounts, in part, the personal journey of the first author as he explored and decided on various courses of action with regard to the research highlighted in this paper. As such, parts of this article are recounted in the first person. The role of the second author was primarily as a guide; drawing on the experience he gained in a similar undertaking several years before.

Three factors were instrumental in determining the design and implementation of this study. The first factor concerned my own experience in trying to implement and facilitate a virtual team as part of the Virtual Team: Managing the On-line

Meeting internet-based course I¹ had developed for a tertiary institution in New Zealand. From this generally unsuccessful attempt, I realised that serious issues were involved in working in a virtual environment; for example, getting virtual team members to participate. I was interested in learning more about them; in short, I wanted to be an integral part of the learning process.

Second, when this study commenced four years ago, very little empirical research had been conducted on virtual teams and almost nothing on virtual team facilitation. The research that had been published mostly involved student subjects. Bordia (1997) pointed out although most computer-mediated communication research focuses on its application to organizational and social functions, the applicability of results is "jeopardised" because most of the research is done on student subjects. Jarvenpaa and Leidner (1999) echoed this thought in their often-cited study, *Communication and Trust in Global Virtual Teams*. To make this study as meaningful as possible, it was my intention to work with professional organizational people, who themselves were working within their organizational contexts. The results of the study would then be directly applicable to the ways in which these people work. One challenge, of course, was how to persuade busy professional people to take part in the study.

The third factor was that a research framework that was both attractive to professional research participants and fundamentally compatible with the grounded theory approach that would be used in the analysis of the data was needed. The use of some form of action research was confirmed after consultation with academic and professional colleagues.

After a thorough investigation of possible research methods, it became clear that action learning would meet the circumstances raised by these three factors. As will be explained further in the methodology section below, an action learning framework 1) provides a relevant learning opportunity for research participants, 2) allows for groups of people to work on real organizational issues, 3) allows for the researcher to be intimately involved in the learning set, 4) is fundamentally compatible with grounded theory approaches. Another very important consideration is that an action learning approach is an ethically sound way to conduct research as it offers research participants something valuable (their learning) in return for the data they provide the researcher.

The research question in this study was - How do facilitators of virtual teams build relationships with their virtual team members? That is, can a theory be developed that describes the processes that a virtual team facilitator goes through when building relationships with virtual team members? The challenge was to recruit virtual team facilitators and create a research framework that would foster the collection of relevant data. This was done by offering prospective research participants 'something of value' to compel them to participate - a free and comprehensive action learning training program on virtual team issues and processes. The training program gave the participants the information and skills they might need to initiate and facilitate their own virtual teams, as it was quite possible with virtual teams being a new phenomenon, the participants may not have had any or only very little experience with them. In return, the facilitators planned for, initiated and

¹ The first person singular 'I' or 'me' will be used to indicate the action learning role of the first author. 'We' is used to denote the joint activities carried out by both authors. The second author provided advice and support during the study.

facilitated virtual teams within their organizations and met together regularly to discuss and evaluate their experiences. This formed the bases of the study's data collection, which were being continuously analyzed using grounded theory techniques.

In the following sections, the action learning training program and the supporting research methodology will be discussed in light of the study's research question.

The Action Learning Training Program

The 'Virtual Team Action Learning Program' was specifically designed for this study. The design of the training program was based on my own experiences with virtual teams and a pilot project that ran for over one year. The pilot project involved one virtual team facilitator who wanted to initiate a virtual team within a global partnership of companies. The pilot participant and I worked together, more or less, as co-researchers in the manner of participative action research (Whyte, 1991). At the conclusion of the pilot program, I developed the training program and issued a call for more volunteers. Eventually, six facilitators joined the study.

Each of the two Action Learning Programs was ten weeks long. The content of the program covered virtual team issues and processes of concern to a facilitator (Table 1). The content was similar for the two training programs. During the training programs, each participant planned for, evaluated the use of, or actually initiated and facilitated a virtual team within their own organizational context. The three facilitators and the trainer/researcher in each program met every two weeks for two hours. In order to give a clearer picture of what actually occurred in the training program, each training session will be described in more detail.

Table 1. Outline of Virtual Team Action Learning Program.

<u>Virtual Team Action Learning Program</u>
<p>Session One Virtual Team Implementation and Project Planning</p>
<p>Session Two Developing Virtual Team Purpose, Communication Strategies and Protocols, and Technology</p>
<p>Session Three Developing Team Identity, Building Relationships and Intercultural Communication Issues</p>
<p>Session Four Preparing for and Facilitating Virtual Meetings</p>
<p>Session Five Concluding a Virtual Team and Other Training Issues; Virtual Teams in the Organization</p>

Basically, each two-hour session was divided into three sections. Section 1 began with a report by each of the three participants on the virtual team issues they had encountered during the prior two weeks. This was followed by an open discussion in Section 2 involving myself and all the participants on how a facilitator might handle these issues. In Section 3, I gave an informal presentation on key issues related to the implementation and facilitation of virtual teams. Table 2 illustrates the format of the first three sessions, which are representative of all five sessions. As can be seen from Table 2, the issues covered in Section 3 one week became the basis of Sections 1 and 2 the following week.

Table 2. Detailed Program of Typical Training Sessions.

Virtual Team Action Training Program <i>The VT Pioneers</i>	
Session One	
1. Pre-program interview with each participant	50 minutes
2. Open discussion on training needs	30 minutes
3. Training on VT Implementation and Project Planning	40 minutes
Virtual training - contact <i>VT Pioneers</i> using 2 - 3 different media; note and evaluate your experiences	
Office - create project plan, initiate your virtual team (or continue if in one); keep notes of what is working and what isn't.	
Session Two	
1. Progress report/issue review with each participant	50 minutes
2. Open discussion on implementation issues	30 minutes
3. Training on Developing VT Purpose, Communication Strategies & Protocols	40 minutes
Virtual training - exchange ideas with <i>VT Pioneers</i> re: communication strategies; note and evaluate your experiences	
Office - with your virtual team develop team goals and communication protocols; keep notes of what is working and what isn't.	
Session Three	
1. Progress report/issue review with each participant	50 minutes
2. Open discussion on develop team goals and communication protocol issues	30 minutes
3. Training on Developing Team Identity, Building Relationships and Intercultural Communication Issues	40 minutes
Virtual training - continue exchanging ideas and strategies with <i>VT Pioneers</i> ; note and evaluate your experiences	
Office - with your virtual team develop team identity & begin building relationships, discuss intercultural differences and possible effects on the team; keep notes of what is working and what isn't.	

As can be seen from Table 2, participants were asked to continue work during the subsequent two weeks on the implementation and facilitation of their individual virtual teams in the general subject areas that were presented in the training sessions. For example in Session 1, we looked at virtual team implementation and project planning. After this session, it was hoped that the trainees would return to their offices and work on the implementation of their virtual team and develop a project plan. By doing so, they would be engaging in 'action' within the context of their organizations. At the next session, they would bring back their experiences to share, discuss and critique with their learning set. Essentially, a mini learning cycle was being conducted within the larger action research cycle.

Semi-structured face-to-face interviews with each participant were held at each training session and phone interviews were conducted with each participant between training sessions. Informal discussions between participants were also recorded during the training sessions. A follow-up review and evaluation session was held for all the facilitators approximately one year after the training programs were completed in which facilitators were given a final interview. These interviews and discussions, as well as other written and electronic documents, became the research data from which the analysis and interpretation were conducted. This analysis and interpretation is illustrated in the section Collecting and Analyzing the Data.

The Research Methodology

Action Learning and Its Action Research Antecedents

Action research produces highly relevant research results, because it is grounded in practical action, aimed at solving an immediate problem situation while carefully informing theory. (Baskerville, 1999, p. 2-3)

Action learning is closely linked to action research and is cited as one of the 'several streams' of action research (Lau, 1999). Zuber-Skerritt (1991, p. 214) argues that action learning "... is a basic concept of action research". Action learning is described as the process by which groups of people work on real organizational issues and come up with practical solutions that may require changes to be made in the organization (Revens, 1982).

Action learning is a practical group learning and problem-solving process where the emphasis is on self-development and learning by doing. The group, known as the action learning 'set', meets regularly and provides the supportive and challenging environment in which members are encouraged to learn from experience, sharing that experience with others, having other members criticize and advise, taking that advice and implementing it, and reviewing with those members the action taken and the lessons that are learned (Margerison, 1988).

Action research (AR) is a qualitative method used in IS research. AR combines theory and practice (as well as researchers and practitioners) through change and reflection in immediate problematic situations within a mutually ethical framework (Avison, Lau, Myers, & Nielsen, 1999). The main tenets of AR should by now be well known to the general IS community (Baskerville & Wood-Harper, 1996; Kock & Lau, 2001) and do not bear repeating here. The important point is the growing recognition that AR is being increasingly used in the IS field in recognition

that a social system can be more deeply understood if the researcher is part of the sociotechnical system being studied (Kock, 1997). By offering to apply positive intervention on the system, AR researchers promote cooperation between themselves and their research participants fostering improving information exchange and research quality (Kock, 1997).

In a study of how facilitators of conventional meetings become facilitators of face-to-face electronic meetings, Yoong and Gallupe (2001) adopted the 'experiential' version of action learning. They argued that learning to be a facilitator of electronic meetings requires more than just 'reading', 'talking' and 'thinking' about it. It also requires the actual experience of 'doing' it. Yoong and Gallupe (p. 84) stated, "Facilitators need to know what they can or cannot do before embarking on improving or changing these facilitation behaviours. This link between what is already known - the facilitators' experience in conventional meetings - and what they want to know, change or improve - the use of the electronic meeting tools - is also a common feature of experiential learning. The process of integrating new experience with past experience through reflection is an important aspect of the trainees' learning to be facilitators of electronic meetings".

Using similar arguments, action learning provides a useful approach for those who are in the process of unraveling the nature and complexity of virtual team facilitation (Yoong, 1996a). It focuses on tackling real and current organizational issues. The use of virtual teams in organizations is certainly a real and current issue, and action learning provides an appropriate framework for studying virtual teams.

Yoong's model provided several guidelines for the planning, design, and implementation of action learning projects on virtual work. For example, participants are encouraged to work in groups and use the learning groups to: work and gather data on real life issues and problems associated with working in the virtual workplace; reflect and improve on their workplace practice by the appropriate incorporation of groupware tools; interlink their action and reflection, and to discuss their action and reflection with others. Furthermore, participants are encouraged to: learn and experience and to use the experience as a foundation and stimulus for further learning; discuss their prior experience and to recognize the effects and influence of prior experience in their learning; use the knowledge, skills, and experiences of other group members as resources for their own learning; gain new experiences by testing techniques and actions, and invite group members to provide feedback, taking that feedback and implementing it, and reviewing with those members the action taken and the lessons learned (Yoong, 1996a).

The following comment by a participant on why she wanted to participate in this study illustrate the relevance of the 'action learning' paradigm.

So I have significant interest/experience with virtual teams from different ethnic and cultural backgrounds - but I am no expert - there is still an awful lot for me to learn. Mostly my virtual team experiences have been great - but there have been one or two pitfalls along the way. I have done much of my work by "the seat of my pants". I would like some kind of structure in terms of learning to set up an organised system, the sorts of things that make a good virtual team, the sorts of things that make things work well, the things that can be done differently. I am particularly impressed with all the other bios I have

read from the other participants. I look forward to both learning and contributing.

As the participant's comments above indicate, action learning meets the requirement that this training program be tailored to meet the needs of a group of experienced organizational people who bring their own professional expertise and who, by researching their own practice, would be able to learn to improve their own facilitation skills in a virtual team environment. Action learning can assist a participant to seize ownership of what needs to be known and release a powerful chain reaction of effort within the learner and the learning set independent of the trainer (Casey, 1983).

Traditional Grounded Theory and Grounded Theory Approaches

The notion of what is traditional grounded theory is somewhat problematic. Glaser and Strauss (1967) are credited with creating grounded theory. Later Strauss and Corbin (1990) made significant changes to the methodology, much to the chagrin of Glaser (1992). However, these changes by Strauss and Corbin also came to be widely accepted. For the purposes of this study, the term 'traditional grounded theory' will refer to either the original incarnation of Glaser and Strauss or the later one promulgated by Strauss and Corbin when either is followed to the letter. Grounded theory approaches may include some of the elements of traditional grounded theory such as the constant comparative method, theoretical sensitivity and theoretical sampling, but often refer to techniques of grounded theory, such as open coding, used in conjunction with other research methodologies. The use of grounded theory approaches and techniques will be further explored in Grounded Theory Approaches and Techniques below.

Traditional Grounded Theory

The goal of grounded theory is to generate a theory that accounts for a pattern of behavior which is relevant and problematic for those involved. (Glaser, 1978, p. 93)

Traditional grounded theory is a methodology for developing theory that is grounded in data systematically gathered and analysed in which theory emerges during actual research, doing so through the continuous interplay between analysis and data collection (Strauss & Corbin, 1990). Central features of this analytic approach include the general method of (constant) comparative analysis, theoretical sampling, theoretical sensitivity and theoretical saturation (Glaser & Strauss, 1967). Strauss and Corbin later introduced a paradigmatic framework to assist in structuring data in meaningful ways (Strauss & Corbin, 1990).

In traditional grounded theory data are collected and coded simultaneously. Subsequent coding will confirm these categories or will refine, extend and modify them to fit the new data. New categories may emerge at this stage. 'Theoretical sampling' is the process that governs this data collection procedure, in which the coding and analysis done at the initial stages determines the subsequent data to be collected.

Theoretical sampling is the process of data collection for generating theory whereby the analyst jointly collects, codes, and analyses his data and decides what data to collect next and where to find them, in order to develop his theory as it emerges (Glaser & Strauss, 1967, p. 45).

Unlike statistical sampling, theoretical sampling is the process of collecting data for comparative analysis and is especially useful to facilitate theory generation.

It is by theoretical sampling that representativeness and consistency are achieved. In grounded theory, representativeness of concepts, not of persons, is crucial. The aim is to build a theoretical explanation by specifying phenomenon in terms of the conditions that give rise to them, how they are expressed through action/interaction, the consequences that result from them, and variations of these qualifiers. (Strauss & Corbin, 1990, p. 9)

Theoretical sampling is a flexible procedure that allows the researcher, unconstrained by a prescribed sample, to pursue theory development as new concepts emerge from the data. It also allows for the selection of samples from outside of the norm to verify or test the validity of a category (Chenitz & Swanson, 1986).

As the study continues, data collection and coding are reduced as analysis and theory building become more dominant. Emerging concepts from the data are compared and contrasted with the literature to establish hypotheses, which are then refined and elaborated to develop theory. The generation of theory occurs around a core category, which accounts for most of the variation in a pattern of behavior (Glaser, 1978).

(The core category) has several important functions for generating grounded theory: integration, density, saturation, completeness, and delimiting focus. (Glaser, 1992, p.75)

The core category is often, but not always the same as the Basic Social Process (BSP) (Glaser, 1978). BSP's are "pervasive, fundamental, patterned processes in the organization of social behaviors, which occur over time and go on irrespective of the conditional variation of place" (Glaser, 1978, p. 100). Stages in a process, defined by normally discernible breaking points, are a prime property of BSP's. In short, BSP's can be understood as theoretical reflections and summarisations of the patterned and systematic flow of social life.

The notion of 'theoretical sensitivity' is particularly useful at this stage. Strauss and Corbin (1990, p. 42-43) define it as "the attribute of having insight, the ability to give meaning to data, the capacity to understand, and capability to separate the pertinent from that which isn't". Sensitivity is achieved through a variety of approaches including extensive literature search in related fields of study and a series of reflections on personal and professional experience.

Further data collection and analysis become more selective and are finally concluded when 'theoretical saturation' (Glaser & Strauss, 1967) is achieved. This means that additional data, coding, or sorting would not contribute to the extension of the developed theory.

A number of recent studies in IS using traditional grounded theory (Mallalieu, Harvey, & Hardy, 1999; Pries-Heje, 1991; Yoong, 1996a) have been conducted over the last decade. It is apparent that grounded theory is chosen as the research methodology when the subject area under study is new, the research problem is unclear or ambiguous, and/or large amounts of unstructured and complex (textual) data are generated.

Grounded Theory Approaches and Techniques

Recently there have been a number of studies in IS (Gopal & Prasad, 2000; Maznevski & Chudoba, 2000; Sarker, Lau, & Sahay, 2000; Trauth & Jessup, 2000) that have made selective use of grounded theory techniques. These grounded theory approaches usually change the emphasis of emergent theory as put forth by Glaser and Strauss (1967) or modify or discard Strauss' and Corbin's paradigmatic approach to theory building (e.g., Sarker et al., 2000). Even more common have been a number of IS studies, particularly in interpretive inductive studies that require the development of meaningful categories (e.g., Trauth & Jessup, 2000), that have combined various elements of grounded theory with other research methods. The most commonly borrowed elements from traditional grounded theory are the grounded theory coding techniques (open, axial and selective) used to analyze data.

The Appropriateness of Grounded Theory in this Study

Given the nascent state of knowledge on virtual teams an inductive methodology such as grounded theory is particularly well suited to the study of virtual teams. (Sarker et al., 2000, p. 1)

Grounded theory methods are highly congruent with the need to understand rapidly evolving information systems as they are used in their organizational environments. Two distinct characteristics of grounded theory are especially relevant here. The first is that the conceptual framework is generated from the data rather than previous studies, and the second that the researcher attempts to discover the dominant processes in the social setting rather than describing the unit under study (Stern, 1987, p. 81-82).

The choice of grounded theory as a research method for the collection and analysis of data in this study was guided by the following considerations (modified, from Yoong, 1996a, p. 33-35):

1. Little previous research on the topic
This study is explorative in nature. No other studies have been located that focus on the experiences of facilitators as they implement and facilitate virtual teams. The aim of this study is an inductive generation of theory based on a detailed descriptive account; subject to a vigorous and systematic analytic approach of what actually happened in reality will be the product of this study.
2. The focus is on human experience and interaction
This study looks at the experiences a group of professional business people found important as they each implemented and facilitated a virtual team

within the larger context of their organizations and the rapidly evolving ICT environment. Grounded theory facilitates "the generation of theories of process, sequence, and change pertaining to organizations, positions and social interaction" (Glaser & Strauss, 1967, p. 114).

3. Applicability to practice

Grounded theory is a methodology that can close the gap between practice and research by providing an emergent theory based on a detailed and carefully crafted account of the area under investigation. "This theoretical account not only aids the researcher's understanding, but provides a means of communicating findings to those in the area studied, either as a basis for discussion or as a vehicle for implementing change" (Martin & Turner, 1986, p. 143). As such, grounded theory clearly complements the action learning framework used in this study.

4. The use of contextual interpretation

Human experiences are complex and rich. Orlikowski (1993, p. 311) suggests that "to produce accurate and useful results, the complexities of the organizational context have to be incorporated into the understanding of the phenomenon, rather than be simplified or ignored. In this study, the complexities and richness of the facilitators' experiences have been captured as they implement and facilitate their virtual teams within their organizational contexts.

In summary, before this study was conducted, very little was known about the issues facing facilitators as they implemented and facilitated virtual teams and how they handled these issues. This study, although, substantive, was exploratory in nature, focussing on the experiences the facilitators underwent as they facilitated virtual teams. The research approach employed attempted to meet the challenge articulated by Jackson (1999, p. 319) "to create a body of knowledge that can inform research and practice across all types of virtual teams, ... as well as identify points of difference between varieties of teams".

Grounded Action Learning

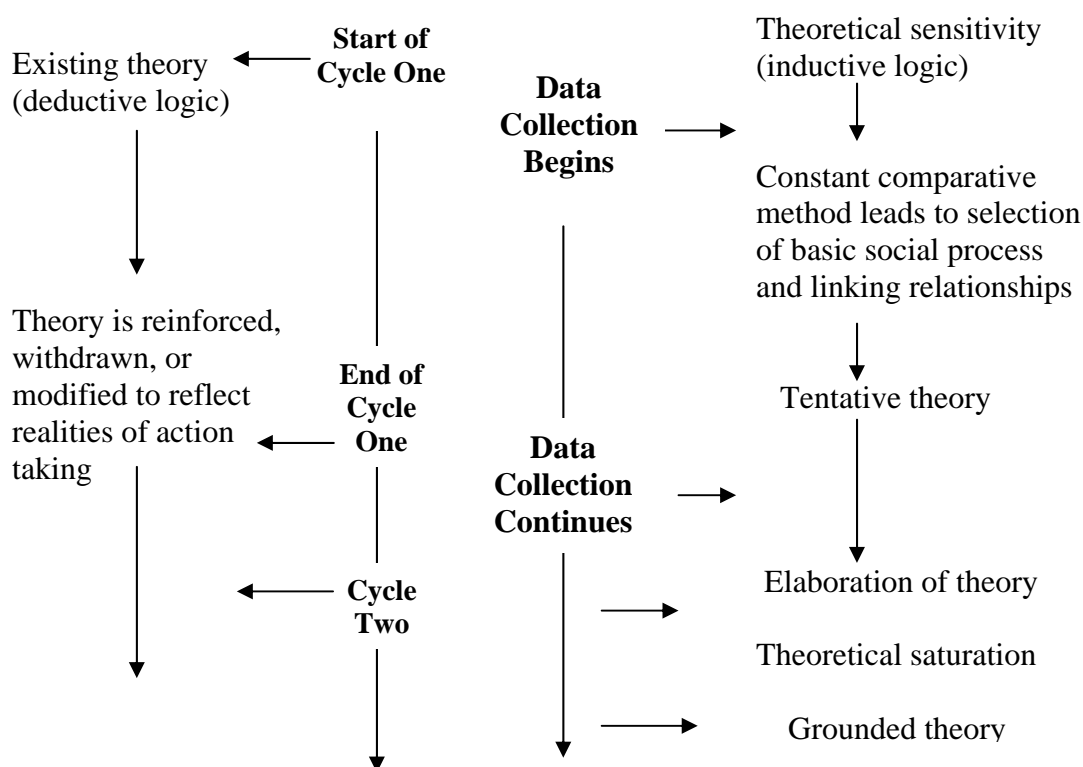
Both grounded theory and action research have been undergoing evolutionary changes as research methods. As has been shown above, the grounded theory method has been maturing and branching as it is affected by multiple experiences and new ideas in the world of inquiry (Annells, 1997). Its synthesis of sampling, analysis and coding is perceived as rigorous, while still allowing the researcher to remain flexible and creative when investigating new phenomena (Baskerville & Pries-Heje, 1999). Sarker et al., (2000, p. 9) concluded, "Few methodological approaches can accommodate the ontological and epistemological range as the grounded theory".

While action research embodies a strategy for studying change in organizations and has proven popular in IS research, it has gained only limited attention in the information systems research literature (Lau, 1999). In response, Lau (1999) developed a comprehensive action research framework to try and advance the understanding and use of action research in IS. Others, such as Baskerville and Pries-Heje (1999) consider the reason for this limited attention may be action research's lack of rigor, particularly in its theory development. In response, they have sought to

merge some techniques from grounded theory with the theory formulation steps of action research. They see this as a refinement and improvement of the action research method and call their method grounded action research.

On the one hand, Baskerville and Pries-Heje (1999, p. 7) state that "grounded theory, like action research, is a highly collaborative process" and that the rigor of grounded theory, alluded to above, is compatible with the character of action research. On the other, they argue that action research and grounded theory cannot be fully integrated on several grounds. First, action research is usually too limited and goal oriented (i.e. to solve a problem within an organizational context) to permit the full use of a comparative method like grounded theory, where theoretical sampling implies data collection within a wide range of situations. Also, action research normally begins with a practical problem suggesting predefined categories and concepts whereas in grounded research core categories usually emerge sometime after data collection has begun (Figure 1). During action research the core category may evolve or be abandoned.

Figure 1. Theory Building in Action Research and Grounded Theory.



However, these two objections do not materialize when grounded theory is used in conjunction with action learning as discussed in the following section.

The Integration of Action Learning and Grounded Theory Techniques

Integrating grounded theory and action research can take place in two ways according to Baskerville and Pries-Heje (1999). The authors suggest (1) using

grounded theory notations, such as memos and diagrams, to illustrate the relationship between emergent theory and the raw data and (2) utilising grounded theory coding techniques “for the evaluating, learning and diagnosis phases of action research” (p. 8).

In this study both of these suggestions were followed and are demonstrated below. Moreover, the grounded theory method was placed within the standard action research cycle creating, in essence, a grounded action research cycle, or more specifically in this study a grounded action learning cycle. Table 3 outlines the grounded action learning cycle used in this study and compares it with the traditional action research cycle. The changes reflect the nature of this study as well as the inclusion of grounded theory methods. The grounded action learning cycles will continue with different action learning groups (theoretical sampling) until a grounded theory has emerged and theoretical saturation has been reached, i.e. the evaluating and learning phases produce little change in any of the categories, especially the core category.

Table 3. Iterative Grounded Action Learning Cycle Compared with Traditional Action Research Cycle.

Cycle One

Action Research Cycle	Grounded Action Learning Cycle	
	Researcher	Participant
Diagnosis	Needs Assessment	
Action Planning	Training	
Action Taking	Data Collection	Implement & Facilitate Virtual Team
Evaluating	Data Analysis	Evaluating
Specifying Learning	Theory Generation	Specify Learning

When this research was originally conceived, I intended to use a traditional grounded theory method, collecting data from virtual team facilitators without any preconceived notions or constricting frameworks. As it became clear that I had to offer my research participants, who were busy professionals, something in exchange for their time and effort, I created a training program in which they could receive knowledge and a safe place to improve their virtual facilitation skills. I believed the action learning training program with the set topics that I chose to present, such as VT Implementation and Project Planning, Developing VT Purpose and Communication, Strategies & Protocols (see Table 1 for training program outline), would invariably have some influence on the experiences that the facilitators had and hence on the data I collected from them. It is primarily for this reason that the methodological approach I have taken here can be more accurately be termed a grounded theory approach within an action learning framework, or grounded action learning, rather than traditional grounded theory.

It should also be re-emphasized that there are significant differences between the grounded action research as espoused by Baskerville and Pries-Heje (1999) and the grounded action learning approach used in this study. Working within the client-system infrastructure, according to Baskerville and Pries-Heje (1999, p.18) "means that every action research project begins, from a grounded theory perspective, with certain pre-defined categories and perhaps even a pre-defined core category ... contradicting a grounded theory tenet that theory must be allowed to emerge from the open coding". Because I was not working within the client-system infrastructure, my concern was exclusively for the learning that the participants achieved and the unfettered emergence of the data; albeit given the limitations described above. I did not have to overly concern myself with the organizational management that the participants worked for, which is normally a significant concern of traditional action researchers. However, I was very interested in the contextual elements that the participants worked with, and many of these were organizational in nature.

Finally, a characteristic of action learning is its iterative cyclical nature often involving the same learning set. The learning set continues in successive cycles until an appropriate level of self-development and learning is achieved. In this study, each iterative cycle involved a new learning set. This is a modification of the action learning approach and was made to improve data collection by accommodating the grounded theory notion of theoretical sampling. It should be pointed out that the action learning training program itself was evaluated at the end of each cycle and changes were made to the training program in the manner of action research. As for the participants, although their involvement with their action learning set ended at the end of each cycle they were invited to get in touch with me if they wanted to discuss new experiences or insights.

The Relationship between the Training Program, Action Learning, and Grounded Theory

The features of action learning have informed the design and implementation of the training program, and every effort has been made to link them with action and reflection activities in the training program. Table 4, based on Yoong's (1996b) model of action learning in the office of the future, illustrates the relationship between a number of learning activities and relevant features of the Virtual Team Action Learning Program.

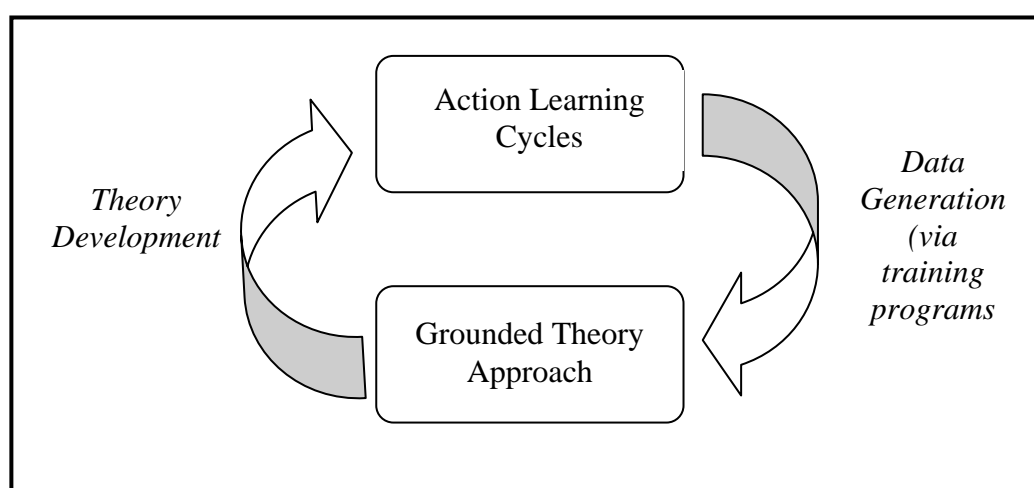
Table 4. **The Relationship between Action Learning and the Training Program** modified from Yoong, 1996b).

Learning Activity in Action Learning Training Program	Features from Action Learning in the Office of the Future
Implement and facilitate a virtual team within the organization	Work and gather data on real life issues and problems associated with working in the virtual workplace
Learning to use Netmeeting, e-mail, listserves and other electronic	Reflect and improve on workplace practice by the appropriate

communication channels to facilitate virtual teams	incorporation of groupware tools
Progress report/issue review with each participant	Interlink action and reflection
Open discussion/peer feedback	Discuss actions and reflection with others

As explained in Section 3, this study is based on a grounded action learning methodology. An action learning framework was used to generate data while grounded theory approaches were used in the analysis of the data. Figure 2 shows the relationship between action learning on one side, and grounded theory methodology on the other.

Figure 2. Data Generation and Theory Development (Yoong, 1996a).



Collecting and Analyzing Data from the Program

This section begins with a discussion of some practical issues associated with this study, followed by a description of the procedures used during the collection, analysis and interpretation of the research data. The section ends with a discussion of issues relating to the study's rigor, credibility, and validity.

Practical Issues

The field work in this study, which involved the pilot study, the designing and conducting of the two subsequent training programs and the associated collecting of interview and other field work data, took place over a period of three years. Dividing the fieldwork into three blocks of activity, the pilot project and the two training cycles, proved to be a useful approach. The extended period between each block of fieldwork provided time for transcription and analysis of the interview data. Equally importantly, these in-between periods were used for reflection, interpretation and strategy building.

These reflective periods, which are built into the action research cycle as well as the grounded theory method (Yoong, 1996a) significantly influenced the way the next period of fieldwork was conducted. The following two examples are illustrative: the difficulties I encountered in the pilot project working with a single individual, encouraged me to think strategically about my data collection methods and consequently to devise a training program for several participants so as to ensure adequate data collection; the interim results from the first training program helped me to determine the selection of the second program participants based on the principle of theoretical sampling. Trainees in the second training program were selected because of their differences to those from the first training program, both in their experience with virtual teams and in the global nature of their virtual teams and team projects. As a result, I was able to compare and contrast the emerging theory with the data as prescribed by the constant comparative method.

Analysing the Research Data

In grounded theory, the constant comparative method provides the researcher with an established set of procedures for conducting the data analysis. Although data collection and analysis are presented in two sections here because they represent different conceptual stages in the research process, in fact data collection, analysis and interpretation are concurrent and iterative processes (Glaser & Strauss, 1967). In this study many of these approaches of grounded theory are used in data collection and analysis.

Data Collection

As explained above several methods of data collection have been used in this study primarily based on semi-structured interviews and discussions between the researcher and the facilitators and informal facilitator reports, but also including the researcher journal, and to various degrees: participant notes, organizational documentation and copies of electronic conversations, i.e. e-mail. These methods provided for the collection of diverse kinds of data and enhanced the use of the constant comparative method (Glaser & Strauss, 1967).

In the first session of each training program, the participants introduced themselves, their organizations, their experiences with virtual teams, their proposed virtual team projects, and any other relevant background information. In subsequent reports participants would discuss their implementation and facilitation efforts with their virtual teams and any issues that had come up in the previous two weeks. Generally, the content of these reports would mirror the training lesson of the prior training session. The researcher and other participants would occasionally ask questions of the reporting participant. Each report lasted between fifteen and thirty minutes.

After the participants made their reports, the discussion was opened up to everyone including the researcher. Explanations were sought, suggestions were made and other issues that were on participants' minds were raised. This part of the session generally ran for about thirty minutes. Whenever it was called for, I used the grounded theory principle of theoretical sensitivity - my growing awareness of the key emergent issues as I collected and analysed data - to guide participants' reports or free

conversations to draw out the similarities, differences and density of the trainees' accounts of their experiences.

Between training sessions, a semi-structured telephone interview was usually held with each of the trainees, particularly if a trainee had missed the training session. In these telephone interviews, I would especially ask participants to expand on particularly relevant points they had raised in the training session, again with theoretical sensitivity as my guiding principle. These telephone interviews also allowed the participants to raise issues that they were more comfortable talking only to the researcher about.

As is common in qualitative research, a large volume of data was collected (Gopal & Prasad, 2000), and I began to analyse the data by listening to and transcribing each recorded interview and discussion. Even working through *Via Voice*, a software package that allowed me to transcribe directly into the computer by speaking into a microphone, this was an intensive and time-consuming process, but it helped me to become thoroughly immersed in the data and to continue to develop theoretical sensitivity (Glaser, 1978). In all over 250 pages of interviews and discussions were transcribed from the pilot project and Cycles One and Two. Transcripts were returned to the participants for member checking and validation.

In these programs, I was not only the trainer but also the researcher and co-learner. That is to say, in my role as trainer I presented information to the participants; in my role as researcher I would ask questions to try and generate relevant data; and in my role as co-learner I would listen and learn from the other participants and share my experiences and insights with them.

Data Analysis

In this study, my first step in the analysis of the data was to code all the transcripts as well as relevant documents such as e-mail correspondence. I used open coding techniques, a process of labelling the events and ideas represented in the data (Baskerville & Pries-Heje, 1999). Again this was done throughout the pilot project and the two action learning cycles. During the pilot project and part of the first training program I did this coding manually, but later on I used NVIVO, a computer software program developed especially to be used with qualitative research methods (Richards & Richards, 1994). Using NVIVO I was able to peruse the transcript and assign one or more conceptual codes (called free nodes in NVIVO) to each line, sentence or paragraph, most often in terms of properties and dimensions (*ibid.*). All transcripts from the pilot project and each of the two training programs were similarly coded. In all 69 conceptual codes were developed. Table 5 illustrates how I used open coding to assign conceptual codes to participant comments.

Table 5. **Open Coding: Assigning Conceptual Codes to Data.**

Participant Comment	Conceptual Code
I used calls if I felt I was not getting back the stuff that I needed from them, as in this case.	Communication Strategy
The other teams were holding formal Crown team meetings, which could take forever. So we relied a lot will on trust again. We trusted the Conservation people to keep their bits under control and it worked very well.	Trust
The building trust one is interesting - it's one thing to have money at stake, it's another thing to have a company's reputation at stake, but we're dealing with clients whose personal reputation is at stake. It can get very emotional.	Trust
That's an interesting point of quality versus quantity of. Some people tend to try to get things done by quantity, firing e-mail after E-mail at you. One of the people I work with will call me up to ask me to do something and then send me an e-mail asking me if I have done it, all in about 30 seconds.	e-mail
That could be true. I have never had a serious discussion on ICQ. It is always hi, how are you, or let's meet in a chat room. It does seem to be seen as a social medium. You are right, if you can encourage people to use I C Q as a social medium.	ICQ
Yes he has access to that in all the information on that. It's an okay intranet, its not all things to all people. But I guess some people must get some advantage from it being there.	Intranet
We have 11-hour difference with South Africa, too, which throws things out little bit. It's a question of prioritizing things, is it that urgent that I ring someone at this hour, because I'm only going to be able to get them first thing in the morning or last thing at night.	Time Differences
I'm wanting to steer a careful path between doing what the group wants to do and guiding the group. I want this group to be fully participatory and to be able to move in any direction which group consensus allows. Equally I see the need for moderation, particularly over the initial stages to get the group up and running effectively. So I propose to be reasonably directive at first but to keep asking questions and seeking the consensus of the group through formal and informal questionnaires and processes.	Facilitation Strategies

The examples of conceptual codes given in Table 5 are varied in their level of abstractness. Some of them, like e-mail, intranet and time differences, are relatively low level descriptions, while trust and facilitation strategies are at a relatively high level of theoretical abstraction. But in the beginning of the coding procedures, as a researcher, I tried to approach the data without any particular preconceived notion

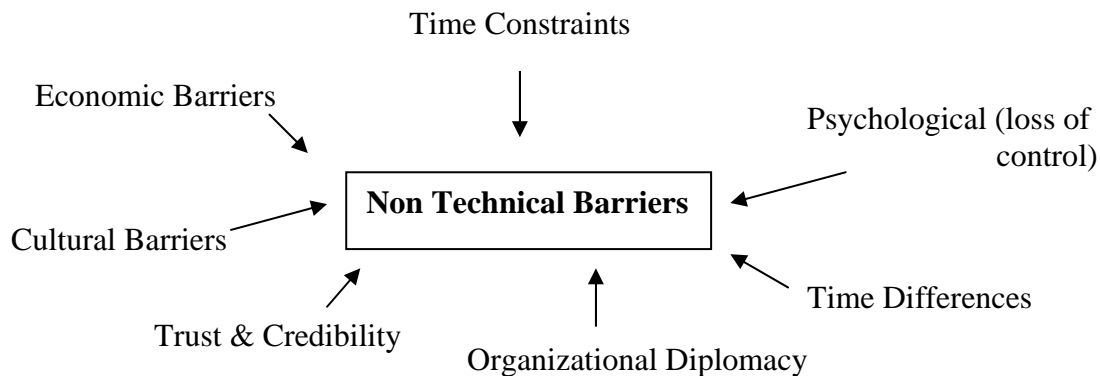
(Trauth & Jessup, 2000) and simply assign a descriptive label. Often data could be described in multiple ways as can be seen from Table 6.

Table 6. **Examples of Assigning Multiple Codes.**

Participant Comment	Conceptual Codes
The other thing is working across organizations. In the future we're going to increasingly be working across organizations, even virtual organizations.	Organizational Issue, Culture
I would rather send an e-mail than use the telephone, simply because of the amount of work I am doing.	E-mail, Communication Strategy, Organizational Issue
So I guess it's an idea of the rolling present. For example if you were to check your e-mail four times a day and somebody else checks it once every four days, you are going to develop different concepts of work flow or work pacing. Your contribution to the team is different and you'll probably judge other people, the other team members, by the way you were doing it and the way you're accessing the team....	E-mail, Communication Protocols

At the end of the first training program, I began looking for connections between conceptual codes through the use of several strategies. As suggested by Baskerville and Pries-Heje (1999) I used grounded theory notation such as memos and diagrams. I created various models based on the codes and emergent categories that were taking shape, as well as my intuition guided by increasing levels of theoretical sensitivity. I also wrote narrative, chronological case studies of each of the participants. This gave me another lens through which to view the data and to draw cross linkages between the experiences of each of the participants, as well as further immersing me into the data. These cases also gave me a valuable way to engage in 'member checking' with the participants when they read through them and verified their experiences as I had written them up.

As data analysis continued, particularly during and after the second training program, using axial coding and the constant comparative method, I continued to merge, change and occasionally eliminate codes (Sarker et al., 2000). Examining the conceptual codes for similarities or differences, I grouped them into clusters of conceptual codes, which I called conceptual categories, and which represent a higher level of abstraction (Figure 3). At this stage of data analysis because conceptual categories were emerging (in the manner espoused by Glaser, 1992), I did not feel the need to use the paradigm system developed by Strauss and Corbin (1990).

Figure 3. Grouping Conceptual Codes into Conceptual Categories.

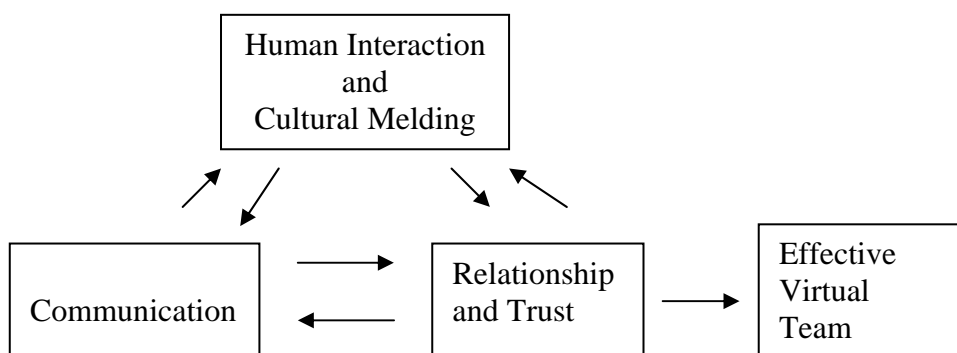
Nine conceptual categories were eventually developed (Table 7). This grouping was done with the help of the NVIVO indexing and retrieval system. I did extensive writing around these categories, which I called 'Emergent Theory'. Essentially, these were a collection of integrative memos (Sarker et al., 2000) in which I organised subcategories, began interpreting the data and brought in participant quotes for illustration and support. I did this for the Pilot Project and two training programs. As with the writing of the case studies, this gave me another perspective on the data and the linkages between the two cycles of data collection, as well as getting me started on the process of interpreting and understanding the data.

Table 7. Key Conceptual Categories.

Conceptual Categories
Communication Channels
Communication Strategies
Communication Protocols
Virtual Team, Facilitation and Related Issues
Culture
Human Interaction
Organizational Issues
Non Technical Barriers
Technology

As I reread the data from the various perspectives I had developed - transcripts, coding, cases, and emergent theory - it became apparent that newer and higher levels of abstractions and relationships were forming. I tried constructing models to give form to these relationships. Figure 4 is an example.

Figure 4. Use of Grounded Theory Notation to represent Theory-Data during Action Research Cycle.



Eventually, it became clear to me that *relationship building* was the key social process (Glaser, 1978) that facilitators were concerned with as they initiated their virtual team. Although I had not listed it at first as a key conceptual category, I found after reexamining the data that relationship building was a significant factor in the *Human Interaction and Virtual Teams, Facilitation and Related Issues* categories as well as figuring prominently in several others. At this point, I sought to delimit my coding to only those variables that related to the core category in sufficiently significant ways (Glaser, 1978). The core category, along with the other significant theoretical categories and the relationships between them eventually became the emerging grounded theory.

Concluding the Study

Richards and Richards (1994, p. 446-447) summarises the data analysis process as involving:

... the recognition of categories in the data, generating of ideas about them, and the exploration of meaning in the data ... concepts are captured; links are explored, created, and tested; ideas are documented and systematically reworked, in textual memos, models, and diagrams expressing the specification, explication, exploration and elaboration of theories.

For example, in this study, some conceptual codes from the pilot study continued to appear in the first training program and then in the second training program, while others did not. From the codes that continued from the pilot to the first training program I was able to begin to construct theoretical categories, which were then confirmed or modified, expanded or even discarded when the data from the second training program was analysed. In a sense, the initial categorising of data served as hypothesis building that would be tested against the data collected in the following training programs. Strauss and Corbin (1990, p. 111) described this process as such:

As you have probably noticed, while coding we are constantly moving between inductive and deductive thinking. That is, we deductively propose statements of relationships or suggest possible properties and their dimensions when working with data, then actually attempt to verify what we have deduced against data as we compare incident with incident. There is a constant interplay between proposing and checking. This back and forth movement is what makes our theory grounded!

As alluded to earlier I strived to choose, where possible, trainees with differing characteristics. Termed theoretical sampling, this method of selection increased the likelihood of "negative cases" (i.e. cases that do not fit an existing category). As a result, I was able to compare and contrast the emerging theory with the current set of data. Should a conceptual category "survive" a negative case, I could be increasingly sure of its robustness (Glaser & Strauss, 1967).

Theoretical sampling and constant comparative analysis with the aim of discovering an emergent core category in the tradition of Glaser (1992; 1978) were the main strategies for data collection, analysis and interpretation in this study. In the cyclical process of gathering, analysing and interpretation, every unit of data is compared with every other unit. Theoretical codes and later categories emerged with the aid of the indexing and retrieval capabilities of NVIVO. The relationships between the conceptual categories also emerged and were explained. The memos and diagrams helped to provide a high degree of procedural rigor embodying the multi-threaded "chain of evidence" important in achieving reliability in qualitative research (Yin, 1994).

As this process continued through the pilot, and the two training programs, it became clear that the core category along with the other significant conceptual categories and the relationships between them were not being substantially altered. At that stage I knew theoretical saturation had been reached and data collection could be concluded.

In the following section the implications for the grounded action learning approach in IS are discussed

Conclusions and Implications

We believe there are a number of implications of the grounded action learning approach described in this paper. First, learning to facilitate a virtual team is a complex and difficult experience. The action learning component of grounded action learning provides the trainee with the means to combine both experience and reflection as the learning is taking place. Second, the grounded theory component of grounded action learning provides the researcher a lens to analyse and interpret the research data i.e. the trainees' experience. The selective uses of different grounded theory techniques enable the researchers to directly link research data with participant's experience thus ensuring a closer link between theory and practice. It will enable IS researcher to minimise criticisms that IS research findings are seldom relevant to organizational practice. Finally, the grounded action learning approach has potential beyond just virtual team research. Information systems researchers in general, might consider this approach when studying learning in complex, technology situations. For example, we believe that this form of practice-focussed research will

become more pervasive as organizations learn to manage emergent forms of both virtual and knowledge work.

In conclusion, we believe that grounded action learning is a powerful approach in the training of organizational users of emergent technologies as well as an effective method for researchers to collect and analyse relevant data based on the users' experience. The approach offers the potential to develop emergent theories of new information technology applications that are based on actual practice. It is hoped that this paper, which describes the grounded action learning approach to the training of virtual team facilitators, will promote identification of and discussion about the many complex issues associated with the introduction of new technology in the workplace.

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