CARING MACHINES

EMERGING PRACTICES OF WORK AND CO-ORDINATION IN THE USE OF MEDICAL EMERGENCY COMMUNICATION TECHNOLOGY

Dr.Polit Thesis in Sociology
NTNU 1997

Aksel Hn Tjora
Department of Sociology and Political Science
7491 Trondheim, NTNU
tel (+47) 7359 0265
fax (+47) 7359 1564
e-mail: aksel@tjora.net

This is a PDF-version of the doctoral thesis submitted in 1997 and defended in 1998. Earlier (paper) versions are published in 1997 by the Faculty of Social Sciences and Technology Management NTNU, ISBN 82-7861-081-9 and in 1999 by G<Academy, ISBN 82-91976-01-5. This PDF-version has a compressed layout and page numbers are different from the earlier paper versions.

PREFACE

In October 1994 I was invited by Doctor Paul F. Forstrønen to study the development of medical emergency communication centres. As one of the driving forces behind the new system, he was looking for someone that could observe and analyse the social and organisational changes that had occurred in the acute medical sector during about 20 years of development and almost 10 years of operation. After describing what he was looking for, he nevertheless gave me free hands to develop my own research within this huge field. He gave me a few names of people such as doctors, nurses and administrative personnel, that in different ways, had been involved in the development of the communication centres in the health service.

Following a snowball method for identifying informants, I have interviewed during the work with this thesis several nurses in the medical communication centres and doctors and administrators who in various ways have been involved with the development and management of the centres and the system in general. However, most of the data is based on my observation of the work in the centres.

Through observation, it was possible to see what was going on in the centres, in quite another way than in interviews. In municipal centres (the LV centres; to be explained), it was often problematic to have an observer position because of the size of the LV centre "cabinets" in many nursing homes. In the regional communication centres (AMK centres; also to be explained), on the other hand, it was possible to relax in the back of the room, far enough from the observers not to disturb them and close enough to have follow their activities and to discuss their work with them. It was fascinating to watch the AMK centre team in emergency actions, and it actually made me personally confident that one would be in safe hands if one was involved in an accident. In one of the first days of observation in an AMK centre, one incidence made a certain impression, as my pulse and excitement increased.

> There is an 113 emergence call at 14.30 hrs. It is an elderly man with a cardiac arrest, and the ambulance is sent immediately. While the ambulance is on its way, the nurse has contact with the caller. "Do you know how to do heart compression?" the nurse asks.

> "No? - Hold the line, please, don't hang up." - "Isn't there anyone there who knows how to do heart compression and mouth-to-mouth?" The answer is obviously negative. The nurse asks again: "If I give you instructions, can you manage it?" - "Is the patient lying down now?" - "Remove his clothes from the upper part of his body. Place the palms of your hands between his nipples. Press. Count up to five. Bend his head back, pinch his nose, hold your hand under his neck". - "Has anyone breathed in his mouth twice?" "Is he breathing then?" - "If you put your ear close - look at his chest, is it moving?" - "No reaction?" - "Then you'll have to try heart compression, put your hands between his nipples and press hard" - "Try blowing in his mouth." - "Is the chest heaving?" - "Press the chest 5 times, and then blow." - "Are there any more people there, so you can take it in turns?" - "Heart compression and mouth-to-mouth." The other nurse at the AMK centre is sitting beside her and says "You can't force them to do it." The nurse who has taken the call says to the caller, "You don't need to hang up." She's feeling the stress a bit, but replies: "No, we can't force them"; she also says it to me afterwards. "Is there anyone who can continue the mouth-to-mouth?" - "You're doing a good job, even if you don't continue." She calms the caller. "Is the patient breathing?" - "Is there anything in his mouth?" (Meanwhile another emergency call comes into the centre and the other nurse answers.) The ambulance reaches the man with the cardiac arrest, the telephone is put on one side and the nurse can hear the ambulance crew working on him.

A little later, we heard from the ambulance personnel that the patient was doing all right, with a beating heart and breathing lungs on his way to the hospital. It was impressing to watch the nurses at work, instructing people in life-saving via the phone. Certainly, I thought, this work would be interesting to learn more about.

And it has been interesting indeed. Many intriguing aspects have popped up along the study, concerning not only the use of technology which was the starting point, but interprofessional relations, intensive coordination of team work, and interesting contradictions in the medical emergency organisation. Since October 1994 I have learnt to know a field of study that, at least in Norway, has remained unstudied for a long time. However, it has become clear to me that the medical emergency organisation is a very rich field of study. Besides, it is an organisation that is developing fast, institutionally and technologically. I hope that many interesting research projects will be undertaken in the sequel to this piece of research work.

Like any other accomplishment, this thesis is not the result of my own energy alone. Many people have helped me on the way.

I would like to thank Paul F. Forstrønen, at Haukeland Hospital, for the great confidence and believe that he offered me when he invited me to study the communication centres in the medical emergency service. There would be no findings, however, if it was not for the sympathetic interest that have

welcomed me in various LV and AMK centres. I owe a great many thanks to the nurses and ambulance coordinators that let me come very close to their work during observations. I will also thank the nurses, doctors and administrators that shared their experiences with me during interviews in the project start-up.

Especially I would like to thank my mentor, Professor Bjørn Hvinden at the Department of Sociology and Political Science, Norwegian University of Science and Technology. Without the interest that he has shown in this research project, through the readings of various drafts and invitations to discussions, I could not have brought the thesis forward.

The research project has been conducted under the organisational umbrella of PAKT, Program on Applied Coordination Technology at the Norwegian University of Science and Technology. I would like to thank the PAKT management for supplying the infrastructure that was needed to do this work. The work has been indirectly financed by Telenor[1] Research and Development.

I would like to give many thanks to all the students at PAKT for building a community of candour and delight, also when the going got tough. I think we all have learnt a lot from the time we have been together. Especially I would like to thank Berit Moltu, Per Einar Weiseth and Robert Moen for many stimulating discussions. I have also appreciated discussions with Olav Eikeland, Håkon Finne, Lucy Suchman, and Eric Monteiro.

I would also like to acknowledge the assistance from Stewart Clark, Administration, Norwegian University of Science and Technology for his English editing work on the thesis and Richard Binns for English translation of Appendix 1 and field quotations.

Recreation has been a very important "energiser" for the research work. Through music and family life, it has been possible to keep up the spirit. Thanks to Skrømt, Strapfkernerator, Trip Records, and Vampire State Building.

Most of all, I would like to thank Juni M. and Ingunn F. Tjora. You make all this worth while.

Trondheim, 26 March 1997
Aksel Hagen Tjora

[1] The Norwegian Telecom Company

TABLE OF CONTENTS

TABLE OF BOXES

ABSTRACT

The study of technology has recently become more focused in various schools of sociology. However, Marxist, functionalist, social constructivist, and ethnographic research, have tended to explain technological development either from macro or micro perspectives. Further research is needed to increase our understanding of technology as situated in its social and institutional contexts, where individual and professional relations are considered. In this thesis, elements from several approaches are applied to the study of communication technology in Norwegian medical emergency communication centres.

About ten years ago, LV (doctor-on-call) centres, each manned by one nurse to handle local requests for a doctor, were established in nursing homes. AMK (acute medical communication) centres were introduced in hospitals, and are manned by teams of two to four nurses and ambulance coordinators to handle medical emergency calls (113), internal hospital alarms and local requests for a doctor. Even though the intensity and work loads are very different between the LV and AMK centres, the technical artefacts that are used are basically similar in both types of centre.

Using a comparative case approach, the use of technology was studied through interviews with nurses, doctors and administrative personnel and by observations of the work in six LV and three AMK centres.

There are three main findings in this thesis. First, the operation of LV centres in nursing homes conflicts with the general nursing home practice, and many LV centres are redefined by its users as switchboards to decrease the burden that is placed upon them.

Second, the nurses who work with requests for doctors in a similar way in the AMK centres in fact manage to solve many problems on the phone. The thesis discusses how these differences have emerged from performing the same job with the same technological tools.

Third, the handling of emergency calls at the AMK centres is accomplished through intense social and technically coordinated work. An ideal model of this kind of coordination, “the coordinated climate”, is developed from the observations in the AMK centres, and results from control room studies are applied.

The three findings are summarised in a discussion of how structures constrain and facilitate social and technological practice.

CHAPTER 1

"DO YOU KNOW HOW TO DO HEART COMPRESSION?"

INTRODUCTION TO A STUDY OF COMMUNICATION TECHNOLOGY IN MEDICAL EMERGENCY SERVICES

Over the last 20 years, the communication structure in the Norwegian health sector has gone through a tremendous development. AMK centres have been developed in hospitals and LV centres in nursing homes, throughout the country. This chapter presents a short version of the history of the medical emergency service, and it also discusses the theoretical frame of the thesis. The work is largely based on dialectic models, where society and technology influence each other, and are also built into each other, as well on constructivist models, emphasising how users of technology may recreate its meaning and practice. Moreover, the existence of institutional and professional relationships is taken into account. The question is how the users of new technology in medical emergency communication create new possibilities with the technology and also how professional, institutional, social and individual constraints may impose restrictions on these possibilities.

The development and use of technology has been discussed in several areas of academia for several decades. In human sciences, *the relationship or interplay between social and technological forces* is being increasingly discussed, as technology is becoming more visible in daily activities at work and in the home.

This thesis traces how information and communication technology (ICT) is being adapted and integrated in the development of a new organisational practice, and how the technology is interpreted according to more or less dynamic institutional, professional, social and individual practices. To accomplish this, contextual factors are discussed along with the constructivist, actor-oriented approaches, in which practice related to the technology is emphasised.

In the health sector, advanced technology has been used for many years, for example for monitoring and screening patients. In addition, information and communication technology is being used to a greater extent for filing and exchanging information, for example patient data. One interesting innovation in the field of communication technology is found in the medical emergency communication. In Norway, the nature of this service has undergone a significant change in the past decade. In almost any part of the country, whether you need a doctor or an ambulance, or you witness a serious accident, your call has to be directed to an "emergency centre". These centres are organised on two levels: Calls for doctors are directed to *municipal LV centres*, doctor-on-call centres, that are manned by nurses, in most municipalities located in nursing homes, and if available, in hospitals or in connection to a casualty unit. Calls for ambulances are directed to *regional AMK centres*, acute medical communication centres, that are operated by nurses and ambulance personnel. These centres have different telephone numbers.

Both the regional AMK centres and the municipal LV centres are technically designed to use radio and telephone technology, which is custom-made for this purpose. With radio and telephone the AMK and LV centres are connected together, so that they can assist each other if needed. Although these centres are established in different settings (as nursing homes, regional and local hospitals), the technology used is basically similar in all. Moreover, the working of the AMK and LV centres involves not only nurses, but also ambulance drivers, doctors and others to the medical emergency. The introduction of the AMK and LV centres therefore makes it possible to study the use of one specific artefact by different users of different professions, in various social and organisational contexts.

This chapter first describes the development of the Norwegian medical emergency service, which was initially called the "Hordaland Model". Then

it discusses the theoretical foundations for the study. The structure of the thesis is outlined at the end of the chapter.

OUTLINE OF AN EMERGENCY SERVICE

The Hordaland Model was introduced as a descriptive model in 1981, and the AMK centre at Haukeland hospital in Bergen was established in 1984. Since then, three other hospitals in Hordaland County have established their AMK centres. Below the level of the AMK centres, every municipality has its own LV centre. The first of them was established in the municipality Sotra in 1986, and now (1997) this organisation of the medical emergency service is implemented in nearly all Norwegian counties.

The motivation for building the Hordaland Model was in three parts. First, people in the districts should have secure contact with health personnel on duty. Second, the health personnel in the local communities, hospitals and ambulance service should be given better infrastructure for coordination. Third, the health sector should be concerned about taking advantage of new possibilities in new communication technology (*Ot.prp.*, 1988-89).

The system is based on several levels of responsibility and capacity. In every county there is one main AMK centre and sometimes one to three additional AMK centres, the number depending on the county's geographical location. The main function for all the AMK centres is to handle emergency calls, which in Norway is 113. The smaller AMK centres handle emergency calls, but for serious accidents a main AMK centre in the county may be involved.

The LV centres are located in each municipality. The main function of an LV centre is to handle all requests for a doctor after office hours. The LV centres do not handle 113 emergency calls, but they have a separate telephone number, that is different for each municipality. People may call the LV centre to get the doctor or to ask medical questions, either to the doctor or the nurse who operates the centre. When the LV centre receives a call that the operating nurse (or the doctor) evaluates as an emergency, the operator can immediately connect it to the closest AMK centre. Also, 113 emergency calls, that are received by an AMK centre, that are not evaluated as emergencies, may be directed to the LV centre or the doctor on duty, directly. Both nursing homes and hospitals are supposed to be resource centres for people all over the district they cover (*Sygeplejersken*, 1989). In municipalities that have an AMK centre (i.e. usually a city) the AMK centre can also have the LV centre function as well. I will call this latter type of LV centre "LV telephone", so that it is easier to differentiate between the two. To reach the LV telephone (or the AMK centre) a caller still have two different numbers, one

for the emergency call and one for the request for a doctor. Both types of calls may be answered from the same desk, but in some AMK centres by different nurses. Hence, to sum up, the basic medical emergency communication services are:

LV centres are municipal and located in nursing homes[2], They are operated by nurses who do not attend the centre as a full time service, but in addition to a regular nursing responsibility at the nursing home department. The LV centres are operated by one nurse at a time, who is supposed to help people with medical questions, and transfer them to a doctor if necessary. "LV" is used for elements connected to the LV centre, for instance LV nurse for the nurse who currently is manning the LV centre.

LV telephones are LV centre units that are located in AMK centres, in hospitals. The LV telephones are also municipal[3], even if the AMK centre is regional (multi-municipal). The LV telephone serves exactly the same function as an LV centre. The LV telephone is operated by one or more nurses who share their time between answering the LV telephone and emergency calls in an AMK centre. The 113 emergency calls have priority, of course. The reason why I have called these LV services "LV telephones" is that they are not separate centres. (The term "LV telephone" used this way is not common among the users, but here I have to differentiate between them.)

AMK centres are located in regional hospitals and are supposed to handle 113 medical emergency calls. The AMK centres are operated by one or two nurses and one or two ambulance coordinators, who have no other responsibilities than to operate the centre. They also work in the emergency ward and as ambulance drivers, respectively, when they do not have their AMK duty.

Even though it is only the AMK centres that serve the actual emergency calls (i.e. 113), I have chosen to use "emergency centres" to term both LV and AMK centres. This is done for simplicity, and besides, the calls for the doctors outside office hours, that the LV centres handle, are of course a sort of emergency, on a smaller scale.

[2] As mentioned, an LV centre may also be located in a small hospital, like like in the town of Røros. However, those municipalities that have hositals usually also have AMK centres, often with attached LV centre function (LV telephone). The general rule is therefore that LV centres are located in nursing homes.

[3] It is natural that the LV telephone serves the municipality in which it is located. However, there are cases where the *LV function* of a small municipality is served by an *LV telephone* that is located in a large neighbouring municipality's AMK centre.

A BRIEF HISTORY OF THE NORWEGIAN MEDICAL EMERGENCY SERVICE

My goal with this study is to analyse the interaction taking place between a technical system and social, institutional and professional systems, with the emphasis on human interpretation and practice. Hence, my focus is on the individual nurse (or ambulance personnel) who works with this technology, within the structural context of the health professions and institutions and existing practices.

The development of the medical emergency system since early in the seventies may give a glimpse into the governmental and formal sides of the technology appropriation. It may serve as background knowledge for the reader, like it did for me. This story of governmental decision-making processes cannot serve as a complete description of the development of the AMK-LV system, but it does form a picture of the period that it took to define what has later to become the dominating tool for people in Norway who need acute medical help. Here is the short version of the story[4]

Early in the seventies there was growing awareness in the Norwegian government, and society in general, that the emergency preparedness capacity in health care and other sectors were not easily available for people. These government services (health care, fire department and the police) needed a communication system to coordinate the necessary help for people in need. In 1973 a small communications centre was established in the emergency ward at Haukeland Hospital, in the city of Bergen. In 1975 the "Alert Committee" ("Varslingsutvalget") proposed the principles on expertise ("fagkyndighetsprinsippet"), alert centres in the large hospitals, a coordinated communication system and simplifying the relevant pages on alarm numbers in the telephone directory. Another committee ("Vaktsentralkomiteen") in 1981 recommended the establishment of multisector alert centres that should serve the people through the 000-number, that previously was used by the police. This centre was supposed to have the responsibility for mediation, not giving advice or directing action. In other words, this proposition did not follow the previously proposed principle on expertise, and it caused reactions from some of the health personnel, who were represented by Doctor Forstrønen at the emergency ward in Haukeland Hospital.

The result from these reactions was that in 1983 the Ministry of Social Affairs gave Doctor Forstrønen the task to examine alternative models for the implementation, operation and maintenance of a closed radio network between hospitals and nursing homes to use for the daily acute health service

[4] The story is based on "Helsetjenestens Kommunikasjonsberedskap - status pr. januar 1995" ("The Health Service's Communication Preparedness - Status as of January 1995"), pages 3-5.

in peace time and in catastrophe situations in both peace and war time. The result of this work was the so-called "Hordaland Model" ("Hordalands-modellen"), the first generation of the health service's communication preparedness in Norway. From 1983 to 1987, the work with the Hordaland Model and governmental decisions led to the use of the Hordaland Model as a model for the national acute health service. In 1987, all Norwegian counties received descriptions of the national model for the communication preparedness for the health service and directions of responsibility structures from the Health Directorate (Helsedirektoratet). The counties were recommended to start the work to implement the model immediately. In 1990 the Ministry of Social Affairs delivered regulations for planning, implementation and operation of the national model[5], and in 1991 the Health Directorate decided the technical specifications[6] of the service.

Suppliers of communication technologies were asked to take part in the work to make detailed technical specifications for the national alarm system's functions, but only one supplier was interested. The aim of this work was to design equipment that suited the needs of the users in the acute sector, within the scope of the available technical possibilities. In addition, one needed to design systems with similar functions on the national level, and use already existing resources as far as possible. Early in the eighties the technological platform was decided, and today the equipment is said to be too old. However, since the early eighties, there have not been developed supplier independent standards that satisfy the demands that were established because of security reasons. Some of these features are the control of availability (priority) and the conference connection.

The Governmental Health and the Telecommunications Authorities ("Statens Helsetilsyn", "Statens Teleforvaltning") developed and tested of equipment for the alarm services until 1994. The suppliers have co-operated on the technical functionality to secure compatibility. There are two main suppliers to deliver complete systems and four suppliers of portable units, competing on price and functionality. The development has been successful in the way that the health sector has been capable of letting the suppliers design equipment according to stipulations from the health authorities, and not just from what the suppliers wanted to sell to the health care sector.

The Norwegian alarm phone numbers were, until 1994, 001 for fire department, 002 for the police and 003 for medical alert. The European standard of *one* number, 112, was one of the reasons why the numbers were changed in

[5] In Norwegian, "Forskrift om medisinsk nødmeldetjeneste (kommunikasjonsberedskap i helsetjenesten)".

[6] In Norwegian, "Tekniske funksjonskrav til kommunikasjonsteknisk utstyr som inngår i helsetjenestens kommunikasjonsberedskap".

1994. However, because of the principles of expertise, the use of different numbers for the different sectors was established, 110 for fire alarm, 112 for police and 113 for acute medical help. The use of three numbers was recognised as an extension of the European standard. If anyone calls the wrong centre (the wrong number) he or she is swiftly switched over to the right one, without having to call again. The 113 number is now answered all over the country by AMK centres, except in one local area, Hamar.

For about ten years, the new emergency centres have been operative in hospitals and nursing homes, but the governmental decision-making process of course says little about the *experience of the users* of the new emergency centres, and the ways in which they have appropriated the system. The users response to and experience with what is for them new technology is of main interest in this thesis. It is also important that structural factors are taken into account, as long as they relate to the users' perception and use of the technology. The following section outlines a theoretical framework that in a sociological way emphasises the interplay between technical and social systems, in which the users are seen as actors embedded in these systems.

THEORETICAL PERSPECTIVES

There has been a lot of speculation on the progressive and regressive consequences of technology, technique, science, industry, and so on. Technology has been seen as providing the foundations for either an industrial utopia of rational organisation, affluence, leisure and freedom *or* an industrial dystopia of centralised technocratic control, a fragmented alienated citizenry, mass culture, and petrified mechanistic thought (Badham, 1986).

Many studies have been aimed at understanding the relations between organisation and technology. However, in the social sciences such relations are never simple and one-sided, so also in the studies of technology. According to Richard Badham:

> "Technology can be examined as a necessary condition for the development of specific social arrangements and as providing the possibility for certain social advances to occur. It does not, however, provide sufficient conditions for such changes. Moreover, the technologies which are developed and used are given a form which reflects, at least in part, the interests and values of those involved in their invention and implementation" (Badham, 1986:152).

The latter argument is emphasised in science and technology studies (STS), and Pinch and Bijker's (1987) study of the development of the bicycle is a good example. In this study, the design of the bicycle is discussed with focus on different actor groups and their specific needs concerning bicycle specifications, and how these groups interacted with the designers and other groups. As claimed by Tribe (1973:631), the processes through which indi-

viduals and communities *interact with the evolving structures* that the technology defines as it develops and is diffused, can be more important for the "impacts" of the technology, than the particular technology's integration with society. Moreover, the purpose of design may not be consistent with how the users apply the technology.

> "Technologies contain certain modes of thought and behaviour which, again in part, reflect the purposes for which they were designed. It must be emphasised, however, that the effect of technologies may be different from the original purposes for which these technologies were created" (Badham, 1986, p. 152).

The development of new communication technology[7] in and between organisations will create new realities and possibilities for organisations and their members. Both formal and informal structures, personal networks, trust relationships, face-to-face interactions, transfer of information and knowledge, coordination activities and power relations are phenomena that are affected by changes in communication technology.

However, the influence of new technologies is differentiated. In some organisational and inter-organisational contexts, interaction via computerised technologies has limited influence on total communication, whereas such technologies may contribute to dramatic changes in other organisations. Besides, to identify actual *pure consequences* of the technologies is impossible because what we can see is the result of the interaction *between* the social and technological changes, and partly because of this, as claimed by Tribe (1973), there are no end results, but only "sequences of events lying on a continuum of time, with no sharp division between process and outcome" (Tribe, 1973:633). Since we use the term "technology" about the technical artefact, *including its use*, we will stress the *emergent nature* of technology.

SOCIOLOGICAL PERSPECTIVES ON THE USE OF TECHNOLOGY

Many studies in the social sciences have focused on the development and use of technology, but in social sciences in general, no consensus has been reached concerning a best approach for such an area of study (as for any other area). It can be confusing that the approaches are about as many as there are researchers in the field. This section brings together some of the most interesting approaches to establish a theoretical basis for the sociological study of the use of communication technology in medical emergency settings.

[7] By communication technology I include the use of technical artifacts facilitating or mediating communication. Examples are telephone, fax, letters (mail), electronic mail, teleconferencing, and others. Moreover, in the term "technology" I include the *use* of technical artefacts.

In the *Marxist approaches*, the relationship between technology (means of production) and society is viewed as *dialectic*. Although many interpretations of Marxism put the emphasis mainly on the means of production (capital; technology), other and recent followers of Marxist approaches have stressed the Hegelian roots of Marxism. This implies a perspective that is less deterministic and which puts more emphasis on the two-way dynamic *dialectic relationships* between technical and social systems (Winner, 1977; 1986; Hirschhorn, 1984; Feenberg, 1991; Zuboff, 1988).

Functionlist approaches suggest that technology has certain sets of (intended and unintended) consequences or (manifest and latent) functions. As one structural factor that is put onto social life, for example in the workplace, the social study of technology should focus on the unintended consequences, or the "social effects of an advancing technology" (Merton, 1968). However, there are several contextual factors that determine what role a new technology will actually have: Whether the technology is going to be experienced as "good",

> "depends not so much upon the intrinsic character of an advancing technology, which makes for increased capacity to produce an abundance of goods, as upon the structure of society which determines which groups and individuals gain from this increased bounty and which suffer the social dislocations and human costs entailed by the new technology" (Merton, 1968:616).

One of the important aspects of the functionalist approaches is the differences and possible contrasts between intended and unintended consequences or between manifest and latent functions (Merton, 1967). In the field of communication technology, some of the media (richness) theories (cf. Sproull and Kiesler, 1991) follow the functionalistic paradigm, looking for the communication media's impacts on organisational effectiveness.

The *structurational theory of technology* is a more recent approach, that can partly be seen as a reaction to the Mertonian form of functionalist analysis (Giddens, 1976). Here, Giddens' general structuration theory (Giddens, 1984) is applied in the field of technology. It is argued that technology has both facilitating and constraining capacities for the social system. The technology is the instantiation of some of the rules and resources constituting the structure of an organisation (Orlikowsky, 1992). Following Giddens (1984), these rules and resources make action possible. I will include Galegher and Kraut's (1990) notion of *technology as prescriptive and permissive* in this approach. Technology is designed to interfere with human action in two ways, prescriptive, to direct human action and correct human foibles, and permissive, to allow current practices to be extended into new realms in which they had previously been impracticable. Giddens' use of structure as both *rules* and *resources* is a close parallel to this.

In the *social constructivist approaches* (Bijker, Hughes and Pinch, 1987; Bijker and Law, 1992; Law, 1991) the technological *innovations* are focused on especially. These approaches draw on the theory of Berger and Luckmann (1966) on how reality is socially constructed. Further, the social construction of technology approach stems from social studies of science, which emphasise how scientific facts are constructed through the development of heterogeneous inter-group networks, thus how they are determined by social forces, as well as by purely scientific (if they may exist) motivations. The concept of these heterogeneous networks (Latour, 1987) is then applied to the development of technology as well, substituting science with technology. The design of technological artefacts is discussed as trajectories negotiated between various relevant groups of actors. There are some variations within the tradition concerning in what sense social and technical systems are viewed to be analytically distinguishable. In the *interactive* view it is assumed that there is a fairly stable matter-of-fact division between the social and the technical, that the social shapes the technical, and reciprocally, that the technical is also capable of shaping the social. The more radical *seamless web* view resists the notion that the division between the social and the technical is either stable or matter-of-fact (Bijker and Law, 1992:201).

In the more recent *ethnographic approaches* the use of communication technology is studied as a situated practice, emphasising the detailed use of technology as related to social (cognitive) practices (Suchman, 1987; Hutchins, 1988; 1990; 1995; Hutchins and Klausen, 1996; Lave and Wenger, 1991; Heath and Luff, 1992; 1996; Smith and Whalen, 1995; Orr, 1996; Engeström and Middleton, 1996). In these approaches, detailed on-the-job observations and close analysis of texts, action and talk are performed to "examine what people in modern jobs actually do" (Stephen R. Barley's foreword in Orr, 1996:xiii). According to the ethnographers, the examination of practice reveals a complexity that cannot be seen from a distance.

From the above it is obvious that the ontological grounds for the various approaches are different. There is actually a vast variability between for instance the ethnographic focus on the detailed practice of the actors and the macro perspective of most Marxist approaches where the politics of technological development are focused on. However, I will propose that it is possible to follow a research strategy that uses elements from several of the listed approaches. And it means that the *complete* set of foundations for each approach must be left for the construction of a *synthesis* ontology, a *realist* ontology (Reed, 1997).

By a *critical realist ontology* Reed (1997) suggests to maintain the agency/structure duality that the postmodernist turn in organisational analysis (ethnomethodology, action network theory and post-structuralist the-

ory) denies (Reed, 1997:29). The realist ontology is a nested ontology, "in which social mechanisms and processes operate at different levels of abstraction that tie into each other within a stratified, multilevel and relational model of society" (Reed, 1997:31).

> Agency and structure are interrelated, but they possess emergent properties distinct from the level of social reality to which they refer [..]" (Reed, 1997:31).

This means that the current relational properties and principles (i.e. structure) impinge on current actors and their situations as they find themselves operating in pre-structured contexts. The "[s]ocial actors draw on, unequally distributed, assets that these pre-existing structures make available as a basis for their engagement in forms of social activity which will reproduce and transform the institutionalised positions-practices in which they are located" (Reed, 1997).

Work practice is contextually situated in face-to-face and technologically mediated social networks, and within and between structural settings of institutions, professions, technology, and individuals. None of these elements are stable, and they are all interacting with each other. It is reasonable, however, to believe that institutions, technical artefacts and partly professions are *perceived* as the more stable elements among people in general. The latter point is very important, because it makes people willing to adjust their practice according to perceived constraints from institutional, professional and technological "guidelines", and perhaps let go of their social and individual preferences. Hence, for people in general, technological, institutional and professional facts are often considered to construct, or determine, the contexts in which work has to be done. This means that social factors are considered to be without any "effect" on technology, for example.

REMEMBERING STRUCTURES IN ACTOR PERSPECTIVES

The project of the social constructivists is aimed at showing how the development of science and technology does not follow any natural invariable path of development. For example Latour (1987) has showed how scientific facts are the results of strategic behaviour and power relations in heterogeneous networks between scientists. However, the social constructivist approach focuses mostly on the development of technological artefacts, whereas the users ordinarily have to operate, or interact with, ready designed technology. On the other hand, when technology is used here to signify both the technical artefacts and the use of them, some degree of construction, appropriation or further development is left to the users. Besides, as pointed out by many of the constructivists, a technical artefact has "interpretative flexibility", that is, relevant social groups may attribute different meanings to it.

The constructivist perspectives are widely used in social studies of technology. For example, the "social construction of technology" (SCOT) approach is applied by many researchers. This position has very much to offer when it comes to identifying relevant participants in the development of technical artefacts. Most of the constructivist research is concerned about the processes and interactions that lead to the general acceptance of certain technological designs or scientific laws (facts). As explained by Latour, "[w]e study science *in action* and not ready made science or technology; to do so, we either arrive before the facts and machines are blackboxed or we follow the controversies that reopen them" (Latour, 1987:258, his own italics).

Button (1992) claims that the constructivists put too little emphasis on the ordinary distinctions that exist among the people who work with the technology that is discussed.

> The orientations of scientists, the orientations of technologists, the orientations of persons at large in society are lost by ironicising them through relativist-constructivist theoretical practices (Button, 1992:7).

Hence, Button compares the constructivist argument with that of the labelling theorists: As for the constructivist study of science, "the reality projected by science is to be displaced by the reality projected by sociology, and the meaning which scientists give to their own actions is to be transformed by the sociologists' re-interpretation" (Button, 1992:8). When addressing the contents of the technology in our study, we need to avoid elaborating an alternative version of reality, in which ordinary distinctions that exist in society are disregarded in the name of a sociological theory of reality.

Similarly, Merton criticises the subjectivists' (read: constructivists') transformation of the Thomas Theorem, as they took it from the original; "If men define situations as real, they are real in their consequences", to the "fallacious maxim"; "If men do *not* define situations as real, they are not real in their consequences" (Merton, 1976:175). Accepting that the social definitions that are common in groups make up an important dynamic part of the social environments in which actors create the anticipated social reality (e.g. through self-fulfilling prophecies), Merton reminds us about the practical constraints in the more invariable components of social situations: "If men do *not* define real situations as real, they are nevertheless real in their consequences" (Merton, 1976:177). Technical, as well as institutional, professional and social, relations exist and may work as (changeable) constraints, even when they are not necessarily perceived as such.

By removing the phenomena out of the realm of the social world and often neglecting the actual work process involved in the development and use of technology, the constructivist studies of technology conform to the idea of

sociology, traditionally: How to account for a particular state of affairs by combining various elements (Button, 1992). Hence, both taking the users' perspective and applying a social constructivist perspective, can be a problematic combination. In the social constructivist analysis of technology it is important not to make any a priori distinction between different types of social groups (Pinch and Bijker, 1987). Consequently, when Bijker introduces the technological frame, he makes a point that the frame only applies "to the *interaction* of various actors. Thus, it is not an individual's characteristic, nor the characteristic of systems or institutions; frames are located *between* actors, not *in* actors or *above* actors" (Bijker, 1987:172, author's italics). Each technological frame is to be considered a network, according to Latour's actor network theory. But for example for the nurses working in nursing homes, it is obvious that the nursing homes exist, as more or less unchangeable institutions, and that this, which is a fact for the nurses, puts serious constraints on their actions.

Moreover, many of the constructivist studies do not really address the content of technology, although they often claim to do so. Rather, technological artefacts are used as platforms for viewing constitutional and structural arrangements of society in general, like for example the power relations in society, or the capitalist mode of production. The social content of technology, which is often claimed to be the focus of study, seems to mysteriously disappear in the course of investigation (Button, 1992).

But having said this, for example the actor network theory (Latour, 1987), looks for multiple causes or sources to explain the state of affairs. This is an advantage of the theory; that one may search for causes among all kinds of actors, no matter how closely or in what way they are connected to the historical trajectory towards a design closure.

In my study of the LV and AMK centres, I focus on the *use* of the technical artefact that is already designed, while regarding that the actual design of the technology - technology in its term including its use - is to some degree an accomplishment of its users. Thus it is necessary to approach the users' perspectives as well, and see what is perceived as facts for them. The constructivist approach views technological development as seen from an outside view, which is not sufficient as an ontological basis for studying how the technology is handled in institutional and professional settings. The *existence* of institutions and professions, and the importance of this existence for the users, is needed to be taken into account.

Hence, following Reed's (1997) recommendations, when studying the medical emergency organisation, it is necessary to consider not only the specific practices in the emergency centres, but that the centres are located and situated in institutions and among practitioners belonging to different profes-

sions. Presumably these institutions and professions influence how the centrals are used. As described above, the LV and AMK centres are located in nursing homes and hospitals. They are attended by nurses who are working in these institutions. Doctors, ambulance personnel and others (for example patients and their next-of-kin) are also involved in the running organisation of the medical emergency, as a practical accomplishment. With the strong professional interests that have become visible in the Norwegian health service over several years, one should not omit the dimension of professions and division of labour from any social research in this field.

REMEMBERING ACTORS IN DIALECTIC PERSPECTIVES

One type of perspective, in which relationships between institutions and professions may be explored, is the dialectic model, inspired from Marxist approaches. Dialectic models were extensively introduced to sociology with Marxism, where especially the forces of production were given much determining capacity in the relationships with other aspects of society.

> "The relations of production in their totality constitute what is called the social relations, society, and, moreover, a society at a definite stage of historical development, a society with a unique and distinctive character" (Marx, 1849:156).

But drawing on Hegel's view that a unified truth is created through contradictions, Marx developed the dialectic materialism, in which society develops through *contradiction* and *resolution* between conflicting parts, regarding that "every historically developed social form as in fluid movement, and therefore takes into account its transient nature not less than its momentary existence" (Marx, 1873).

More generally, the relationship between society and the individuals (or between structure and action, or micro and macro) has always been an important topic in sociology, and in the different positions one has emphasised the influence of different parts of the relationship. Durkheim concentrated on the effect of society on human actors. As a methodological collectivist (Gilje and Grimen, 1993; Archer, 1995), Durkheim (1897/1951) explained individual action by the role of social phenomena, and his theories have been criticised for an over-emphasis on the way society directs individual action more than the way human actors constructs society. Max Weber (1925/1968), on the other hand, being a methodological individualist, described social structures as aggregates of individual actions by several individuals. Weber and Durkheim were both concerned with the causality of social systems, from micro to macro explanations and the other way around.

As suggested by Archer (1995) and Reed (1997), micro and macro perspectives are possible to apply side by side by taking into account the *time factor*, and how micro interactions over time may be constitutionalised as

macro structures, under which further micro interactions are taking place. It is important, though, that the presence of macro or meso structures (for example institutions and professions) and the influence from these are taken into account in the study of micro interactions.

In some studies of technology, this tradition is followed by letting technology take place on the structural side of the dialectic, as one dimension of a structural influence, in addition to, for example, "bureaucracy", "culture", "language", "class" and "organisation". Hence, one may view the relationship between the technical system (for example communication technology) and the social system (social relations) as a dialectic relationship.

But as the constructivists maintain, the technological and the social are often difficult to distinguish. They have grown together into one indivisible body, a "seamless web" (Hughes, 1987). Technological artefacts are often strongly connected to social practices, and it can be difficult to see the technology separated from these practices. Also, social practices are often impossible to analyse without the technology that is used within it. It is therefore useful to include in "technology" the practice through which the technical artefact is used, and not only *the* technical artefacts, as suggested above.

Even if "hard technological determinism" still appeals to large audiences (Marx and Smith, 1994), there are many ways in which social systems influence technical systems. As emphasised by constructivist theorists, not only is technology socially constructed in the design process, but social contextual factors may have strong influences on how to choose between and use technologies.

> "Adopting firms still have to *choose* technology from available alternatives; the implementation and debugging of the technology has yet to be carried on; and new *working practices have to be established* around the new technology" (Wilkinson, 1983:21, author's italics).

Østerberg (1993, p. 30) differentiates between the reciprocal dialectical relationship between human actors (social interaction) and the pseudo-reciprocal dialectical relationship between a human actor and a non-human actor (a machine, or a "material structure"). Østerberg describes the pseudo-reciprocal dialectic relationship as a parody on human action; we get in return the same answers that we feed into the machine. The material structures are materialisation of the socio-cultural context. Using Sartre´s terms, Østerberg describes artefacts as guidelines for action, that defines the "practico-inert field" (Østerberg, 1984:75; 1988:149) that restrains and mediates actions, and with which human actors interact. Once designed by the use of human activity and intention, the artefacts seem to demand to be operated in certain ways. Thus, in the practico-inert field, the human experiences demonstrate *counter-finality*, that is, how the products of one's activity (for ex-

ample technology) turns against oneself. Hence, the machine follows its own deterministic logic, as it "transforms and embodies the expectations of the owner of the machine, making them inert and alienating". A constructivist critique of Østerberg's dialectic approach is that there is no account of exactly *how* the material structure (practico-inert field) is actually *materialised* (Sørensen, 1988). Also, in constructivist approaches, the technologies are considered as having no natural logic of development, but that the artefact is redefined (in several stages) by various relevant actors.

According to Latour (1991) "technology is society made durable", referring to the way in which designers "delegate" strategies to the technical artefacts. Machines "participate" in human society to such an extent that it is difficult to consider technology apart from society. Machines represent the intent of their designers, and these intentions and their results must be considered in their social settings. According to Akrich (1992), the reality of the machine is not in the machine itself, in its designers' attentions, or in its users' intentions, but in all three at once, as they intersect in the situation of use. For Durkheim (1978:193), architecture, communication lines, transport facilities, instruments and machines are kinds of "crystallisation", by which society is attached to material carriers. Even if Durkheim applies a macro perspective, referring to "society" and Latour refers to actor networks, both perspectives view the result of the development of technology as certain structures that are taken for granted.

In Giddens' structuration theory (1984) structures are viewed as being created over time, and "finally" taken for granted. Structures do not only constrain action, but do also facilitate it, or make action possible (the *duality* of structure). In an application of Giddens' theory on technology (Orlikowsky, 1992), technology is considered as structure. Orlikowsky emphasises the socio-historical context of use and development of technology, and *the dual nature* of technology; technology as objective reality and technology as a socially constructed product. It carries us up from the deterministic quagmire of seeing either the constraining abilities of technology, as has been a tendency in functionalism (consequences of technology), or seeing agents that construct networks without bringing in taken for granted structures, like constructivists do.

In many of the studies referred, the actual work practice is conceived as "black boxes" (Sørensen, 1988), or in abstract terms like "technology" or "production". The growing body of ethnographic research (Suchman, 1987; Hutchins, 1988; 1990; 1995; Hutchins and Klausen, 1996; Lave and Wenger, 1991; Heath and Luff, 1992; 1996; Smith and Whalen, 1995; Orr, 1996; Engeström and Middleton, 1996) contributes to the inclusion of actual work practices in studies of technology in use.

TECHNOLOGY IN THE HEALTH SERVICES

Applying one of Orlikowsky's points, the relationship between technology and humans, or human and non-human actors, has to be considered asynchronous over a period of time. The way technology is designed and implemented will constrain possible actions. Furthermore, there are divisions of geography and hierarchy between the design and the use of technology. The *designers* of technology are usually not its *users*. But as pointed out earlier, as we consider technology to be both the actual machines and how they are used, some part of the design will always be left to the users.

For example, in the health service, the use of medical technology may be seen as both constraining and facilitating action. The implementation of new technology is often motivated by a more or less generally accepted logic of modernisation: *Modernisation is progress, which is technology, which is good*. With the increased use of technology in all areas of life, we often believe that we are doing our things better. But in a study by Axelsen (1976) it is claimed that the increased use of technology in hospitals is actually creating a greater distance between the doctor and the patient. Further, Axelsen maintains that the reason why the hospitals are so permeated with technology is that the human body is thought of as a machine and that illness is a kind of dysfunction in one or more of the machine-parts. The best available technology is preferred to find the damaged parts and fix them. Axelsen brings up this discussion, as he notices that the technology that is used *on* the patient to give diagnosis, creates a distance that he believes should be as small as possible in a good health care policy. It should also be noted, as suggested by Carpenter (1993), that work with advanced technological equipment may give nurses higher status within the health-care system.

The operation of the AMK and LV centres may also to some extent mechanise and replace the direct personal contact between doctor and patient. Elstad (1995:146) emphasises the need for nurses to still concentrate on the expressive actions together with the instrumental and technical actions. When the latter actions are ever more mediated by advanced technology, it may be more difficult to also preserve the expressive elements of health care on account of the standardisation of actions. In the medical emergency centres, new communication channels are used to mediate both expressive care and concrete advice of more instrumental character. Since interpersonal concern, sensitivity of other's feelings and trust are core qualities in the caring part of the nursing practice, the nurses are faced with the challenge of finding ways to include these attributes of communication even through radio and telephone.

Moreover, as the nurses take over some of the patient communication that the doctors used to have, are they also likely to gain autonomy in relation to

the doctors? The implementation of LV and AMK centres may be conducive to a process of *dedifferentiation* between these two health professions.

DEDIFFERENTIATION BETWEEN PROFESSIONS

The growth in specialisation and differentiation in industry and society has generally been an important part of rationalisation of western societies. With the division of labour, new work roles, occupations and institutions have been created. However, according to Rueschemeyer (1986), there have also been processes of dedifferentiation. Differentiation and dedifferentiation are commonly coexistent, not only for nations' evolution and devolution, but also for instance for occupations or professions. When Rueschemeyer sees a trend of dedifferentiation, he refers to the "growing bundle of tasks and rights that fall to every person by virtue of being a member of society" (Rueschemeyer, 1986:153). Dedifferentiation is also observed as adaptability, for instance in organisations, and fusion of functions, for instance through "overlapping jurisdiction and multiple channels of command and communication" (p. 166) between professions.

According to Rueschemeyer (1986), dedifferentiation may develop through fusion of functions between professions through multiple channels of command and communication. An important question concerning the organisation of the medical emergency system, is whether the new use of communication technology between professions in the medical sector makes possible a process of dedifferentiation between those professions. Nurses have for many years been working for more autonomy from the doctors, and the practice of the emergency centres could be used as a remedy for such development, considering that multiple channels of command and communication between nurses and doctors are developed with the centres. A process of dedifferentiation is also possible between nurses and ambulance drivers.

LEVELS OF ANALYSIS

As suggested above, it is possible to take into account both micro and macro relations, and to apply both constructivist and functionalist approaches. However, as suggested by Reed (1997), these approaches aim at different levels of analysis. Further, the approaches tend to focus on different periods of history. For example in the constructivist approaches to technology, one is usually studying a period of development or innovation of a specific technology or technological artefact. In functionalist approaches one attempts to analyse and assess the consequences - intended and unintended - of an "item" (e.g. new technology) of same permanence regularity in terms of "function" (Merton, 1968). As suggested by Archer (1995), *time* establishes the relation between agency and structure.

Following Reed (1997), we may study technology both as *distributed assets* that actors draw on, and as *pre-structured contexts* under which the actors find themselves. In the field of the medical emergency centres, we may study the technology both as assets and as contexts, or both as resources and rules, applying Giddens' (1984) terminology. Further, there are additional social structures (professional, institutional and individual) that are also both rules and resources, and that have to be taken into account in the analysis.

In Table-box 1 three different units of analysis are listed, as used in this thesis. Since the technical equipment is fairly similar in these units, it is possible to study the forming of technology based on similar equipment in the various contexts. It gives an opportunity to study both how technology as an asset is fitted into various pre-structured social contexts, and how technology is itself structuring new contexts, in which social action is undertaken.

Table-box 1

Actor-Structure Relations in Different Units of Study

Unit of study	Type of unit	Actor-end of dialectic	Structure-end of dialectic
LV centre (Ch. 3+5)	single user	how the actor's individual interpretation of LV centre defines its use	how institutional, professional and individual constraints influence individual practice
LV telephone (Ch. 4+5)	single user in team	how team definition of the LV telephone influences individual practice	how the team situation influences individual practice
AMK centre (Ch. 6)	team user (multiple user)	how the AMK team develops its practice by using technology	how established team practices constrain technological possibilities

Three various emergency centre units are studied, the LV centre, the LV telephone and the AMK centre. The differences between how and by whom these units are operated gives an opportunity to focus on various aspects of a structure-agency dialectic.

The constructivists claim that the dichotomy between social and technical systems (actors) must be left for a better understanding of the development of science and technology. However, as pointed out above, this development can in many senses be analysed sociologically along with the long discussed dialectic between agency and structure. Technological artefacts may be thought of as structural properties, but these are, applying Giddens' (1984) structuration theory, developed during prior agency. Hence, it is possible to analyse concrete technological implementations using sociological theory. Moreover, we can use these empirical cases for further developments in these sociological debates.

I have therefore in this thesis chosen to view the social and the technical systems as analytically separable. However, as pointed out below, the borders between these systems (we may as well call them subsystems) are blurred. There are interactions and interfaces between the technical and the social which are rather complicated, as for example one function may be undertaken by both social and technical mechanisms.

FOCUS OF RESEARCH

As discussed above, it is possible to look at the relationship between technology and society as a dialectical relationship. It does not mean that these are always clearly separable. However, even if the boundaries are blurred, there are some qualities that are natural to link to the technical and other qualities that are more naturally associated with the social aspects of the relationship. To prepare the analysis, we need to approximate a specification of what is social and what is technical. Both the social and the technical capacities are differentiated into sub-capacities, that are related to each other.

THE SOCIAL

The social capacities are differentiated into small and large institutions, organisations, professions, groups and individuals, and so on, that are connected to one another in different ways. For example, some small institutions may be subordinate to a larger one. Individuals are working in the institutions, but they are also members of various professions and local communities. There are intersections between the various social sub-capacities. There are relationships of power both between different professions, between institutions and between communities. Besides there are trust, distrust, love, anger, and so on in interpersonal relations. Moreover, the individuals follow their own intuitions, inclinations, interests and feelings.

More specifically, a key main social system is the medical emergency *organisation*, which is differentiated into institutions like hospitals, nursing homes, ambulance services, emergency centres (AMK and LV centres), professions like nurses, doctors, ambulance personnel and individual members, all different from the others. In addition, there are the national, regional and municipal administration, and of course, patients. Between nurses and doctors, the interprofessional struggle for autonomy (Abbott, 1988; Freidson, 1970; 1994) has lasted for a long time. There are also unresolved divisions of responsibilities between nurses and ambulance personnel. Institutions like hospitals and nursing homes are designed to take care of rather different tasks in the society, and are usually formally disconnected.

Since it is the nurses that generally work with the LV and AMK centres, it is the nurses' situation that is in focus. Hence, most of the interviews and observation are of nurses.

THE TECHNICAL

A technical system is referred to a system consisting of physical objects or artefacts (Bijker, Hughes and Pinch, 1987). Often the words *technics*, *technique* and *technology* are used somewhat arbitrarily, although technology, in the strict sense of the word, means knowledge about technique. Often technology is used to refer to the activities or processes of using technology. As suggested earlier, I will suggest here that the terms technique or technics can be used for the artefacts, and technology for both the process, or use, of the artefacts and for the knowledge about them, together with the artefacts themselves.

More specifically, the technical capacities that are discussed in the thesis consist of AMK and LV centres, that are interconnected through a radio network.

Picture-box A

Button Panel of Radio Unit

The AMK and LV centres are interconnected by radio lines. With the upper 12 buttons, the operator may open direct radio connection to any of the close LV and AMK centres. These radio units are both used in AMK and LV centres.

Telephone lines are also set up between the centres, and besides, a more advanced geographical position tracking system[8] is now being implemented in all the AMK centres. It makes it possible to locate the source of an emer-

[8] This system is based on GPS (global position system) technology, where satellites are used for very accurate positioning and marking of emergency callers and ambulances.

gency call on a digital map, and also follow ambulances on the map, which is displayed on a computer screen. In both LV and AMK centres there is another registration system that saves important data about the caller; name, address, the telephone number from which the call is made, and the date and time for the call. In the AMK centres, all information is displayed for everyone in the centre. The radio-telephone units, that the nurses in the centres use, are identical in both AMK and LV centres. But the AMK nurses use an additional telephone, to operate several incoming lines.

Picture-box 2

Several Incoming Lines

The telephones at the AMK centres serve many lines (numbers), as seen from the right hand side of this telephone, where there is one button for each such line.

INTERACTIONS BETWEEN TECHNICAL AND SOCIAL

The relations between technical and social capacities are, however, the main focus in this study. As discussed above, the emergency communication service may be considered as a dialectic relationship, in which there are several processes between the technical and the social capacities (i.e. differentiated technical and social parts). Following the Marxist view of social development, it is through the several different processes (for example conflicts) between the technical and the social capacities that work practices emerge.

More specifically, there are several social and technical sub-capacities within the organisation of the medical emergency service. LV centres are introduced in the nursing homes. How can one make use of these centres and still attend to the nursing home as a day-to-day care institution for the patients, not as a primary health service emergency centre? How will the nurses influence and transform the LV centres, to be able to make them compatible with the nursing home work context? How are the more or less settled practices in the institutions helping or obstructing the intended consequences of the LV centres? In both the AMK centres and the LV centres the contact with the patients is mediated through communication technology, or more specifically, telephone or radio. How can the nurses develop a relationship of trust

with the patients on the phone when providing medical advice and help, mediated by the communication system?

There is also a social micro-organisation in the AMK centre, between the two or three operators, who use technology to collect, share and distribute information. How do they combine their various tasks and responsibilities in the group with the various technological tasks? As mentioned, professions like nurses and doctors are fighting for their autonomy in workplaces. Is the use of communication technology giving any of the parties a better chance to develop an autonomy? Does for example the nurses' use of AMK and LV centres make them capable of doing work tasks that traditionally have been performed by physicians? As argued by Freidson about the nurse profession:

> "To escape subordination to medical authority, it must find some area of work over which it can claim and maintain a monopoly, but it must do so in a setting in which the central task *is* healing and controlled by medicine" (Freidson, 1970:66).

Accordingly, if the nurses are capable of controlling the work in the emergency centres it could be an escape out of the general subordination. It is reasonable to believe that it will not be easy to achieve this autonomy. Therefore: Will the traditional interprofessional conflict in the health sector *limit* the possible effects of the new AMK and LV centres?

A limitation of the literature on automation, deskilling, and the dialectic between technology and social systems, is that the concrete character of work is rarely discussed. Abstractions conceal what is really being accomplished by workers, for instance how a possible process of deskilling works in practice. Deskilling does not necessarily deprive the workers of the skills they have, rather it may merely reduce the amount of information given to them (Orr, 1996). According to Kusterer (1978) deskilling tends to describe more the management intentions more accurately than working realities. So also in the study by Braverman (1974), as he reached his conclusions not by studying actual work, but managerial writings. A study of the actual workers in activity is called for.

This study of the AMK and LV centres focuses on the work that is being carried out by nurses and ambulance coordinators in these centres, and in what way the tasks are accomplished. I am looking for the complexities of practice, the intersections of social and technical processes, that cannot be seen from a distance. These complexities constrain how work can be done, and this process has crucial implications for those making policy about the work in question (Orr, 1996:155). Further, only when there is a proper understanding of how work in the AMK and LV centres is being accomplished, one is able to design suitable technical tools for this work.

THESIS STRUCTURE

Methodological considerations are discussed in *Chapter 2*. The empirical work is described and discussed, especially with emphasis on the reflexive "funnel structure", in which problem definitions are delimited and clarified, by periods of reflections in steps in-between collection of data. I also discuss the ethical dilemma of how to report the result of an interactive interviewing process, especially the problem of setting a boundary between my own theoretical analysis and an intersubjective reasoning of an interview. Also the question of unsolicited and solicited accounts (Hammersley and Atkinson, 1995, or on which background the informants say what they say, is discussed. Referring to a small dispute in the journal *Organisation Studies* (1995), on how to get true data in research, I will briefly sketch the dilemma of presenting what the informants think is important versus presenting what is interesting in research. In a part of the research project I used the computer software "NUD·IST" (Richards and Richards, 1994), and I will briefly discuss and evaluate my experience with this tool.

The further chapter separation follows the topics from the field. In Chapters 3 to 5 the LV function is discussed. In *Chapter 3*, the location of the LV centres in nursing homes is examined. Being the only health related institutions found in most Norwegian municipalities, the nursing homes were chosen to handle the operation of the municipal LV centres. I analyse how this location of the emergency technology has influenced nursing home life, how it is possible for a nurse to combine the responsibility for the centre and other work in the nursing home, and the new roles for these nurses emerge from the establishment of the LV centres.

Chapter 4 focuses on the screening or assessment work that the nurses perform via the LV telephone. Using their own knowledge, experience and medical indexes, many nurses are able to define preliminary diagnosis over the phone. By the use of "Norsk Indeks", the nurses follow decision-making diagrams to approach a specified "diagnosis", which is at least sufficient to decide the degree of urgency for a case. In the chapter we will analyse how such explicit evaluation work done by the LV centre nurses may expedite the change of division of labour between nurses and doctors.

Chapter 5 clarifies the variations in serving the LV centres in nursing homes and LV telephones in AMK centres. It is especially the nurses that operate the LV *telephone* at the AMK centres who seem to perform the task of screening the callers. The nurses at the LV *centres* at nursing homes seem to be more reluctant to give advice to callers, and many of these nurses almost automatically forward all questions straight to the doctor, acting out a switchboard function only. At the end of Chapter 5, we will discuss in-

creased demand for health resources, as an unintended consequence of the emergency system (Merton, 1967).

In Chapters 6 and 7, I focus on the practices of the AMK centres. *Chapter 6* is dedicated to the internal working procedures in the AMK centre. I am concerned about the communication strategies adopted at the AMK centres, how they share information, how they communicate and coordinate their actions, and how they develop mutual knowledge between the nurses and ambulance coordinators. The nature of the team work in the AMK centres is discussed, applying concepts of redundancy and holography, among others. Chapter 6 is concluded with a comparative discussion of automation and collaboration, using other studies of emergency centres as background.

In *Chapter 7*, the organisation of the AMK centres, as presented in Chapter 6, is compared with the coordination of underground trains and airports. Several "control room studies" discuss the aspects of such work contexts. With the background of the empirical knowledge from the previous chapters and other studies, an ideal type of organisation that draw on what is common in control rooms and AMK centres, the "coordinated climate", is presented and discussed. Chapter 7 is concluded with the discussion of what kind of role the use of technology may play in organisations of a "coordinated climate" type.

Chapter 8 concludes the thesis. During the previous chapters, the dialectic between technical and social systems has been discussed by using the empirical study of Norwegian medical emergency centres. In this chapter I review from the previous chapters how social and organisational factors are very significant in the health sector, and that this constrains how technology may be used. Moreover dedifferentiation and decentralisation-centralisation are discussed. The chapter ends with an appeal to emphasise the social, or human, ways of coordinating activities whenever change in work practice is being planned, with or without the implementation of technology.

Appendix 1 is a direct translation of the personal reflection of one of the LV centre nurses, focusing on the individual experience of the meaning of the new work task for the nursing home nurses. It is translated and reprinted in the thesis by the kind permission of the author.

Appendix 2 is a reprint of two of the pages of Norsk Indeks (NI), the Norwegian Index for Medical Emergency Assistance.

Appendix 3 is a summary of the thesis in Norwegian.

A few topics concerning further research in this field are suggested in *Appendix 4.*

CHAPTER 2

"WOULD SHE HOLD BACK NEGATIVE THOUGHTS?"

REFLECTIONS ON METHOD

In this chapter the approach to the field of investigation is discussed. Data was collected through an *intensive* design based on semi-structured interviews and observations. The observations were of a "fly-on-the-wall" type, but the inevitable participative aspect of even this form of observation is discussed. As claimed by Hammersley and Atkinson (1995) there is no such thing as "pure" data, neither interviewing nor observational methods. Hence, the data from the field work is a result of the reflective interaction between researcher and field participants (informants). There is also an ethical side of this: How to be "true" to the field, when all one can get is this interactive "truth"? This leads us to the issue of relativism, discussed on the background of a dispute in the journal *Organisation Studies* (1995). The experience with the computerised qualitative analysis program NUD·IST is also presented and discussed.

I started this study with an idea that I wanted to find out about how communication technology is used in medical emergency centres in Norway. I was invited to the field by Dr Forstrønen, one of the initiators of the organisation model of the service that is now implemented, the "Hordaland Model". However, there were no directions or guidelines from Dr Forstrønen, so even though he may have had some personal interests in the results of this study, I have been able to decide the design and methods independently.

INTERVIEWS AND OBSERVATIONS

Since the idea was to understand how work was being performed, it was necessary to get into close interaction with the actual workers. Thus I chose to pursue an *intensive* design, involving a limited number of research units, both in terms of locations and informants. In the medical emergency centres, nurses are the key operators. I started out with interviews of nurses in nursing homes to improve my understanding of how they worked in the LV centres. About the same time, I carried out interviews with doctors and municipal administrators who in different ways had been involved in the development and implementation of the medical emergency service. The reason why I started with studying the LV centres and not the AMK centres was that I thought the working of the LV centres would be easier to understand and could serve as an introduction to the whole system of emergency centres at various levels. During interviews with nurses in *eight* LV centres I was able to get an idea of how they have felt about the introduction and how they feel about the work in the centres.

Interviews and observations give different data on work practices (as suggested by Hammersley and Atkinson, 1995). I felt a need to *see* how the nurses work with the LV centres, not only how they *said* they worked. As claimed by Argyris and Schön (1978), there may be differences between how people act ("theory-in-use") and how they think and say they act ("espoused theory").

> "When someone is asked how he would behave under certain circumstances, the answer he usually gives is his espoused theory of action for that situation. This is the theory of action to which he gives allegiance and which, upon request, he communicates to others. However, the theory that actually governs his actions is his theory-in-use, which may or may not be compatible with his espoused theory; furthermore, the individual may or may not be aware of the incompatibility of the two theories" (Argyris and Schön, 1978:11).

This means that one has to watch people's actions to see what they really do, as the accomplishment of the activities of daily life is to a great extent taken for granted (Garfinkel, 1967), no matter how skilled they may be. Fur-

ther, it was important to follow Lave's (1996) suggestion, that people's actions cannot be analysed in isolation from the socio-material context of this activity.

To come to terms with how nurses were working at the LV centres, I therefore conducted observation in *six* different LV centres in one county, during two weeks. Later, I conducted interviews and observations in *three* AMK centres. This was done during five periods, where each period lasted three to four full days. When carrying out the observation I have been registering the activity by using hand-written notes. In one of these three-day observation periods I also used video recording under the observation, in addition to notes. I will discuss the experiences from using video shortly. Since I wanted to learn how the nurses were actually using the LV centres, I could not rely on written documents, for example manuals and written directions, as data. Written documents have only been used for the review of the formal history of development of the "Hordaland Model" in Chapter 1. The amount of field work is summarised in Table-box 2.

Table-box 2

Field Work

	Number of Centres visited	One-day observation	3-4-day observation	Additional interviews
LV centres	8	6	0	5
AMK centres	3	0	5	4

Summary of field work in LV and AMK centres.

The observations of the AMK centres have been much easier to undertake than those of the LV centres, because of the different spatial organisation of the centres. While the AMK centres have enough space and even a spare chair for an observer, many of the LV centres are squeezed into "broom closets". In one of the centres, the nurse and I just managed to get an extra chair into the "LV centre closet", and I think we both felt that we were sitting upon each other. The observational work was a bit unpleasant for me, and I suppose it did not make *her* work easier. Nevertheless, it has mostly been possible to observe the work in both AMK and LV centres without having to disrupt the work going on. That my presence in the room as an observer may have influenced the working practice or the informal gossip in-between work, one can never dismiss.

As mentioned, I used video recording in one three-days observation period. The great advantage of using video was obviously that it made me able to record the exact interaction between the members of the AMK team. An episode like the one on page 58 would be impossible to reconstruct if there

were no video recording. Even if an audio recording could have grasped the conversation, I would have miss the important physical interaction on the AMK centre. But the video recording did also cause a slight problem. The video camera had to be located so that it would have as much as possible from the AMK centre inside the picture frame, and it was placed on a tripod in one corner of the room. This location made the camera clearly visible for everybody at the AMK centre and for visitors as well. In several episodes the presence of the video camera was commented, as referred at page 94, for example. The camera was so much commented that it is reason to believe that the AMK team members did have it in their minds, that they were video taped. Especially this might have been so because there were a lot of idle time in the period when I was filming. Even if the camera was one of many technologies in the AMK centre, it did not naturally belong there. Nevertheless, as mentioned, it made me able of recording some important episodes.

REFLEXIVITY

Between the most intensive periods of interviews and observations, it was possible to spend time on analysis and reflection on the data. The continuous movement between the various stages of research, as suggested by Strauss (1987:19) in his writings on grounded theorising, could be followed so that the emergent theoretical interpretation could guide subsequent data collection. All the data collection periods have been between two days and one week, and in-between those periods I have had time to examine and discuss data with colleagues, confer with theory and previous research, and not at least work with my own thoughts and texts. Through the flexing between these processes, I have developed and transformed the research problems, and clarified and delimited the scope of the work. I started with a rather broad scope of studying the interaction between the work on AMK and LV centres and the technology that is used in these centres. Hence, the study has had a kind of "funnel" structure, that according to Hammersley and Atkinson (1995) is characteristic of ethnographic research.

As the study progressed and time was spent both on data collection and analysis and theorising, it was clarified that the technology used in the AMK centres and the LV centres was basically the same, but that there were some significant differences between how nurses in LV centres and in AMK centres were able to use their nursing competence in relation to this technology. Therefore, the scope was restricted to focusing on the internal and contextual practices of the LV and AMK centres, in which it was possible to apply a comparative case study approach. The case has been limited to the use of communication technology in the practice of medical emergency communication and the comparative aspect has mainly focused on

understanding the differences in practice in the various centres. I decided not to analyse the political process of decision-making for the development of the technology used in the centres, nor would I focus on how the situation for doctors, patients, ambulance drivers and people in general, changed with the introduction of the AMK and LV centres, as long as it was not important for the work in the centres itself.

ETHICAL INFORMANT INTERACTION

Ethical guidelines in research have tended to focus on how to avoid harming the informants, for example by direct physical harm (in medical experiments) or by spreading confidential information about them (in social science studies). Usually, such rules are negatively formulated ("you shall not..."), and when there are any positive admonitions (like many of those suggested by NESH[9]), these are often embedded in methodological considerations. One of those embedded ethical discussions focuses on how a researcher may get data from his informants.

In scientific inquiry one has been concerned about how to avoid disturbing the informants' reasoning, for example how to avoid putting words into their mouths during interviews. From the quantitative, positivistic paradigm, the ideal for research is to collect the standpoints from (or rather the facts about) the informants in the inquiry, *uncoloured* by the interviewer's presence (avoiding "interviewer effects"). However, most researchers in the social sciences are more aware of the inevitable effect the researcher has on his or her informants, even in posted questionnaires: The formulations of questions will always have a significant effect on how questions are answered. The observer is an interacting "research instrument *par excellence*" (Hammersley and Atkinson, 1995:19). In both quantitative and qualitative research the researcher is not able to completely omit his own appearance or effect on the final analysis and conclusions, or as Skolimowsky (1992, in Reason, 1994) puts it: "We always partake in what we describe". The fact that behaviour and attitudes are often not stable across contexts, and that the researcher may influence the context, becomes central to the analysis (Hammersley and Atkinson, 1995:19).

It means that even though I applied a *fly-on-the-wall* observer position, I could not be a "complete observer" (Hammersley and Atkinson, 1995:104), as the complete observer is without any contact with those he is observing, for example through a one-way mirror. On the other hand I did not participate in the *work* in the AMK and LV centres (although in one situation I

[9] The National (Norwegian) Research Ethical Comittee for Social and Human Sciences, in Norwegian: "Den nasjonale forskningsetiske komité for samfunnsfag og humaiora", cf. NESH (1994).

helped one of the ambulance coordinators with a word processing problem). Moreover, I find Junker's typology of "observer as participant" (Junker, 1960:36, presented by Hammersley and Atkinson, 1995:104), the category next to the complete observer, as an incorrect description of my role, as I did not participate in the actual work. I would rather like to call my role one of "interactive observer", as my formal role was as observer, but in which I was interacting with the observed. The fact that I was interacting with the nurses and ambulance coordinators is likely to have some impact on what I observed. For example, *even though I did not get that impression*, it might be that the nurses and ACs were more concerned about keeping their informal conversation to matters relevant for the AMK centre work, when I was observing them from the back of the centre.

To hide such researcher's effects when reporting, would not be very ethical towards the scientific society. However, is it ethical to utilise this effect? Several qualitative inquiry techniques do so, by utilising the interview as an interactive process between the researcher and the informants. Consequently, it is not possible to report the exact story or meaning of the informants, but only the intersubjective reality that was created in the meeting between the researcher and the informant. The ethics of telling the (intersubjective) truth, and defining the true story, is therefore strongly interconnected with methodological considerations.

According to Reason (1994), human inquiry essentially requires full participation in the creation of personal and social knowings. Reality is a process, more than a state of things, and inquiry must allow the construction of reality, not just through the mind, but through the reflective action of persons and communities: Research must admit the social construction of reality (Berger and Luckmann, 1966). The researcher may be interested in developing the science of action, and the informants may be interested in developing their sense of empowerment and competence from the research process. It is also possible that the informants want to use the researcher as a spokesperson or advocate for their interests.

The interview questions in this study are based on both theory and observations, made in the early stages of the study. These questions and feedback become part of the informants' narratives, which again are responses to further questioning and observations. My interpretation is reflected in my questions and as argued by Gudmundsdottir (1995), the stories the researcher tells in reports and papers are as much the stories of how he or she understands theory as related to his or her data, as they are stories about his or her findings and results. The consequence is that one can never completely capture the pure, uncoloured experience of an informant, and the research report will *have* to be the result of an interactive process between the researcher and the informants, and both parts' theories and experiences.

As soon as I called at the centres and started interviewing or observing my informants, I stepped into an interactive and interpreting process with these persons, and my report is a result of that *process*. In some cases, however, one might be worried about letting too much of one's own theories and interpretation enter into the data collection. After all, the informants are interested in the research project itself, not at least its results and how the results may be applied. An excerpt from the experience of the observation of an LV centre in one of the nursing home serves as an example.

> At one nursing home, I was discussing with a nurse the national politics on the care of the elderly. This nurse was working in a short term department at the nursing home, which means that she mainly had to care for elderly staying at the nursing home only for some weeks while they recovered from a stroke or something like that. They would go back to their homes after the recovery. This nurse was especially concerned about the way many old people did not want to live in old people's homes or nursing homes. They wanted to stay home, preferably until they died. These people should get better services at home, the nurse said. She also told me about other elderly who after they had been to a nursing home for recovery, got totally dependent on help, not because they could not manage on their own, but because they enjoyed the service so much. They did not want to do their daily activities (like eating and cleaning) on their own any longer, they wanted to have the extra service and attention that they got at the nursing home.
>
> During the discussion I began to think about my own work, the social studies of communication technology, and the way some kinds of technology could be used as support for the elderly who wanted to stay at home. But I did not share my thoughts with the nurse that was my informant, most of all because I did not want her to think negatively of me as an incurable technology optimist (which I am definitively not). Besides, I was uncertain of the potential effect such thoughts would have on the information she was giving me. Would she hold back negative thoughts about the LV centres because she believed that I would defend this technology and "be disappointed with her attitude"? Or she might would have exaggerated the negative sides of the LV centres to persuade me about how bad they were, so that I could bring this information to people that could do something about it.

The informants may have assumed that I had useful thoughts about their work and the way they use the LV centre, or the way they organise their work around the LV centre. And I did have thoughts about the LV centres, not at least because I have seen many ways of organising them, during my visits to the different centres in various municipalities. As long as I have knowledge that my informants may regard as useful, and that they ask for, I should not hold it back, according to guidelines in a "participative inquiry" (Reason, 1994).

But where can one establish boundaries between one's own (theoretical) analysis and the intersubjective reasoning in the interview? The situation that I experienced is like the one presented by Gans (1968). As a participant-observer, he was able to be spontaneous in conversations dealing with subjects that he was not studying, but when discussion turned to topics he was studying, he felt he had to be careful to remain aloof, to be free to observe. The participation "requires the surrender of any personal interest one might have in the situation in order to be free to observe it, and the people who are creating it" (Gans, 1968:304).

But how is this possible? In fact, it *is not* possible. The goals of the research are always at the back of the researcher's mind. Besides, the informants are interested in the research project, and when they ask about its foundations and goals, they deserve to know. (Of course they have been asked in advance to participate in the research, and have formally consented to do so on the basis of the information I have provided about the research project's objectives.) The discussion concerning the research itself that sometimes emerges during an interview or during idle periods of an observation, often qualifies the informants to a status as co-researchers, as is usual in phenomenology (Moustakas, 1994). Anyway, the research project is presented to all the informants, both to get access to the observational situation and to play fair with the informants. "It is hard to expect "honesty" and "frankness" on the part of participants and informants, while never being frank and honest about oneself" (Hammersley and Atkinson, 1995:91). They know that I am there to study the way they communicate, with emphasis on how they handle the emergency calls. All of us are interested to learn as much as possible from our co-presence.

I have also been interested in what they do between those calls, for example in informal conversations in idle periods in the AMK centres. This is something I have not emphasised if not asked specifically. I have been worried that these parts of their practice, which I believe are more fragile, could be too influenced of my presence, if it was said that these idle activities were as important as the emergency actions. In the idle periods my presence is more significant, both because I am physically visible when the operators turn away from their desks, and because they do not have to concentrate on their work. In these idle periods my quasi-fly-on-the-wall position was changed towards more of a "full participant" (Hammersley and Atkinson, 1995) position, since the actual activity at the centre turned into informal conversation, in which I became a natural and equal partner.

Nevertheless, it has been natural to describe my research project for the informants in all interviews and observations, and even though I have not been able to expatiate on every point of focus in my research, I can say that in no case has anybody been played false. As suggested by Miles and Huberman

(1994:292), "[r]esearchers traffic in understanding." The way we get access to study people in their work is that we may offer them greater understanding of their work, through the research process, in which they participate.

Not only what is said, but also other non-verbal signals are important for the fieldwork. As pointed out by Hammersley and Atkinson (1995), the researcher will be identified by the informants with "ascribed characteristics" (Hammersley and Atkinson, 1995), and although these characteristics are seldom absolutely determinate or fixed, the characteristics may shape relationships in the field. Such characteristics can be sex, ethnicity, religion, age or others. In my study it may be the attitude towards the AMK centres, the LV centres, or health politics in general, or what exactly I would think about the way they performed their tasks, that could be my important characteristics.

My research work has been presented in the nursing union's magazine, *Sykepleien* (1996). This was in the middle of my observational periods at one of the AMK centres, and I was in high spirits because I was fascinated by the way the AMK team handled their work. That I had a very positive experience from this AMK centre was obvious from the presentation in the magazine, and even though no specific centre and no names where mentioned, the nurses from this centre knew that I was referring to them. Later on, in my next observation at this AMK centre, the nurses were clearly flattered about the "report" from their AMK centre, and they told me they were happy about it. Through this presentation the nurses were more confident with my goals in the research, for example that I was not there only to look for short-comings and malfunctions and propose improvements of their practice. It may possibly have given a good sign that this interview was presented in their union magazine. Anyway, the article made the research easier, as the AMK personnel became more relaxed concerning my presence.

UNSOLICITED AND SOLICITED ACCOUNTS

In the fieldwork among the nurses, there were great variations between how the arguments were put forward. Sometimes, one might ask what was the motivation behind the arguments: Why did the nurses describe the situation as they did?

Many nurses apparently did not like to operate the centre, but very few of them said so, directly. Instead they referred to different problems with the operation of the centre. One such problem was the fear of meeting the neighbour at the other end of the line. There will always be such problems in the health service, and in other public service departments, that one has to

relate professionally to a person that one may know from other contexts. This is especially difficult when there is some kind of personal crisis involved. However, was not the chances rather small, even in the smaller communities, of having a friend on the LV telephone line? Also, several nurses at the LV centres claimed that the confidentiality imperative was badly handled at the LV centres. There are several nurses who operate the centre during an evening, and the telephone journal is usually lying on the desk, in sight of anyone at the office where the LV centre is located. It would be possible for anybody to see what has happened earlier the same night.

According to Hammersley and Atkinson (1985), informants may give both *unsolicited* and *solicited accounts*. Not all answers are direct responses to the ethnographer's questions, but they may still be expressions that reflect the perspectives, concerns and discursive practices of the people who produce them. The fright of having the neighbour on the line or the worrying about the display of personal data may be a pseudo-argument against the LV centre. It was the observations that balanced these accounts, as I, as a researcher, got a better (more independent) understanding of the practice during observations than through the interviews. Neither from the observations nor from the interviews was it possible to get completely "pure" data, free from potential bias (Hammersley and Atkinson, 1985:131), but with the balancing of interview data and observation data I was able to reflect about the implications of the interview accounts.

The data from interviews and observations are used to illuminate each other. In the two specific examples, the observations tell me, first, that the neighbour will probably not call, and if he does he will probably not be asked for personal details. If there really is an emergency, he will probably call the 113 emergency number as well. I can say this because in my observations there is typically something like 20 calls in one night, in a municipality of 10000 people, the chances that one of the neighbours will call are fairly slim. But you can never know this for sure, the neighbour may be a person with poor health, or the nurse may know a lot of people, and besides, the statistical probability is never a guarantee against a very special situation. The second argument, about the confidentiality problems, is also possible to illuminate from the observations. Most of the LV centres are located separately from the gathering areas, often in separate rooms, where available. It means that one does not happen to see the telephone journal, *by accident*. Many nurses also fold the journal, which is really only a sheet of paper, so that the written data is not visible without unfolding the paper. If one *wants* to see the journal, on the other hand, one will be able to do so in many nursing homes.

But why should they disguise their reasons for being reluctant? For the informants it is not 100% obvious what my reasons are, and to whom I am

reporting, even though my information to the informants are straightforward on that point. But I could be their spokesman to some management decision makers that may solve problems that I discover that the nurses have. If so, they should leave their long-drawn sighs with me, hoping that something should be done. In that case, they might disguise arguments that have been presented already. If I were to report how the nurses were performing, they might like to idealise the picture of their own operation of the LV centre, and maybe blame the doctors if the operation is not smooth enough. An idealisation of the LV centre work can imply extra effort from the LV centre nurse when observed by a researcher, and therefore hard to discover, even when doing observations in the centre.

NOTHING BUT THE TRUTH?

With all the caution and guardedness towards any form of determinism, that characterise some of the social constructivist studies (cf. Bijker, Hughes and Pinch, 1987; Bijker and Law, 1992), the result may be a form of relativism that interferes with the interest to provide clear answers or even advice. The relativism that many of the constructivists include as an epistemological a priori, may as well be an obstacle for theoretical development in constructivist sociology. In *Organisation Studies* (1995), there has recently been a discussion on the post-modern studies of organisations, initiated by Martin Parker. What he tries to do in the paper is "to begin to provide the theoretical clarity which will allow critical-radical studies of organisation to negotiate or avoid the subjectivist and relativist quagmire of post-modernism without falling into the trap of naive positivism or empiricism" (Parker, 1995a:554). The discussion of modernity and post-modernity is not an important focus here, but the discussion between Parker and others might clarify an important epistemological problem.

Parker criticises the postmodernists for their lack of ethical-political force, or the ability to disagree with one another, striving towards a better world. "How can you disagree constructively (that is to say, with the aim of building something you believe to be better) if you can offer nothing but negation or the suggestion that everybody is right in their own way?" (Parker, 1995a:558). Accepting that all knowledge is interested and provisional, does not mean that we have to stop there, "celebrating the impossibility of the enlightenment emancipatory project" (Parker, 1995a:562). Stewart R. Clegg answers with questioning "progress and rationality" as appropriate goals for theoretical reflection. The social scientist cannot serve progress and rationality by taking sides, which tends towards the autocratic and unreflective (Clegg, 1995:570). Max Weber's (Weber, 1922/1971:162; Brubaker, 1984:59) emphasis on reliable empirical knowledge as the basis for sound (ethical-political) decisions, is also Clegg's preference. In the same discus-

sion, Norman Jackson (1995) and Pippa Carter (1995) answer Parker by emphasising that the proper test of knowledge is "not the truth content, but what those opinions lead to - the usefulness of knowledge, its *praxis*" (Jackson, 1995:571). Jackson further questions Parker's need to write the truth, or if he cannot write it, not to write at all; the urge to write does not have to be the urge to tell the (universal) truth. "Because I cannot claim any transcendental certainty for my writing, does it make it pointless?" (Jackson, 1995:572).

Parker's answer (Parker, 1995b) is the one that represents my own epistemological standpoint here, that we all espouse various forms of relativism. We cannot claim our arguments as the (universal) *Truth*. Knowing this, we need to be honest about our ethical-political positions, even if this is not basically in focus in what we write. In this study, what I have written down, is what I have learned from observations and interviews in the field, what I have learned from reading and discussing theory and research reports, and what I have been able to analyse on this background. The nurses and others who are involved in the field that I am studying, may or may not agree with me on all arguments. The latter does not necessarily mean that my arguments do not reflect realities of the field.

As I am studying a field where the practices are very differentiated, what I see in one place may not be relevant or representative, to what I have seen elsewhere. However, my arguments are drawn from the interest of what seems to be important practices in the AMK and LV centres, and what is important and interesting in a sociological analysis.

USING NUD•IST IN QUALITATIVE DATA ANALYSIS

After the three first periods of interviews and two observation periods, I used the computerised tool NUD·IST (Non-numerical Unstructured Data Indexing Searching) for sorting data. The program is organised into a document part and an index part, and applies a cut-copy-paste process on the raw data to construct a very flexible way of relating text pieces or other data formats to an index system. The index system is hierarchically ordered. Besides, there are well developed search engines for searching the raw data, for indexing, or searching the index systems, for finding clusterings, testing hypothesis, making qualitative matrices, etc. (QSR, 1994).

After being introduced to NUD·IST by Amanda Bow and Karen Wale in March 1995, shortly before the first interviews of nurses in LV centrals, I decided to use NUD·IST in my data analysis. Although I had planned to use NUD·IST for

the complete analysis, I found it difficult because of the hierarchical structure of categories (indexes), that NUD·IST is based on. I have problems with accepting the idea of the designers Richards and Richards (1995), that it is *natural* to think in terms of hierarchical ordered categories. They think of the categories as sorted by a general-to-specific process (Richards and Richards, 1995:82). A source of the problem may be that the categories are thought of as characteristics (like age, gender and religion), a way of thinking that stems from survey approaches.

My analysis focuses mostly on the relations *between* the people, institutions, professions and technologies that I study. Following the categorising strategy of NUD·IST in the complete analysis, I feel that I would have to separate these units, and their work and practice, and the contextual factors. I am afraid that it would draw me too far away from the relational nature of my data. As pointed out by Kelle and Laurie, implementing a consistent and stable coding scheme at a too early stage of data analysis could have a "hazardous influence on hypothesis generation" (Kelle and Laurie, 1995:28). I believe that the closeness to the data is needed in the exploring strategy that is followed. In a review of NUD·IST, Weitzman and Miles pointed out some of the same drawbacks with the program as myself; "distance from the data, context-less search hits, [..] and hierarchical-only coding" (Weitzman and Miles, 1995:256).

Nevertheless, NUD·IST provided a very useful way to sort the data, so that the sorted lot could be retrieved at any moment. As the amount of data grew, it was easy to include into the NUD·IST document system, and browse the raw data, addressing fragments to different categories (indexes). The hierarchical index tree was modified continuously, as new analysis of new data made me think of new categories, or as analysis made it natural to delete or merge old indexes. After three interview periods and two observation periods, I had a large amount of data, that was systematically ordered. However, that the ordering of the indexes is hierarchical was more confusing than useful for this preliminary data analysis of sorting the observed phenomena. Hence, without using the index tree, I still used the indexes. I left the NUD·IST approach after having established the preliminary categories, and pursued a manual, intuitive sorting and categorising approach of the data from the observations and interviews that came later.

The use of NUD·IST is not only interesting in a methodological discussion, but also in a discussion of technology and work practices, hence in the focus of the thesis in general. When I started to use NUD·IST, the program was of

course already fully[10] designed. Nevertheless, I was able to reconstruct the designers' idea of a hierarchical ordered index tree, to a bunch of indexes that for me at that time were unrelated. I put all indexes on one level of the tree, so no index would be subordinate to the other. My use of NUD·IST was therefore not really a use of an analysis software, but a use of the software reconstructed as a very useful tool for selecting and ordering raw text by categories.

In the same way as many of the LV nurses more or less reconstructed the LV centre, that was supposed to be a service telephone into a switchboard, I appropriated NUD·IST to be a sorting tool, an advanced file manager. Although the artefact was already designed, it did not stop me from redesigning the use of the system to suit my own purposes, or avoid using the parts of the software that were conflicting with my research strategy and aims.

As pointed out by Coffey and Atkinson (1996), it would be wrong to allow the software to drive the research strategy. After having used the functions of NUD·IST that (I think) did not alter my research strategy, I felt it was right to leave the software for more manual methods.

[10] Of course, there is no such thing as a fully designed *software*. We all know that no software is ever designed to its final stage, even from the manufaturer, as new versions are released now and then, until the software is taken off the market.

CHAPTER 3

"BUT IT'S THE OTHER WORK I'M HERE FOR."

OPERATING THE LV CENTRE IN A NURSING HOME

The location of the LV centres in nursing homes was not a self-evident choice. Struggling day out and day in, doing routine work to support the care of the elderly, the responsibility for an acute medical telephone was about the last thing many nurses were expecting to get. Nevertheless, being the only health-related institutions in most Norwegian municipalities, the nursing homes were the only option, if there was to be any municipal, local medical emergency service located in an existing institution. This chapter focuses on the operation of the LV centre and the nurses' work in the nursing home departments. How was it possible for a nurse to combine the responsibility for the centre and other work in the nursing home? Was a new role for nurses in nursing homes emerging after the establishment of the LV centres? How does the nurses' rationality and work perceptions conform with the task of operating the centre?

The LV centres are in many ways the basis of the medical emergency service. They are the result of distributing the emergency system into people's local environments, to the municipal level. In Norway, the nursing homes are the only health-related institutions existing on municipal level, and most of the municipalities in Norway have nursing homes. Therefore, the LV centres are usually located in these.

The first LV centres were introduced in some nursing homes on the west coast of Norway about ten years ago, in 1986. The motivation for establishing these centres was to bring part of the medical emergency service as close to the people, the users, as possible. The idea was also that *local knowledge* in the medical emergency organisations was very important to be able to handle emergencies as fast as necessary.

In many of the larger city municipalities, with larger health institutions, i.e. small or large hospitals, the LV centres are located in these. In some hospitals, the LV centre is located in the same room as the AMK centre, and is operated by the same nurses that handle 113 emergency calls. (These LV centres are called LV telephones.) Whether the LV centre/telephone is located in hospitals or in nursing homes, it is always operated by nurses, though in some few nursing homes, some nursing assistants also operate the centres.

Before and during the introduction of the LV centres, many nurses in the nursing homes were sceptical about this new function that they were expected to perform, in addition to their traditional task, taking care of elderly. But it is now ten years since the first LV centre was put into action, and the general scepticism among nurses has changed and developed into different practices of operation and attitudes towards the LV centres. Some nurses in some nursing homes spend time operating the LV centre enthusiastically, getting involved in the doctor's diagnosing. Other nurses operate the LV centre in a more detached way, handling it more or less like a switchboard, putting patients directly over to the doctor, or forwarding messages to him, after collecting the necessary minimum amount of data. All the nurses have to find ways to combine their LV centre work with their other tasks in the nursing home department.

COMBINING TASKS IN THE NURSING HOMES

As explained, the LV centres are operated by the nurses, in between their ordinary work tasks with the elderly. The responsible nurse follows certain

practices on how to operate the centre. First of all, she[11] decides the urgency degree for the call, and contacts the doctor, the AMK centre or solves the problem herself. Almost all calls in the LV centres are forwarded to the doctor-on-duty. There is always a nurse responsible for the centre, which serves as one of the main features of the system: People will never have to be answered by an answering machine when they call the doctor. They will always meet a qualified person that will answer their questions or forward the call. Typically there are between 10000 and 20000 incoming calls to each LV centre each year, depending on the size of the municipality it is serving. Only a few of these are acute emergencies, most of them are regular requests for a doctor.

All LV centres work the same way, technically, and the nurses who operate the centres are supposed to be able to operate any LV centre. Many of the nursing homes have an extra nurse on job in the evenings, to operate the centre (the afternoons about 15.00 to 20.00 are the hours of heavy traffic). What is a regular call to the LV centre like?

> At 17.00, the phone rings. Simultaneously, a printer starts to print a short message giving the date, the time, and who is ringing. The nurse answers the phone. "Matown LV centre, nurse speaking". The printer prints an "answered" message. The caller explains why he's ringing. He was involved in a collision the day before and is suffering pain after it. The nurse requests his name, address and national identity number, noting these on a form. She asks the caller whether he thinks it's an urgent matter, and rings the doctor while the caller holds the line. She briefly presents the caller for the doctor. The caller usually hears the conversation between the nurse and the doctor, and the doctor then takes over the call. After she has put the receiver down, she completes the form, noting the degree of urgency and a brief account of why the caller rang. She can go back to her regular work.

These regular calls that are received in the LV centres do not take more than two or three minutes. Usually, the nurses will call the doctors via the telephone or mobile phone. Some doctors do not use a mobile phone, and then they use radio connection between the doctor and LV centre, when the doctor is taking his round of consultations. Most doctors use mobile phones and the radio serves as a back-up. The use of radio contra telephone is not much different for the LV nurse, but on the radio two-way conversation is impossible, and they end every message with "over", at least in the beginning of a conversation - at the end they often seem to drop it.

When located at nursing homes, the LV centres were a completely new and different experience for most of the nurses. Many of them were not enthusi-

[11] Throughout the thesis I have used female pronouns for nurses and male pronouns for doctors and ambulance coordinators. This is of course not done to impose some kind of sexist status determination, but because of simplicity, readability, and because it actually reflects the realities of the field.

astic about the new function and responsibility that was added to their work tasks. One of the arguments against working at the centres was their closeness to potential callers. They did not want to know about the personal medical problems of other people, people that they might even know personally. One nurse said:

> "The system's been thrust upon us. One auxiliary nurse resigned partly because of it. She didn't want to know about other people's accidents, "it might be the neighbour." It's not only the LV phone, we're continually being given new things to do, without being asked. Another auxiliary nurse was scared of telephones and refused to do the job."

The problem of "the calling neighbour" was adopted as an argument against the responsibility of the LV centre in nursing homes. There will always be such problems for workers in the health service, at least when working in some form of emergency ward. In the nursing homes, you might have the neighbour's mother as a patient, and the problem is a bit different: The nurses usually know what is happening before it does, and the situation is a more ordinary one.

For many nurses it was exactly the situation of great predictability and control that made them work in a nursing home, rather than in a hospital. According to a nurse in one of the nursing homes, the nurses who wanted to work in nursing homes typically had small children or they had been working in intensive hospital environments earlier.

> "It's a fact that many nurses from hospitals come to smaller places and nursing homes to gradually reduce their work load and have time for the family" (nursing home nurse).

When they now have to operate the LV centre, the working environment changed a lot, in the direction of more stress and pressure, the work situation they wanted to leave behind.

It is seen as a problem by the nurses that they have to give a higher priority to serving the centre than doing the work in the nursing home[12]. The operation of the centre does not always fit too well into other work in the department, because it is so very different. A nurse told me that

[12] Such priority problems are also to be found in small AMK centres. All the AMK centres are located in hospitals, but there are variations in how they are organised with the rest of the hospital. In the rather small AMK centre in Ottvalley, the intensive care unit is now responsible for the AMK centre. It is a small centre where no nurse is fully dedicated to the operation of the centre. The operation of the AMK centre is sometimes in conflict with the rest of the job, similar to the problems with the LV centres. In one of the small AMK centres the head nurse said that "*the emergency ward has to come first when there are patients there. In that way, the AMK centre has been considered a telephone, that one will answer when there is time, and not like a piece of work that is as important as taking care of patients*". Also, the continuous exchange of experience is difficult in the small AMK centres because they run shifts with no overlapping. Only one person serves the centre, like the typical situation in an LV centre.

> "sometimes it's busy enough already, you "lose the thread" of what's going on in the unit. It's easier for us on the blue unit than for the others, though. They have to run further to reach the LV phone."

There are large variations on how the LV centre is made to fit in the nursing homes. Some are "stowed away" in rooms that, if it was not for the technology installed, would look like broom closets. Other LV centres have a more centralised location in between the nurses' duty room and the nursing home living rooms. Some of the nursing homes cover large areas, and the combination of a regular duty on the nursing department and operating the LV centre might involve a lot of running. Especially at nights, when one nurse may be responsible for several departments and the LV centre, the combination can be tough.

Picture-box 3

Nursing Home Corridor

Many nursing homes are designed with long corridors, which means that there can be "long distance" running to take an LV centre phone call at the other end of the department.

Also there are some of the duties at the nursing homes that presuppose continuous involvement. When few members of the staff are at work, there may be nobody to take over a nurse's work so that she can answer the LV phone.

> "You can feel irresponsible dashing away from helping someone to eat, for example. Many people have problem swallowing, and they sit and cough and clear their throat while you're dashing to answer the phone" (nursing home nurse).

One of the dilemmas of operating the LV centre is that some of the operations in the nursing homes, like those described, are actually more acute than many of the LV telephone calls. Many of the calls to the LV centre are routine calls for a doctor that might as well be directed to the doctor in office

hours. The keenness for answering the LV centre, leaving needy elderly to wait, is hard to uphold and accept when most of the calls are routine matters. And some of the most difficult tasks for nursing home nurses, comforting the next of kin after a death, are not at all possible to combine with the responsibility for the LV centre.

> "It's especially difficult to be disturbed if you're having a meeting with relatives, and are perhaps in the bier room. So I never take responsibility for the LV phone with me in there. There are a lot of old and sick people it's very difficult to have to dash away from. But it would be absolutely crazy to have a separate person employed on the LV phone because, after all, there's often not much to do" (nursing home nurse).

The LV nurse share the responsibility for the LV centre with other nurses or nursing assistants in these cases. In other situations, other nurses have to assist the LV responsible nurse when she has to run to the phone. Hence, the LV centre also influences the work of other nurses and nursing assistants, than the one who operates the centre at the moment. The external interdependencies, like those relating to the doctor, have implications for the internal interdependencies, as the sharing work and responsibilities with nursing assistants. When the LV nurse has a problem of for example getting in contact with the doctor, her colleagues at the nursing home will have an increase of work load, as well.

THINKING FAST IN A LAID-BACK ENVIRONMENT

The location of the LV centres in nursing homes has interesting implications. In the nursing homes, elderly are taken care of, that is, the physiological needs are assisted when needed, and usually no cure is expected, except for the rehabilitation departments in some nursing homes. The daily routine in a nursing home is very far from fast decision-making that may be needed in an acute emergency, where the early intervention is the way to success. The nursing home is rather characterised by a quiet life, continuous care and help, but usually without cure as an object. The quiet life does not mean that the personnel have a lot of idle time, in fact the working load is very hard (Næss and Wærness, 1995). The personnel in the nursing homes have too little time to spend on social or "non-instrumental" work for the elderly (Sørensen, 1995). However, the tasks are usually routine, and unexpected events occur rather seldom, compared to many hospital wards.

The context of the operation of the LV centres is some of a paradox: How is it possible for the nurses to switch from the comforting and stable nursing home mode to the urgent decision-oriented and instrumental LV centre mode? How are they capable of maintaining the *primary* functions in the

nursing home when other functions are added? The nursing home has been called an institution of the "resultless care" (Wærness, 1982), where the relations are characterised by stagnation and recession, rather than recovery and progress. The responsibility of the LV centre implies therefore quite another attitude to work than what the nurses are used to. Instead of maintaining the qualities of life as much as possible, with the LV centres they have to work with cure and recovery as objectives. This combination brings along a serious problem of priority. Even if one has to run to the LV centre, when the phone rings, there is a great chance that this is only a minor medical problem. The really acute cases are rare, but still the next call could be the one.

Of course, there is also a question of how to get used to the technology that is new for the work-site. The operators of the LV centres contact the doctors through telephone or radio. The use of radio communication is unfamiliar for most nurses, and the technical challenge and fear of pushing the wrong buttons has been strongly felt. Some of the nurses think that they will never get familiar with this radio/telephone unit, because they operate it too seldom and get too little practice with it.

One nurse told me that there are those who do not want to operate the centre:

> "They think they get too little experience with it, and are therefore too uneasy using it. There's a lack of follow-up courses on how to man the LV phone, so they have to learn everything themselves."

With the introduction of the LV centres the nurses were given three-day seminars with theoretical and practical training. However, there are large variations in the nurses' familiarity with operating the LV centres. One of the older nurses in one nursing home said:

> "It's not difficult to use the new system and I notice how I, myself, and the other nurses get up-dated using it. More of the young, newly qualified nurses seem to have greater problems using it."

In fact, it is an interesting feature of the LV centres that it is not necessarily the older and more experienced individual nurses who have had the greatest problems with new technology, as is often expected. It should be noted, however, that it was staff in the "younger" departments at the nursing homes who welcomed the LV centre, whereas the more "settled" departments would not serve the centre. Strangely enough, it seems like these boundaries exist between departments in many of the nursing homes. With the "younger" departments I mean departments where the nurses are keen for new work tasks and where they are interested to try new technology or to do things in new ways. (Usually, these are also the departments where there are most young nurses.) The settled departments do not have these characteristics, tradition and continuity are more appreciated. It falls outside

this project to examine these variations between nursing home departments further.

It is interesting, however, to note that the LV centre was usually welcomed by some nurses and that these positive nurses tended to be gathered in one department. Some nurses even moved between departments to avoid having responsibility for the LV centre. During the years of practice with the LV centres, the nurses have become capable to handle the LV centre, technically. After all, they are used to handling advanced medical technology.

> "It's gradually become a habit, you master the technology and don't think so much about the fear. But it's the other work you're employed for, and this breaks it up. Perhaps you're tending a wound, but have to dash away because it may be a real emergency. You have to break off what you're doing" (nursing home nurse).

As the nurse explains, the fear of not being able to cope with the system, technically, has been more or less overshadowed by the concern of not doing the regular work at the nursing home well enough because of the responsibility for the LV centre. As the nurses' self-confidence has grown since the first LV centres were introduced about ten years ago, they claim that it is now the doctors who are incompetent in using the system. In fact, some doctors have also accepted this. As one of the doctors admitted:

> "By degrees, it was the doctors who lagged behind in the use of the system and the nurses who were the experts. The doctors who don't use it so often are those who make most of a hash of it when they're using it" (a GP[13]).

Also, the nurses usually have, and develop, a great deal of local knowledge that helps them operate the LV centres. There are some regulars among the repeat callers, and the nurses develop strategies for handling those. For the doctors this knowledge is helpful, as one of them said:

> "The nurses get a very good idea of what's going on in the community and get to know patients who use the system a lot very well" (a GP).

The nurses learn how to handle certain patients on the phone. Patient categorisation is handled by nurses also in many hospital departments, as they know the patients. In the casualty department observed by Hughes (1977; 1988), the nurses knew how to tackle many of the patients who came in because they had seen the patients before. The nurses would then, in a discrete way, share their knowledge with the doctor about their familiarity with the patient. Hughes also gives examples of how nurses help the doctors to collect correct information from non cooperative patients, to avoid abuse of the service from some parts of the client population (Hughes, 1988:12). Especially this service from the experienced nurses seemed to help the young doctors, as an element in the process of organisational socialisation of them.

[13] General Practitioner ("allmennpraktiserende lege").

Also in the LV centres the nurses have the chance to develop knowledge about regular users, that the doctors lack, because there is often a huge turnover among doctors, especially in small municipalities.

Local knowledge is also helpful in geographic matters. In the LV centres, the callers are very often too upset to be able to describe precisely how the doctor or ambulance driver can get to their house. When the nurses have knowledge about the local geography, they will help the doctor to get to the right place. The nurse at the LV centre also works as local helper for the AMK centres. The LV centre will often "listen" to some of the actions from the AMK centre, and may assist when local knowledge is needed.

> "For example, the people at Solfjord LV centre can tell the AMK centre that the ambulances they're ordering are not operative, if it's within the local area covered by the LV centre, and which they therefore know well" (leading nurse in nursing home).

In this respect the LV centres serve as local advisors for the AMK centres. Usually the AMK centres cover areas of five to ten municipalities, hence they may have five to ten local advisors in the LV centres.

Many of the nurses appreciate that the work in the LV centre involves them in a more varied medical practice.

> "We think we learn a good deal about diagnosis by hearing what the doctor says, what he asks about, and so on. Besides, we get to know the doctor a bit" (nursing home nurse).

The nurses get in touch with a lot of patients (or potential patients) and they also report that they learn a lot from the contact with the doctors. As one nurse wrote in a personal document concerning the LV centres (Appendix 1), the nurses had to "recall experience and learning [they] thought they had forgotten". Much of the patient contact is indirect, that is, the nurses follow the doctors' work with the patient over the phone.

> "The doctor often gives the caller advice: "Try this or that, and see if it helps." We learn what the doctor puts emphasis on, for instance regarding allergies, the effects of medicines, etc. You learn that way" (nursing home nurse).

If the nurses who operate the LV centres are interested in the diagnostic tasks of medicine, they may appreciate this extra work load as a enriching part of their day. As mentioned before, there are differences between how the nurses perceive the LV centres, but it seems that the location of the centres in one of several departments sometimes solves the problem of negative attitudes to the LV centres. The reluctant nurses may change department, so they do not have to work with the LV centre. Through this process of *self-selection*, some negative experience with the LV centres is avoided, and the general experience seems to be more positive.

> "We find the LV centres a positive addition to the working day, because it is a professional updating of the work in general" (nursing home nurse).

During the years of operation, the nurses in the LV centres have obviously learned a lot, and become experienced decision-makers. Besides, their medical experience has become more varied, and especially their ability to screen patients has been developed during the call-taking in the LV centres. One of the administrators in the Health Department in the city of Beecity refer an example:

> "For example, when there was a severe flu epidemic, doctors were put into the casualty unit in Beecity to screen the patients. But the nurses proved much better at screening patients than the doctors" (municipal health administrator).

The nurses have become so good at giving advice and performing a sort of preliminary diagnosis, that the doctors would not be able to do it better.

THE LV CENTRE AS THE DOCTOR'S ANTEROOM

The LV centre functions as anteroom for the doctor who is on duty that night. The doctor will usually drive from patient to patient (or use a taxi or an ambulance driver). Meanwhile the nurse at the LV centre will direct callers to the doctor, through radio or telephone.

> The telephone rings. The nurse manning the LV phone says, "Soovalley LV centre". The caller has a child with a cold. The nurse says it's doctor Deergood, who's on duty, but that he has patients at the surgery; she'll pass on the message and he'll come later. Shortly afterwards, the doctor calls and asks whether there have been more enquiries, and he receives the information from the nurse.

As in this example, the nurses do not call the doctor for each new request from callers, if there is no emergency. She writes down the callers, and gives the doctors the data when they want it. There have been situations where the nurse has not been able to reach the doctor on duty. The nurse gets stuck in the middle, between the caller and the non-available doctor. In such situations the nurse can reach a doctor via the AMK centre. Nevertheless, usually, the nurses at the LV centres will always make sure that the doctor is available when he is supposed to.

> "In this way, the system has "educated" the doctors. They always have to report that they're available when the shift starts, and if they do not, they're contacted by the nurse manning the LV phone. This is better than before when you never knew whether there really was a doctor on duty at all" (a nurse at one of the first nursing homes to run an LV centre).

But there are sometimes disagreements between doctors and nurses. The typical example is about the degree of urgency, which is one of the most important features in the LV nurse-doctor decision-making relation.

> "It's the nurse who gets the first impression of a caller who's clearly in a state of stress. When the doctor gets to talk to the person, he or she is a great deal calmer, and the doctor interprets a lower degree of urgency than the nurse" (a nurse manning an LV centre).

Also, there are sometimes disagreements between nurse and doctor on the priority between the various patients. The doctor makes the decision, but the nurse sometimes has to push in some direction, because she feels how desperate some people are, when they call the LV centre several times while they are waiting on the doctor to visit them. Like many other receptionists, the nurses at the LV centres function as "gate-keepers" (cf. Hvinden, 1994). The doctors use a local taxi because they are not familiar with the local geography. In the rural districts there is a high level of turn-over among doctors and there are also a lot of doctors from other countries, such as Denmark and Sweden.

> "Then it's often useful to have a Norwegian nurse present who can translate, especially for old people who often don't understand the other languages properly and are a bit deaf" (nurse at nursing home).

With the introduction of the LV centres, the doctors' traditional autonomy has been challenged. When they lose some of their independence, many doctors have been reluctant about the introduction of the LV centres. As one doctor said:

> "It was the doctors who were the greatest opponents of this system. They were worried about having the chance to decide for themselves taken away from them. They'd always relied on using the mobile phone, and were completely independent when it came to taking patients" (a GP).

The nurses have so to speak been struggling with the doctors' reluctance of letting the LV centres influence how they were going to serve their patients, who they were going pay a visit, who they would visit first, and when. In one of the first LV centres, the leading nurse said that,

> "[t]he doctors are quite difficult to handle; they have difficulty in adapting themselves. They're a bit slow, but the nurses manning the LV phones report what's being done so that puts a certain amount of pressure on the doctors. As everything that takes place is documented, the doctors haven't a leg to stand on if they haven't followed the procedures. However, there's a good tone between the doctors and the nurses. At first, the doctors showed a tendency to want to "decide the system", but things run smoothly now" (leading nurse of a nursing home department).

It has also been argued from the doctors that the equipment and the system have been too little developed, and that this was the reason why many of

them were not very enthusiastic. In many municipalities there has taken time to establish 100% geographical radio coverage, and there are still blind spots. Some of the doctors think that the hand-held radio units are clumsy, at least compared with the ever smaller mobile phones, and the batteries are not too good. How strong and credible these arguments are, varies among doctors. But still, the LV centres and the radio networks represent safety for the doctors. They have lots of resources available through the radio connection to the LV and AMK centres. As one doctor said:

> "What's good is that it's easy to call up more people in an emergency, get support from other doctors, or perhaps hospitals, the police or the fire service. For instance, it's turned out that many of the doctors have the device within their reach even when they're not on call. It's not possible to turn it off. This means that it's likely that the doctor on call can get help if he needs it" (municipal doctor).

The doctors' perceptions of and feelings about the LV centres are important in this thesis, as long as they influence how the nurses at the LV centres can operate them. As some nurses that operate the LV centres have to struggle with some few of the doctors, it makes it harder to combine the LV centre work with the nursing home work. For example, a nurse might have to use time to negotiate between hysteric patients (or callers) and unwilling doctors. The existence of the LV centre makes it actually possible for the slow-coach doctors to avoid some of the direct confrontation (by phone) with patients, and the LV centre nurses have to bear the brunt of this external interaction.

COMMUNICATING CARE THROUGH WIRES AND WIRELESS

One of the most important features of the work as an LV nurse is meeting the patients over the phone. To establish a common understanding of the patient's problem, nurses' communication with the callers is crucial. Before the preliminary diagnosis can take place, people at both ends of the line have to try to understand each other. In a nurse's orientation to understand a caller, she must raise at least three validity claims with his utterance (Habermas, 1984:99): "That the statement made is true [..]; that the speech act is right with respect to the existing normative context [..]; and that the manifest intention of the speaker is meant as it is expressed". In some cases, much concern has to be put into reaching some understanding with the caller, and ensuring that the situation is probably as it is described. In most of the LV centres the nurses are very concerned about getting this right, so they will be able to reformulate the call to the doctor, and maybe give a preliminary evaluation as well.

Most of the callers to the LV centres are directed to doctors (GPs or doctors on duty), and the nurse will often help the caller establish an understanding of the medical situation before she contacts the doctor. While the nurse's communication with the caller has an aspect of caring rationality, in addition to a scientifically based problem-solving approach (Ellefsen, 1996), the nurse's communication with the doctor is more based on the professional rationality of medical diagnosis, and search for practical solutions to the patients' problems. Usually the doctor will call the patient or visit him or her. But since before this stage the doctor does not have a first experience with the patient, he usually has to rely on the nurse's perception of the level of illness, and whether there is a need to hurry or if he can put the patient into the "the queue for the night".

Hamran (1991) discusses the communication between nurses in a hospital department, and she is especially concerned about the oral reporting sessions that are institutionalised in the departments, and the possibility of developing communication technology for those purposes. She discusses different forms of knowledge and their connection to different forms of communication. Specifically, the rationality of the oral reporting does not consist of the transfer of quantifiable measurements of patients conditions, but the development of common theories that is open for the subjective and particular (Hamran, 1991:76). One has to establish situations, where feelings and attitudes are expressed, so they are not just privatised and isolated from their context. The rationality of the oral reporting session is its potential for creating those arenas to reflect on and process knowledge, feelings and attitudes. That form of organisation makes it possible to evaluate one's own work and intuitive experience (Hamran, 1991, p. 76).

The caring attitude that the nurses take in relation to the callers, seems to make them vulnerable for the more scientifically-oriented doctors, that sometimes want to undertake their patient consultations in their own order. The nurse will often take the caller's side, because she has felt the uncertainty and even desperation of the caller. Traditionally, nurses often take the deferential role, especially in relation to physicians (Watson, 1985), which also can make it more difficult to handle the caller-doctor connection. This relation makes the nurse, representing patients or callers, very dependent on the commitment of the doctor.

DISCUSSION: SQUEEZED BY TECHNOLOGY?

From the reported observations and interviews with the nursing home nurses, we can read that the combination of working in the nursing home department and serving the LV centre is sometimes experienced as hard. Some

of the tasks at the nursing home are difficult to abandon in a hurry. As expressed by some of the nurses, they were not really asked if this was something they wanted, hence following the same depressing procedure as traditional system designs: There is no or little consultation with the users. This case, however, is different from many information systems designs, by the fact that this is not only a change in the old way to do things, but actually introducing a completely different working task to a work place. It is no surprise that the nurses were reluctant in relation to the introduction of the LV centres. After all, they were going to have extra responsibility for the same salary.

According to Ellefsen (1995), many of the leaders in the nursing homes (both nursing home leaders and department managers) are authoritarian and dominant. The expansive tendency among such a leader, her eagerness to manifest the nursing home's position as a resource in the community, may take priority over the nurses' scepticism towards new changes. Two examples of this expansive strategy of the nursing homes are the development of primary health care and the establishment of rehabilitation units. In many nursing homes these changes have happened at very short notices, and with little involvement from the nurses and nursing assistants (Ellefsen, 1995). There was also a strong pressure from the Health Directorate towards the municipalities to implement their LV centres. Thus, the LV centres have been implemented in a top-down way, by pressure from the government towards municipalities, and second, from the municipal doctors ("kommuneleger") towards the nursing home managers, and then from the nursing home managers to the nurses and nursing assistants, who were going to perform the actual work in the LV centres. In this light, the resistance among some nurses is understandable. It seems likely that the resistance has been as much connected to the way in which the LV centres were introduced, as to the LV centres themselves.

Many nurses report that they appreciate these new work tasks, because of the growing variation of nursing experience that the work in the LV centre involves. Some of the nurses values the extra contact with doctors because they are able to follow some of the doctor's work, in his conversations with patients. They say they learn something from this contact. Is there a *dedifferentiation* because of this? In some circumstances there probably is, because some nurses take the opportunity to work slightly towards a medical specification with the callers, before they involve the doctor. These nurses enhance their diagnostic knowledge in the direction of a doctor's, but it is very much up to the individual nurse. Nurses with hospital experience seem to have more guts to do this, because they do not exhibit the deferential attitude towards a doctor, and they may know that they have valuable competence, also for him. But it is the municipal doctor who designs the directions about how the nurses may work at the LV centres. In some communities the

nurses are not supposed to do anything than record the caller's phone number, and leave the rest to the doctor. Only callers who represent non-medical cases are not forwarded. In these situation the LV centre represents no de-differentiation potential between nurses and doctors.

It is not the LV centre *technology* that makes these differences in outcome. The *practice* with the LV centres is different in all municipalities, and it is because of municipal doctors with different attitudes to nurses' competence, different organisation of the nursing homes and individual differences between nurses. In the dialectic between technology and society, where both parts are influencing the other, the social context very much prescribes the difference between the LV centres. It is relevant and useful to view the LV centre as embedded in the organisational, social and individual context of nurses, patients, doctors, nursing home departments and communities.

Granovetter (1985) uses the term "embeddedness" in the case of economic sociology. His point is that economic transactions are embedded in networks of social relations, and that classical and neo-classical economics operate with an atomised, undersocialised conception of human action. I suggest that we use the concept also for technology, for example the LV centres. The LV centres, their development and use, are embedded in structures of social relations the same way as the economy is. The term embeddedness is used by Granovetter (1985) to emphasise how economic action is not only purely economical, but deeply situated in social relationships as causally prior to the economic transactions. Also implementation and the use of technology are embedded in structures of social relations. It means that the existing social structures to some extent constrain how new technical systems can be implemented and used. Hence, the practice of the LV centres is dramatically formed by the settled organisation and division of responsibility in the municipal health service.

As Sorokin claims, natural objects and phenomena change their natural qualities when they are connected to a system of meaning. A sheet of paper may have enormous power when it is signed by the president of United States (Sorokin, 1978). So also for the LV centres. They could have been used to change the municipal health service dramatically, if let in the hands of someone with authority. However, they are squeezed into a context where there are no extra resources for exploiting the potential of this technology. The use of the LV centres is so embedded in the interprofessional relations, the division of labour and the organisation of the institutions, that there is little profound change because of the centres. But as intended, patients who ring do meet a person, a nurse, at the other end of the line, and not a machine.

Thus, the introduction of the LV centres is an example of how a technical artefact is believed to have significant potential for change in itself, but where

the social system, in which it is introduced, has not enough space and need for it.

CHAPTER 4

"SO, IS HE IN A COLD SWEAT?"

TELEPHONE DIAGNOSIS BY NURSES

Many of the nurses who operate the LV centres, spend a lot of time to help callers on the phone. Especially the nurses who operate the LV centre from the AMK centre seem to be very good at screening or evaluating the callers' medical needs, and are rather close to making a preliminary diagnosis over the phone. By the use of the so-called "Norsk Indeks", the nurses can follow diagrams to approach a medical specification that is good enough to decide the degree of urgency for a case. The explicit evaluation work done by the LV centre nurses may expedite the change of division of labour between nurses and doctors. This chapter focuses on the conscientious performance of evaluation tasks in the LV centre, the making of autonomous nurses and the division of labour in medicine. How do the LV centres operate in an existing settled network or hierarchy of medical professions? How is the established division of labour affected by the establishment of the LV centres? How far is it possible for the nurses to go, in the direction of performing diagnostic tasks? Why did doctors develop the "Norsk Indeks", a tool that makes it even easier for the nurses to "take their job"? Is the nurses' practice in the LV centres really changing the roles in the "doctor-nurse relationship"?

In the previous chapter, we have discussed some special circumstances of locating the LV centre in a nursing home. However, in this chapter, most of the data is collected from LV centres that are located together in the same room as AMK centres, which I refer to as *LV telephones*. One of the important features of this LV telephone is that it is operated by one of two nurses. The two nurses at the AMK centre share the serving of the AMK and LV services, but one of the nurses, "AMK-nurse2", is responsible for the incoming LV phone calls and the other nurse, "AMK-nurse1" is responsible for incoming 113 emergency calls. The division of responsibility and the organisation of the AMK centre is further discussed in Chapter 6. Here, I only focus on the work with the LV telephone, and not the other parts of the AMK centre. In one of the sections I will also refer back to the LV centres located in nursing homes.

CATEGORISING PATIENTS ON THE PHONE

One of the basic ideas behind the LV telephones is to screen patients to decide the level of urgency; how seriously ill or hurt a patient is.

> A little boy has found what is probably an empty bottle of windscreen washer liquid and has been licking it. His mother rings the LV telephone because the boy has complained of a bad taste in his mouth. The mother doesn't know whether he had swallowed any of the liquid, but is worried. The nurse consults the poison index, rings others who should know and discusses the matter with colleagues at the AMK centre before finally giving the mother, who is holding the line, an answer that satisfies her.

Like in the above situation, it is typical that many parents call the LV telephone because they are worrying about their child having eaten something poisonous, being seriously ill, or having hurt themselves badly enough so that they should see a doctor. The nurses handle many of these calls without having to involve the doctor, by using written sources of information, discussing with the other nurse at the AMK centre, and using their own judgement. It seems obvious for the nurses that many calls concern bagatelles, but they are responded with seriousness. After all, everyone who calls is genuinely worried about their child. By using their experience and support of medical references, the nurses are capable of helping many people only by the phone, and many unnecessary doctor consultations are avoided. For safety reasons it is a basic rule that the nurses are very careful about evaluating patients as less serious than may be the case.

Generally there is a lot of medical discussion at the centre, and the concrete cases are used to learn more about what sort of advice should be given. Also the nurses follow up patients, calling them back to check how things are going. Especially there are a lot of elderly people who call the LV phone, and they may be worried to call again to the LV telephone even if they feel

worse than when they called in the first place. They do not want to bother the nurse when it might not be necessary. Other people call the LV telephone a second time when the doctor is delayed, and he often is. Besides, many elderly use a lot of medication, and for them, the nurse at the LV telephone may give advice for specific problems.

> At 11.15, a heart patient rings. The nurse learns that he has taken nitro-glycerine without feeling better. She asks him to take another tablet while she is holding the line.

The LV telephone gets such calls all the time, and the callers are usually helped "on the spot" by the nurses on the LV telephone. People need help to evaluate their medication, in the same moment as it is used. Thus, the LV telephone gives the elderly an opportunity to get help from a competent person, without delay. Other people call to ask about medicament use - what can one use for this and that - how many pills can one take? In this sense, the LV telephone works as a knowledge bank for medical questions, a *medical oracle*, only a phone call away.

Many of the calls that are received by the LV telephone in daytime should be directed to the caller's regular general practitioner. However, there is a heavy load on many of these GPs, so people call the LV phone as a last solution. The nurse at the LV telephone may help them to get an appointment with their GP, as she has access to a "back room" telephone in the GP's office. It means that they can get through even during lunch breaks and at other times when the GP's phone is not answered. Some patients are helped through the system this way, if they have symptoms that the LV nurse evaluates as serious, as the nurse has to bring such arguments in the GP's back room telephone.

When answering the LV telephone, the nurses are very conscientious to solve the caller's problem, even if it takes some time. One of the situations that I observed was especially intensive because the doctor was not available at the time of the call (as he attended a meeting). A mother of a 13-year-old epileptic boy calls the LV telephone because the boy has come home from school with some strange symptoms.

> AMK-nurse2 answers the emergency phone. It's a mother who's wondering what's wrong with her son. She tries to get the mother to test what it can be. "If you take both his hands Ö and he pinches hard with them both? See whether he's got just as much strength in both hands. Then you pinch the skin on both his arms. See whether he feels it equallyÖ" She turns to nurse 1 (Ann): Ann, I've got a mother on the phone here, who has a 13-year-old epileptic son, and he's come home from school, dizzy, has a headache, and feels numb on one sideÖ." Ann goes over to nurse 2 to look at her notes, but just afterwards becomes engaged with another call. The mother is still on the line with nurse 2. "So he's got a bit Ö has he the same strength in both hands? Get him to pinch hard with both hands - but what do *you*

feel? Ö that he pinches equally hard? You think so? Is he pinching really hard? Does it hurt your hands when he pinches? You don't think there's any difference? Ö. No, *your* hands. Do you think he's pinching you really hard? So he's got plenty of strength in his hands anyway? Both hands? Right, now you pinch him on the back of both hands, and ask him whether he feels any difference between right and left Ö So it's not that he hasn't any feeling in the skin on one side? Ö. Both eyes, or is there any particular side?Ö. If he holds his hand over one eye, does he see clearly then? And then he changes to the other sideÖ.. His skin's not numb anywhere? Ö Can he stand and walk?Ö..Can he move?Ö.If he gets up, can he move equally well on both sides? ÖIf he stands beside the bed, can he move his legs equally well? ÖGet him to stand up beside the bed. Ö You know, it's important to get some information about this. ÖYes? And it went O.K.? Can he move forward a bit without any problem? Ö Does he look any different when he walks? He doesn't walk in a funny way? .. Is he pale? .. No. What's his voice like? Ö Is he in a cold sweat?Ö And he has a headache". A call comes in on the 113 (medical emergency number) line, and nurse 2 has to follow the Listen-All, so she tells the mother: "Just hold the line, don't hang up.", but a moment later she says "now I'm back .. Where does he ache in his head? Behind his eyes, yes. Can I have the date of birth of your son? Ö And your telephone number. Hold the line, and I'll be back, don't hang up."

Nurse 2 turns to nurse 1: "AG, this boy here, what shall I do with him, he's got a headache, he feels dizzy, he feels funny on one side, he hasn't anything wrong that his mother can tell by pinching and Ö"
Nurse 1: "pins and needles?"
Nurse 2: "No".
Nurse 1: "No? ...What sort of feeling Ö?"
Nurse 2: "He feels that one side doesn't function as it shouldÖ"
Nurse 1: "Can he pinch?"
Nurse 2: "Yes, he can pinch Ö Purely objectively there's nothing wrong with him, but he feels himself that there's something wrong. He sees a bit oddly with one eye, not a cold sweat, he was seen by the health nurse and then he came home, and she's spoken with their own doctor and he said he would ring straightaway."
Nurse 1: "So their own doctor hasn't seen him?"
Nurse 2: "No."
Nurse 1: "Where is he?"
Nurse 2: "Haven't asked, but they've got phone number 12121212."
Nurse 1: "That's up near where I live. What's his name?"
Nurse 2: "Ole Olsen"
Nurse 1: "Doctor Manson isn't available?"
Nurse 2: "No, he's not available."
Nurse 1: "No, I'd almost Ö no, if he can't get to their own doctor Ö we really ought to have a doctor to see him Ö"
Nurse 2: "Yes, I really don't think we ought to wait."
Nurse 1: "We can get him down here and tell "casualty" that they've got to take him in here then, they'll almost have to

> take him in when we don't have a doctor in town who can look at him. Yes, do that."
> Nurse 2 puts the mother on again: "I've been discussing it with a colleague here, and we've agreed that it's best that you bring him here so that we can examine him properly. Ö. Can you do that? Ö . I don't think you ought to wait *so* long, no Ö. I'm sure everything will be O.K., but since I can't see him, I think you ought to come here as quickly as possible so we can examine him here Ö. No, but can't you take a taxi? Ö . Yes, and I'll tell them you're coming into "casualty", in the emergency unit Ö I'll tell them you're coming Ö O.K? Bye."

In the 10 minute conversation between the mother and AMK-nurse2, the nurse gets the mother to do tests with her son, so that the nurse can try to specify what kind of problem the boy has, to make an evaluation or preliminary diagnosis. It is difficult for her to get the mother to understand both how to perform the concrete tests, and the importance of the tests. From the test results, the nurse cannot conclude anything specific, and she has to try to involve the AMK-nurse1. Rather early in the conversation Mary tries to get AMK-nurse1's (Ann's) opinion on the case. However, before Ann is able to reply on the case, she gets an emergency call that she has to answer.

It takes some time before she is back. Meanwhile, she clearly shows that she is not yet ready to get involved in the evaluation of the boy in the LV telephone, by avoiding looking invitingly in the direction of Mary. Ann discusses a concrete ambulance requisition problem with the ambulance coordinator, who is sitting on the opposite side of Ann than Mary. When Ann and the AC have solved the problem, Ann significantly turns to Mary. She also stands up beside Mary to be able to look at the notes that Mary has made about the boy in the mean time. By the body movements, she is able to maintain her separate orientation (Suchman, 1996:47) with a boundary between her own position and Mary. Ann asks Mary to introduce her to the evaluation of the boy, by turning her body and her chair towards Mary, in such a way that Mary certainly notice Ann's willingness peripherally (as Mary is talking on the phone and writing notes). From that point both the nurses are 100% involved in the evaluation of this case, and they reach a conclusion, not a diagnosis or a specification, but give the advice that the mother comes with her son to the hospital. Mary has at that moment spent about ten minutes with this task, instructing and actually pushing the boy's mother to perform tests on her son.

A parallel to the development of this kind of patient evaluation over the phone is the growing use of *Telemedicine*, "the use of telecommunication technology to assist in the delivery of health care" (Conrath *et al.*, 1983). The idea is not new. Very soon after the invention of the telephone, experiments were made to transfer heart and lung sounds to a skilled specialist who could give an opinion of the state of the organ (Nymo, 1993). Wilhelm Einthoven (1906), who invented the electrocardiograph, started experiments

with remote consultations via the telephone network. In Norway, the first use of telemedicine was established in Bergen, where ships at sea could consult physicians at Haukeland Hospital via Bergen Radio in case of accident and illness (Nymo, 1993). Physicians not only contributed with diagnosis and proposals for treatment, but also complicated surgical operations were performed by help of instructions via radio (Rafto, 1955).

The Norwegian Telecom (Telenor) has been working with experiments, development and implementation of telemedicine in the northern parts of Norway, where distances are large and doctors are few, since the mid-1980s. The aim of this work is to more efficiently exploit the available health resources, also for people in rural areas. By now, tele-pathology and tele-radiology have been developed, and systems have been commercialised and are currently in operation. Tests from the area confirm that the system renders a satisfactory quality of medical services (Nymo, 1993). When a patient needs to consult a specialist, information about the patient is obtained locally, with the help of the general practitioner, and the information is exchanged through a network to a specialist (From, Stenvold and Danielsen, 1993).

The development of the AMK and LV centres has not been part of the telemedicine projects, but there are some interesting similarities and differences between the diagnosing by tele-networks that are done by specialists in telemedicine practice, and the advice that is given to callers by nurses in the LV centres. It is reported from the general practitioners who are involved in telemedicine work, that they acquire more varied medical expertise because they participate in the specialists' examinations, as their distributed hand (Pedersen and Holand, 1993). It is actually the same effect as is reported by the LV nurses, that they learn from listening how the doctors specify symptoms by asking a caller on the phone (Chapter 3). Hence, the experience from both the telemedicine projects and from the LV centres shows that it is actually possible to work out certain kind of diagnosis or evaluations by other media than face-to-face communication. In the situation described above, where the nurses try to evaluate the epileptic boy, the situation is significantly different from the new telemedicine tests. In the case above, it is the mother of the son, a layperson, who performs the tests, to be evaluated over the phone by nurses. In the telemedicine cases, tests are performed by for example a GP, and information from these are mediated through an *audio-visual* medium, and evaluated by for example a hospital specialist. However, the principle is the same, the patient is helped to get an evaluation or a diagnosis in his or her own home.

In telemedicine it is not the idea to replace the face-to-face communication or to replace the physician or other health workers (Nymo, 1993), but to use a potential in the technology to increase the availability of health resources. It

is also believed that telemedicine will be an aid to improve standardisation of treatment and control procedures for medical treatment plans (Pedersen and Holand, 1993). In the AMK and LV centres, one such standardisation is "Norsk Indeks".

"NORSK INDEKS": REVEALING THE MYSTICISM OF DIAGNOSING

A heavy load is put on the nurses' shoulders with the introduction of the AMK and LV centres. Nurses are in fact asked to take decisions that one would otherwise expect that doctors made. One of the important decisions is the degree of urgency, but there have been variations in how doctors and nurses have decided the urgency of a case. Many of the nurses have been frustrated because doctors did not learn the different definitions. The urgency degree determines for example if an ambulance should use the flashing beacon or not. The nurses also give a lot of advice to callers, and of course there will be variations between this advice, as there are variations in the advice from different doctors.

To standardise the quality of medical evaluations in the AMK centres, the Norwegian Medical Association ("Den norske lægeforening", 1994) developed the system called "Norsk Indeks" (Norwegian Index for Medical Emergency Assistance), hereafter called "NI". It is supposed to help nurses and doctors perform and exchange diagnosis over the phone. The NI is unique in the way that it represents a national consensus in the area of diagnosis, and is developed by anaesthesiologists and general practitioners. It is constructed as a hierarchy of questions[14] that one can follow to gradually specify a diagnosis from symptoms described by the caller. The NI is compiled as a book, but is also developed as computer software that may be combined with standard medical software. With NI, all nurses should be able to differentiate between patients who need the ambulance, or the doctor and those who do not. I had one of my observations just after there had been some local cases of meningitis[15], and there had been written a lot about it in the press. There were quite a lot of callers, and NI was regularly used to differentiate between callers with this disease and those that just had caught another cold.

> "Can you bend your head down to your chest, or are you too stiff in the neck? -- Well then, it's not Meningitis, anyway".

The NI is also useful when the caller does not speak Norwegian, because the questions are also in English. The NI is now widely used at the AMK cen-

[14] Two pages of NI is displayed in Appendix 2.

[15] Brain fever, "hjernehinnebetennelse".

tres, but is not considered obligatory in most cases. Many of the nurses do not want to use it as a standard because they feel more comfortable with the use of their own medical knowledge and experience, than "reading from a book". Nevertheless, many nurses use the book as a *post-decision quality control*, to check their own medical decisions and to learn more about concrete cases after they have passed callers on to the doctor. In the LV centres the NI is not a standard, because the nurses let most of the callers speak with the doctor. However, also many nurses at LV centres use the NI as a knowledge bank and reference, and as a translator.

The fact that the Norwegian Medical Association has developed a guide so that nurses can perform diagnostic tasks is interesting in itself. What makes the doctors willing to give some of their expertise in a systematic form to the nurses? Traditionally the doctor has had the role of the superior, and performed his role almost as a *medical artist*, capable of taming the mysticism[16] of medicine. Hospital administration and nurses were at his disposition, although he was more committed to his professional ethics than to any institution (Berg, 1991:165). Being more cosmopolitically than locally oriented (Gouldner, 1957), the doctor had more contact with other doctors in other institutions than other non-doctors employed at the same working place (Kimberly and Evanisko, 1981), and he would picture himself as a institution-independent (Goldberg, Baker and Rubenstein, 1965) professional. This professional, independent, and cosmopolitical orientation stems from the time when professional work mainly took place in small solo offices (Abbott, 1988).

But still, in any discussion of a hospital's resource allocation, doctors tend to use their professional (medical and ethical) commitments as heavy arguments against for example cut of costs in medical departments. There are now some trends towards a decrease of autonomy for the doctors. According to Berg (1991:166) this situation, the "medicracy", has been dissolved from both above and below. The directorates and managers of hospitals are more often lead by economic and political constraints, and medical reasoning has to follow these. The medicracy has been dissolved from below by the tendencies of nurses and other service personnel, to no longer have the deference towards to the doctors' "instructions", but to develop their own professional discretion. In anaesthesia and surgery departments, specialist nurses are responsible for technical functions, and these functions are now generally considered as a nurse's tasks. The medical culture has lost some of its character as a strong and individually committing culture of responsibility, to become an employee culture. The professional standardisation of medical practice is one of the processes that has changed the culture. Berg

[16] It is also claimed, by Posner (1977) that magical elements in medicine are still preserved, where there is little scientific justification for the medical action taken.

claims that the increasing use of electronic journal systems will take away much of the rest of the mysticism of medical practice (Berg, 1991).

But on the other hand, the doctors have for a long time claimed their "jurisdiction" (Abbott, 1988) over certain tasks, i.e. they have asked society to recognise the profession's legitimate control of a particular kind of work. Also, the profession's "license and mandate" (Hughes, 1958) set up the legal authority for the profession to recruit, train, examine, license, and review performance. With the license and mandate the formal limits of its exclusive jurisdiction is set up (Freidson, 1994). Hence, along with the rights to perform the work as it wishes, the profession claims rights to exclude other workers. The jurisdiction secures the doctors' right to exclusively practice medical tasks, and it also maintains their superordinate position to the nurses, since the nursing profession has had to submit to the subordinate position within medicine.

Because of the extreme formality, the legally established world of jurisdiction is a fixed, static world that rejects the living complexity of professional life (Abbott, 1988:64). When new professions claim jurisdiction, it is almost impossible to overlap or challenge already existing professional jurisdictions. One possible strategy for new professions is then to claim a limited settlement, subordination. Miss Nightingale envisioned a nursing profession as an administrative and custodial equal with the medical profession, with independent authority and training. That vision was unacceptable for the medical profession, and the result was the subordination of nursing under medicine (Abbott, 1988).

In the workplace reality, however, the boundaries between professional jurisdictions tend to become blurred, especially in overworked work-sites. There is knowledge transfer between the professions, and a degree of workplace assimilation (Abbott, 1988). Especially at night, when there are few personnel, the boundaries between professions become less distinct. But the excessive assimilation of professional knowledge in the workplace is successfully hidden from the public, and so the public fiction survives that only doctors can do certain kind of things, even when nurses and others are in fact doing these tasks all over the professional world. And since the public believes that nurses are subordinate to doctors, it also believes that all nurses know less than all doctors about all medical questions. Many of the nurses in both LV and AMK centres do a little bit of the doctor's work in diagnosing. The use of NI gives the nurses systematic knowledge of the diagnosing work, and in that sense the NI contributes to the demystification of the doctors' practice in diagnosing patients.

As mentioned above, the Norwegian Medical Association is responsible for the development of NI, and one can ask why they unveil one of their most

important professional authorities. Ironically enough, it is the medical profession itself that is responsible for most of the unveiling strategies (Berg, 1991). Nevertheless, in the age of expert systems and development of artificial intelligence it seems like a good strategy for a profession to keep control of their trade by being the initiator of automation, rather than the victim of it (MacDonald, 1995:172). The doctors may benefit from the development of NI, for example by delegating the less interesting and routine activities to nurses at LV centres, but keep control of how the nurses perform the tasks.

An analogy of the specification with NI is the development of the two types of numerically controlled (NC) machine tools. The first type, the "record-playback" system, involved the machinist making the first batch of components in a conventional way, using the machine manually. All the machinist's movements were recorded electronically so that the rest of the batch would run automatically. The other type of NC would read ready-made programs via paper tape, which the operator simply loaded into the machine and unloaded - the rest was automatic. According to Noble (1979), it was only political and social considerations that made the second type the more used (in America), as it meant that control over the quantity and quality of production could be taken out of the hands of the skilled machinists on the shop-floor, and placed in the hands of the programmers. The programmers were assumed to be more management-oriented and less problematic to deal with (Wilkinson, 1983:88). This argument also follows Braverman's (1974) critique of directive documentation as an attempt to rationalise the work process, according to a scientific management tradition, to increase independence of skilled labour. In the same way as the programming type of NC was chosen in America to maintain management control, the doctors can "program" nurses' evaluation work by the introduction of NI.

It is also explicitly pronounced that some nurses think that the use of NI is problematic, as it binds them to rigid practice of patient categorisation. However, the nurses do not apply NI as a self-contained instruction of how to perform patient categorisation, as they usually try first to specify illnesses and casualties without using NI. To let untrained personnel perform diagnosing tasks over the phone by the use of NI would be unthinkable, as the NI is made for health personnel that can use their professional knowledge in addition to NI.

According to Garfinkel (1967), self-contained instructions are impossible, and as suggested by Orr (1996) in a study of photocopier technicians, the knowledge relevant to the job of diagnosis (of Xerox machines) cannot be precisely defined. The same seems to be the situation for the nurses that operate the LV telephone, as we will discuss further.

THE MAKING OF AUTONOMOUS NURSES[17]

One of the big challenges for the nurses has been to overcome the fear of having this new responsibility. Many nurses have been almost terrified of the centre and its powers. One of them said:

> "I was a bit "scared", it was "frightening"". What would you do if you couldn't get hold of the doctor? You almost didn't want to go to work" (nursing home nurse).

And the nurses have really been given much responsibility. They can put a lot of machinery to work, as they can request ambulance, police, fire departments and others. Traditionally they have been used to make decisions on how to give all patients best possible care, in cooperation with a physician, and as well under close instruction of and by the teaching under a physician (Keddy *et al.*, 1986). Now, with the responsibility of the LV centres they are to some degree left alone with some of the decisions, even though the doctor is usually only a phone call or radio connection away. They have to manage the LV centre in the first place, somehow. This change of a nurse's role is maybe a more general trend.

Wheeless, Wheeless and Riffle (1989) emphasise the need to leave behind the traditional role of the nurse, and the nurse's decision making style. Traditionally, they claim, nurses were not supposed to make medical decisions on their own, but they should rely on the physicians' decisions. There had to be no disagreement between doctor and nurse, and if the nurse wanted to communicate her recommendations, she had to do it without appearing to make any recommendation statement (Wheeless *et al.*, 1989:191). She had to perform the "doctor-nurse game" properly, as suggested by Stein (1967). In the rules of this *game* the nurse would know that making a suggestion to a physician would be equivalent to insulting and belittling him (Stein, 1967:703). Even if the nurse thinks she knows better than the doctor, because she has more contact with the patients, she has to carry out the doctor's orders because the doctor is defined as superior, and it is on the basis of his greater knowledge and competence that decisions should be made (Rushing, 1962).

Contemporary medical models of work distribution point to a more collaborative joint decision-making process between nurse and doctor, more autonomy for nurses in decision-making and intervening in health care decisions. In a statistical study of nurse decision styles, Wheeless *et al.* (1989) found that the nurses' freedom to make decisions is greater when the physicians are responsive to nurses recommendations and when there is not a climate of so rigid rules in the work place. In an observational study of the interaction

[17] In this section, the autonomy of both the nurses in the LV centres in nursing homes (Chapter 3) and LV telephones is discussed.

between physicians and nurses in a casualty department, Hughes (1988) found that in many circumstances nurses perform tasks of diagnosis and treatment to a larger degree than traditionally expected. In his study, he found that nurses often take a lead in the search for information in the early stages of "processing" the patient. They undertake physical examinations, search handbags and pockets for medication, drugs, cards detailing illness conditions, identity information and the like. They may make telephone calls to the local psychiatric hospital, and all this detective work leads them to make a provisional diagnosis on their own.

Many of the evaluations made by nurses are based on everyday knowledge more than medical knowledge, and draw on their previous experience with handling people[18] in the ward (Hughes, 1977). All these sources of information are used to gather as much basis data as possible that is used by the doctor for diagnosing. Hughes (1988) also observed that nurses themselves decide for example that EKG will be required, and even carry out the investigations to have the results ready when the doctor arrives. They also prepare equipment and get the patient ready, before the doctor has been involved. However, in interviews with nurses, Hughes (1988) found that they did not count themselves as taking part in diagnosing because they did not inform the patient nor make any firm pronouncements about it. In the same way, a nurse in one of the AMK centres told me that the use of "Norsk Indeks",

> "....is not to give a diagnosis, but only to give a response to the bodily signs as described by the patient or the caller".

The variations in the casualty department studied by Hughes (1988) has to do with the doctors and the nurses. Especially *senior* nurses would do more diagnostic tasks autonomously for inexperienced doctors. Also for the "rusty" doctors, older doctors without local experience, the nurses would in some way show them how things were normally done in the department.

Also, in the LV centres there are large variations on how much advice is given from the LV phone. In some municipalities, there are rigid instructions from the municipal head physician to leave all decisions to the doctors. In other situations the nurses are given an advisory role that they can perform when they feel safe enough. As suggested by Singleton and Nail (1984), nurses have traditionally had little autonomy in health *organisations* (typically hospitals, where the physicians have had the leading role), whereas

[18] Nurses and other staff in the casualty departments and hospital emergency wards have to apply their non-medical knowledge as the first screening criteria to identify "deviant patients" (Jeffrey, 1979), "problem patients" (Mannon, 1976) or "malingers, hypochondriacs and troublemakers" (Hughes, 1977). These categories of people are usually not considered real patients and are treated by "cool speedy care" (Mannon, 1976) to get them out of the emergency ward as fast and safe as possible. It is assured, nevertheless, by using as little resources as possible, that the patient is not genuinely ill.

they have had, and still have, a relatively autonomous position in relation to the *nursing practise*, how they solve the task of patient care (Ellefsen, 1995). They make decisions of giving supportive care, therapeutic questioning, performing caring behaviour through verbal and non-verbal actions, explaining treatment in daily language, observing expressions of needs, initiating diet schedules (Singleton and Nail, 1984), and so forth. Similarly, Nelsen (1997) found that EMTs (emergency medical technicians, i.e. ambulance personnel) in practice performed a lot more autonomous medical role than as stated in directions.

According to Ellefsen (1995:125), the management (i.e. leading nurse) in nursing homes is often formalised, centralist and authoritarian. Nurses and nursing assistants have little autonomy in their work. However, operating the LV centre involves a form of organisational decision-making, which involves directing other distant actors in a greater extent than in the nursing home department. Even though the physician on duty is supposed to take the necessary decisions, the nurses will have the first knowledge from the caller, hence will have to decide whether to direct him to the doctor or not, and decide the degree of urgency, at least on a preliminary basis. Since the nurses in the nursing homes are superior to the nursing assistants, they are used to some managemental work tasks, but their decision-making is about colleagues and patients that they know well. Serving the LV centre is decision making about patients they do not know, in cooperation with doctors that they do not usually work with. Also, the nursing home nurses are used to the more relaxed environment, which is far from emergency work. It is necessary to have a shift in ones mental model to manage both the LV centre and the internal life in the nursing home.

The introduction of the LV centres in the nursing homes conforms with the increasing autonomy for the nurses and the more emphasis on scientifically rational decision-making in the nurse profession, as is claimed by Wærness (Martinsen and Wærness, 1991). However, as we have seen in Chapter 3, the operation of the LV centres in the nursing homes is in conflict with the normal procedures, as they are carried out, in the nursing homes. The effects are varied, though, as the nurses are flexible and able to use several types of logic, or rationality. Both the scientifically rational decision-making and the rationality of care (Wærness, 1984; Davies, 1995) are used in the nursing practice (Ellefsen, 1996).

ROUTINISING EMERGENCY

The role of the nurse has always been to care for the patient, and the caring philosophy seems to be more emphasised in the way the nurse handles the LV telephone than the way the physicians handle their patients. The care by

the nurses is observed in the way they comfort and try to calm down the patients or callers, still many of the callers may feel that, because of this "relaxing attitude" that the nurses apply, the nurses take a detached and objective attitude to their emergency. At the AMK centres there are incoming calls almost continuously, ranging from the most urgent 113 calls to the plain doctor requests. To a great extent receiving emergency calls and the handling of patients have to become routine. But the routine handling of someone's urgency may be difficult for patients or callers to handle[19]. Hughes (1971) has discussed this problem.

> "In many occupations, the workers or practitioners (to use both a lower and a higher status term) deal routinely with what are emergencies to the people who receive the services. This is a source of chronic tension between the two. For the person with the crisis feels that the other is trying to belittle his trouble; he does not take it seriously enough. His very competence comes from having dealt with a thousand cases of what I like to consider my unique trouble. The worker thinks he knows from long experience that people exaggerate their troubles" (Hughes, 1971:346).

The nurses in charge of the LV telephone also have to relate to the doctor's routinisation in the second place. While the nurse evaluates a crisis described by the caller, the doctor evaluates the crisis, as described by the nurse. Both the nurse and the doctor struggle to maintain control over their decision about what to do. The doctor will struggle to keep control over the disposition of his time. The non-consensus that the caller may feel when the nurse is routinising (making habitual) his emergency (Robboy and Goldstein, 1991), may be felt by the nurse as well, in her contact with the doctor. The nurses sometimes try to push the doctors, when they do not agree with the doctors' priority on patients. In the following situation in an AMK centre, the nurses did not agree at all with the doctor's decision.

> One young man was found dead by his brother in the bathroom. The brother called the AMK centre to get help, and the AMK nurse would like to send the doctor immediately to confirm death and to help the next of kin. The doctor, however, would rather take this visit later at the evening, since the man was dead already after all. The nurses in the AMK centre could not understand this attitude, they were shocked and were discussing it with another.

The LV nurse comes very close to the caller, as the service of the LV telephone implies first-hand confrontation with the patients or the caller (caretaker). They have the direct emotional contact that make nurses take the caller's side, more than a doctor would, who gets the message only indirectly. The nurses are trained to take the caring role, but the caring attitude is sometimes difficult to translate into persuasion of the doctor on the other

[19] It was demonstrated to the extreme in Whalen, Zimmermann and Whalen's (1988) study of an emergency call for ambulance where the caller wasn't able to accept the nurse-dispatcher's routine questions and the nurse-dispatcher was not able to tolerate the caller's desperation, and probably because of this, it all ended in a tragedy.

end of the telephone or radio connection. Doctors are primarily expected to be technically competent and efficient, and are only secondarily expected to provide care. Moreover, they have less extensive contact with patients than nurses. Hughes (1971) discusses nurses as "shock absorber[s] between doctor and patient", referring to utterances of nurses themselves. In the development of the AMK centres, there is a question whether this nurse function is even more accentuated by spreading this part of the nurse role from the hospital sector into the primary health care.

DISCUSSION: AUTONOMY GENERATED BY TECHNOLOGY?

As we have seen in this chapter, the nurses who serve the LV telephone in the AMK centre may appear to be rather autonomous, as they give advice to patients, like any doctor would. But is it because of the use of their new technology that they have this opportunity to autonomous work, or is their work autonomous, anyway? As we have seen, especially from the studies by Hughes (1977;1980;1988), nurses perform evaluational tasks that are used as information for the doctors in their diagnosing of patients. But these tasks are often handled by the nurses in a way so that the traditional division of labour between doctor and nurse is maintained (Wheeless *et al.*, 1989; Stein, 1967). Thus the traditional authority of doctors is not challenged. A nurse may be careful not to present explicit recommendations to the doctor, even though she may have more experience of the specific case at hand.

In the work with the LV telephones, the nurses have the initial contact with the patients, just like in the cases in the casualty department studied by Hughes (1988), and which is usual in hospital departments. As well as in the casualty department, the nurses of the LV telephones collect as much information from the patients as possible (or necessary). The nurses use this information to decide whether or not the doctor should see or be involved in the case, and how urgent it is. As described above, an LV telephone nurse may use a lot of time and effort to specify a patient's symptoms. It might be more difficult for the nurses to make "disguised recommendations" over the phone than for example face-to-face in a casualty department, where non-verbal communication may extend the meaning of the words. However, the nurses usually give the doctor a summary of the information collected, and she will emphasise what she thinks is important and omit what she thinks is superfluous. In that way, by presenting her own version of the patient description, she can in an implicit way tell the doctor what she would suggest that he did. Moreover, the doctor at this stage has no direct contact with the patient, and he has to rely on the nurse's competence. In these cases, where the nurse collects information that is forwarded to the doctor,

the distribution of responsibility between doctors and nurses is rather similar to the one in the casualty department described by Hughes (1988). The technology of using the LV telephone may have increased the availability of a "virtual" casualty department for people, but the doctor-nurse relationship is very much the same. As pointed out by Nelsen (1997), even if the EMTs (emergency medical technicians) would perform their practical job fairly autonomously, they would merely be legal agents of the physician.

However, as described, there are many cases where the callers to the LV telephone will neither be connected by telephone nor visited by the doctor. The callers get advice from the nurses that is sufficient to solve the callers problem, at least temporarily. As described above, the nurses may give advice concerning medication, for example help elderly to dare to take an extra nitro-glycerine. In such cases the nurses operate the LV telephone as independent medical oracles, which is a new role for nurses. Many nurses are able to give competent advice, because of their long experience as nurses, for example from emergency wards or casualty departments. Besides, they may use NI to check their evaluations. In these cases I find it reasonable to say that there is a trend towards dedifferentiation as a result of the use of the LV telephone. It is appropriate to term this dedifferentiation because the nurses expand their working practice into, or in the direction of, the area that has traditionally been the jurisdiction of doctors.

But this is not an *effect* of the LV telephone itself, but a consequence of the way the LV telephones are *practised* by nurses who feel safe with their competence as nurses and who may also enjoy the benefit of secure social and professional back-up from another nurse in the AMK centre. Under such circumstances the LV telephone really fulfil a function of delegated physician's work.

CHAPTER 5

"HANG ON, I'LL PUT YOU OVER TO THE DOCTOR."

VARIATIONS IN THE NURSES' INVOLVEMENT IN LV CENTRE OPERATION

The two previous chapters have shown that the LV centres and LV telephones are operated quite differently. The nurses operating the LV telephone at the AMK centres seem to perform the task of screening callers. Whereas the nurses at the LV centres in nursing homes seem to be more reluctant to give advice to callers, and many of these nurses direct all questions straight to the doctor. One of the problems that the nurses report, is that they are worried about information confidentiality in the LV centres, as personal information is passed on via at least one extra mediator. This chapter focuses on how the LV centres and LV telephones are operated in relation to social, individual, institutional, and interprofessional situating. Focus is placed both on the nurses' redefinition of the LV centre technology in their working places and how nurses define their work in relation to the LV centres. In other words, the effect this has on the operation of the LV centre and the availability of health resources.

As we have seen in the two previous chapters, the LV telephone at the AMK centre tends to work quite differently from the LV centre in nursing homes, although they are supposed to serve the same function, to give competent advice and connect people to the doctor if necessary, at any time. In the nursing home LV centres the nurses forward most of the calls to the doctor, but some nurses discuss problems with patients. When LV calls (i.e. questions for the doctor) are received on the *LV telephone* at the AMK centre, the nurses there usually give more advice and assistance directly than the nurses at LV centres. The nurses manning the LV telephone sometimes reach some form of preliminary diagnosis, and they often use NI to do this. They also follow up patients on the telephone, for instance on medication, as described in Chapter 4. Nurses at the LV centres in nursing homes do not usually provide this kind of service, although one should expect that they were competent to do so, having the same education and knowledge as other nurses. Also, and what is very important, the technology is basically the same, although implemented on a larger scale and in a different social context in the AMK centres than in nursing homes.

The differences in practice of LV telephones (in AMK centres) and LV centres (in nursing homes) may have several possible explanations. These explanations are social, individual, institutional and interprofessional, and are matters that will be discussed in the following sections.

SOCIAL COUPLING OF WORK TASKS

One of the most obvious differences between the AMK centre and the LV centre is how differently these functions are operated socially. The nurse who operates the *LV telephone* is a part of a knowledgeable team, consisting of one other nurse and the ambulance coordinator at the AMK centre. How the *AMK team* works in emergency situations will be more closely examined in Chapter 6, and here we are concerned about how the team works between those situations, when the more routine requests for a doctor are received. In all the AMK centres that were studied, more time is actually spent on handling LV requests than emergency calls. When there are several nurses in the AMK centre the nurses may serve this function more or less with random task responsibility.

Much of the empirical work was undertaken in an AMK centre that is manned by two nurses and one ambulance coordinator. In such an AMK centre, one of the nurses, the AMK-nurse1, has the main responsibility for answering the 113 emergency calls. The other, AMK-nurse2, is mainly responsible for the LV telephone. Nevertheless, this differentiation is almost impossible to read from the actual practice. Even with the responsibility for the two phones, and in addition to hospital internal cardiac arrest alarms,

there is still some spare time. In my observations of the AMK centre, the nurses fill these gaps with conversation and reading, that is informal, but not seldom relevant for the work at the AMK centre.

Picture-box 4

Updating Oneself by Reading During Idle Time

In the AMK centres the nurses have the opportunity to check their judgements with the use of books and indexes, in between actions and phone calls. The updating of personal competence is mostly done in connection to concrete cases, that are either experienced by the nurses themselves or told through stories.

In the professional exchanges, specific medical cases are discussed almost continuously, and new knowledge is socially developed through this discussion and evaluation of one's own and other's handling. Medical reference books, like NI and the Norwegian Pharmacopoeia ("Felleskatalogen") are used to check their judgements. Also during LV telephone conversations, the nurses are able to discuss the case at hand.

As will be recalled from Chapter 4, it was described a case of an epileptic thirteen year old boy that had some strange symptoms and the doctor was not available. In the situation described the nurses tried to specify what kind of problem the boy might have, to make a preliminary diagnosis, at least to decide the urgency degree of the case. Since the doctor was not available, the nurses had to make sure that the boy would come to another doctor as soon as necessary, or that an ambulance was sent. The AMK-nurse2 who answered the LV telephone was very uncertain what to do about the boy, but having the conversation with AMK-nurse1 helped her, not to specify what the actual problem the boy had, but to recommend the mother to bring her son to the hospital. AMK-nurse1 is not superordinate to AMK-nurse2, and

there is no reason for AMK-nurse2 to believe that AMK-nurse1 would have an answer to the boy's symptoms. However, conferring with the other nurse and reaching a consensus on what kind of action to take, helped AMK-nurse2 to make a concrete suggestion for the mother. The joint competence feels safer than one's own competence, even when all team members are equal. Also, the approval from other team members gives one member better confidence in her or his own competence.

A situation like this cannot occur in an LV centre in a nursing home. Since the LV centres are operated by only one nurse, there are usually no other nurses to discuss cases with, at least not at the same moment as one is handling the caller, because the LV centre is usually separated from other rooms. Besides, according to my observations in nursing homes, concrete experiences from the LV centre is rarely discussed with other nurses and nursing assistants in the nursing home department. When the LV responsible nurse comes back after having answered the LV centre, nobody will ask her anything concerning the call. Even difficult or uncertain cases from the LV centre are usually not discussed, although they might be of interest for other nurses and nursing assistants, and although the LV responsible nurse would find some collegial support useful. In this sense, the LV centre seems to be a kind of *non-issue*, through processes of *separation*, in the nursing home work place.

Hence the task of attending the LV centre is socially de-coupled from the regular tasks in the nursing home, the care for the elderly[20]. It means that when one of the nurses has to run to the LV centre, she is defined out of the social attention of the work place. When she gets back to the others, she is the same person as she was before she left, as if nothing had happened.

The situation is almost identical to that usually experienced when one has to go to the toilet at a dinner party. One leaves the table, often without any explicit excuse, and is completely out of the social gathering for two or three minutes. When one gets back to the table, nobody will ask about the experience in the lavatory; if all went well, or if there was enough toilet paper or soap. The fact that a person has just been to the toilet, is politely overlooked, it is as if he or she had never been absent.

Since there is no talk about the operation of the LV centres in the nursing homes, the nurses who are responsible for the LV centre are quite alone with the responsibility, and have to tackle problems and ambiguities concerning the LV centre for themselves. The safest way, then, to handle LV centre

[20] The nursing home LV centres also use to have the responsibility for safety alarms ("trygghetsalarmer") for the elderly. This form of emergency work is much more closely coupled to the core activity in the nursing homes. However, there was very little activity with these safety alarms in my observation periods in the nursing homes.

calls, is to minimise one's own involvement and leave all decisions to the doctor, because he is the only one that she is able to discuss difficulties with, anyway.

The situation for the nurses who man the LV telephone at the AMK centre is very different. Here, the handling of incoming calls is at any time the main task in the working day. The nurses and the ambulance coordinators have suitable opportunities to discuss both medical and technical procedures, changes and problems, in the idle time between handling calls and administering of ambulances. Besides, the idle time gives plenty of *natural occasions* to discuss problems *as they arise*. This opportunity helps the nurses to feel more secure in their decisions. It makes them able to give callers lot of advice and perform a lot of evaluational tasks to specify the urgency degree, so that the doctor can sort the patient consultations accordingly. In most of the cases the doctor does not speak with the callers before he comes to see them. Most conversation is handled by the LV telephone.

Thus, the nurses at the AMK centres have the opportunity to develop what Lave and Wenger have called "communities of practice". The nurses participate "in an activity system about which participants share understandings concerning what they are doing and what that means in their lives and for their communities" (Lave and Wenger, 1991:98). In this community of two nurses who are (in a formally varying degree) responsible for the LV telephone, they have both potential for *learning* and for *supporting* each other's medical evaluations as they are undertaken. With the isolation of the LV centre work in the nursing homes, the learning potential is not developed. Besides, with the lack of social support, the nurses have little resources to rely on to be able to perform evaluative tasks.

Another dilemma for the nursing home nurses who man the LV centre is that there is no continuity between the LV centre work and the nursing home work.

CONTINUITY OF INDIVIDUAL WORK

There are also differences between the individual work of LV centre nurses in nursing homes and those manning the LV telephone in AMK centres. First, there are differences in how the nurses combine work of a different character: Second, there are differences in how much practice the nurses get with the technical operation of the LV centre unit. Third, the nurses in the nursing homes do not have the updated day-to-day training with emergency cases, like nurses in the emergency ward.

The nurses who operate the LV centres have to combine the LV centre work with their care work. It was pointed out in Chapter 3 that in some situations, like feeding someone with eating difficulties and taking care of next of kin in the bier room, it is very inconvenient to be called into the LV centre. Even if the work at the LV centre usually consists of routine activities, the phone may ring at any time, and of course also in the most unsuitable situations. It is a disturbing element in the nurses' workplace. Besides, the task of handling the LV centre is ambiguous in character; at odds with the regular tasks of the nursing home work. The nurses have to change rapidly from the "calm care mode" to the "emergency mode" for any LV centre phone call. This change of mode and disturbance problem shows some of the paradox of localising the LV centre in nursing homes. At the AMK centres, these switch problems are much smaller. Even if the nurses that operate the AMK centres work in the emergency ward more than in the AMK centre, the work is focused on the AMK operation when they have those duties.

In most of the nursing homes, the attendance of the LV centre results in a rather small extra work load. There may be no more than ten to twenty incoming phone calls during an evening duty, and the handling of these calls is usually performed in a quick regular way: "I will let the doctor know, and he will call you back later." or "Will you just wait a second, I will put you through to the doctor". Extraordinary actions are rare, and the knowledge of the *various* technical functions of the LV centre unit is for some of the nurses poorly maintained. Hence, the nurses are uncertain about all the operational alternatives of the LV centre. Many nurses say that they fear the responsibility of the centre, because they may have to perform some kind of special action, where they feel incompetent. The operators of the AMK centres are continuously trained in these special actions, and the work load on the centre is large and varied enough to practice the different strategies and functions in day-to-day activities.

Not only the nature of the nurses' individual work tasks and training on the LV centre, but also their ambitions as nurses seem to vary a great deal between the AMK and the LV nurses. As mentioned in Chapter 3, many nurses move from hospital work to nursing home work because they want to calm down, get away from the stress of emergency actions that is common in some hospital departments, and have more time for their family. Hence, the professional ambitions are often lower among the nursing home nurses than nurses in the emergency ward, who also have the duties in the AMK centre.

From my observations in the AMK centre, it is obvious that the nurses are keen to learn as much as possible from their work. Even if a caller is transferred to the doctor's responsibility, the nurses often discuss the case afterwards, if it is interesting, and look up in manuals and NI to see if they can

find out more than they already did for the caller, or to check if what they did was right. In that sense there is a social learning situation in the AMK centre. Because of the lack of conversation partners and of idle time situations, such learning situations do not exist in the LV centres in the nursing homes. Besides, as mentioned, many nursing home nurses do not have the same professional ambitions as emergency ward nurses. The nursing home nurses may have ambitions for the work in the department, even if they do not have such personal objectives for the LV centre work. Such a division of ambitions are less relevant for the nurses in the AMK centre, as they are working in two situations, the AMK centre and the emergency ward. These departments are much more based on the same knowledge and practice and have the same objectives (correct and early intervention).

INSTITUTIONAL EXPECTATIONS

There are several expectations connected to institutions like nursing homes and hospitals. These expectations come from both the medical professions, the institutions' insiders, and the general public. Everyone has some idea of what nursing homes and hospitals should be like and what they should work with.

INSTITUTIONAL PROFILE AND PERSONAL INTERESTS

As described in Chapter 3, the LV centres were introduced in the nursing homes neither as a consequence of a wish from the nurses, nor because it would fit into the institutions as a natural part of it, but because it was the only possible municipal location, where nurses were available 24 hours a day. However, the nurses who had chosen to work with care-taking of the elderly, did not expect to have the responsibility of a work task like the LV centre. On the other hand, the nurses that operate the LV telephone from the AMK centre, have been doing work quite similar to the work in the AMK centres in the emergency ward, only directly with incoming patients, not over the phone. These nurses usually have an interest in emergency medicine; that is why they work in this department[21]. The difference in the institutional profiles of nursing homes and hospitals means that the nurses who are employed in those institutions have different motivations and ambitions, since most nurses have chosen to be where they are. While the manning of the LV telephone at the AMK centres is a duty that is closer to the nurses' main task, that is not so in the nursing homes, where nurses are motivated to work with geriatric care.

[21] Nurses are one of the few occupational groups in Norway who may choose their working place, because of a lack of nurses in almost any institution in any town.

Also people in general, the public, patients, and their relatives, have certain expectations about the institutions. They are not used to call the nursing home when they are ill, and most people do not actually know that their call for the doctor is received at a nursing home. Anyway, it is the doctor they want to see, and they may be reluctant to give information to a nurse. Some of these callers are concerned about the proper handling of personal information. Is it handled confidentially?

THE PROBLEM OF CONFIDENTIALITY

Not only the callers, but also nurses and doctors have been concerned about the information handling in the LV centres. One of the doctors' main arguments against the system has been the question of confidentiality. In the beginning it was easy for anyone with the right equipment (for example anyone in the municipal technical department ("teknisk etat") and the police to listen to the radio communication. For many of the doctors this was not good enough and they refused to use the radios. The problem has been solved with "scrambling" (electronic encrypting) of the radio messages. But there is still a problem with information security because some of the sensitive information, that a doctor's diagnosis can be, has to be mediated through an extra person.

Many of the LV centres serve small communities, where most people know almost everybody else. Some of the nurses do not want to take part in the information exchange because they are afraid that the caller or the injured may be an acquaintance, or they do not want the caller to feel embarrassed to tell the nurse the problem. These nurses therefore do not even ask a caller his or her name, but only register his or her telephone number, so that the doctor can call him or her back in private. Other nurses try to specify in collaboration with the caller what the medical problem might be, as described earlier. Hence, there is a lot of variation in how much the nurses in the LV centres take part in the diagnosis, and also to which degree they listen to the conversation between the doctor and the patient. Usually, the doctor calls the patient back from his mobile phone, so the conversation is kept outside the conference system that goes via the AMK centre.

Nevertheless, the nurses are supposed to make notes from all callers with names, telephone numbers, dates of birth and the reason for calling. Some patients think it should be unnecessary to tell the same story to several people, but they are told that they need to because the doctor has to call the patient back, and decide when, he has to get some idea of the degree of urgency. In one of the LV centres the nurse always presents herself by her name, so the caller will know who he or she is speaking with. The nurse will then leave it to the caller to decide how much information he would like to

pass on to her. If the nurse needed the doctor because she was ill herself, she would call the doctor directly.

> "If I rang here, it would be my colleagues I'd talk to. It's a bit easier when you ring directly to the doctor, at any rate there's not so many people involved. Here, your name, address, national identity number and what's troubling you have to be repeated time and again, and are written down" (nursing home nurse).

The nurse is worried about having her name spread over a desk by the LV centre. However, there are practices for not displaying these notes for passers-by to see them accidentally. Besides, as she said, it is still possible to get the doctor, directly.

One of the doctors had a more relaxed view on the problem of information security, concerning the use of radio, that is available for other than health personnel.

> "There are too many hysterics about protecting data. People, for instance in the municipal engineering department, who listen in on the network and get hold of information that is personal are very disciplined when it comes to spreading information. Besides, conversations are mostly anonymous, that's to say, you talk about the "patient". You use the *phone* to talk to one another about personal things, perhaps to get the name and national identity number of the patient" (GP).

At the LV centres they use a telephone journal to keep track of the callers. It is really one sheet of A3 paper with columns, and it is very helpful when the nurses relief each other's duties. Besides, the journal is documentation of the activity at the LV centre, and is safely filed. But the journal may expose all callers for a particular night to anybody that would visit or work at the LV centre.

> "There are so many people manning the service. Besides, the telephone journal's lying open, so everyone who comes into the office can see all that's happened so far during the evening" (nursing home nurse).

As a consequence, the LV centre is not so popular among many people. In one small municipality, many of the callers do not want to give their names, and the nurse does not press them either. They do not give any personal data to the LV centre nurse, they just want to speak to the doctor directly. So the nurse usually registers only the telephone number, to have the doctor to call back. In the same municipality, doctors say that to have only the telephone number, is sufficient. They keep conversation on the radio to a minimum, because other people could be listening on the same frequency.

However, in other municipalities, they practice the protection of patient information very differently from the municipality described above. In one of the LV centres, the nurse and the doctor would even involve the taxi driver in mediating patient data. When the doctor is in a patient's house for a con-

sultation, he will leave his telephone with the taxi driver, and the driver will answer the phone to leave messages for the doctor. The caller might have to present his case three times, to the nurse, to the taxi driver and to the doctor. When the LV centre nurse forwards the caller to the doctor, neither the nurse nor the caller may know that it will be a taxi driver that answers the phone. Some patients may tell most of the story before the taxi driver presents himself, if the driver is not aware of this.

> "There's one taxi driver who's a gossip, so we avoid him, but otherwise they're extremely conscientious" (nurse manning this LV centre).

In the observation of this LV centre I experienced that an evaluation was actually done by the taxi driver:

> Someone calls the LV centre - A small boy has fallen down a flight of steps. "Is it long since he fell?". The nurse gets all the details - "You can talk to Doctor Flynn." - She puts the call through, but it's the taxi driver who takes the phone, and he makes a note of all the information. Just afterwards, the driver rings back wanting to know the number of the doctor's bleeper, because he wants to get the doctor to come, in case the reported fall is serious.

In the example above, it is the taxi driver who actually makes this evaluation. The nurse only leaves the message with the doctor, but the taxi driver actually assesses the situation as possibly urgent, and will get the doctor's opinion immediately. This case is an extraordinary situation, not at all representative for the LV centres in general. Nevertheless, it shows that there is a considerable variation in protecting sensitive patient data.

However, is there really a confidentiality problem, or is it only one of the available excuses for the nurses to let the physician handle all information and take all decisions? The are several reasons to ask such a question. First, the confidentiality problem should be easy to solve or minimise. The nurses may keep the telephone journal closed, and they may practise message forwarding in other ways than involving the taxi driver. For example, by discussing the problem only with the doctor. Second, some of the nurses obviously *do not want to* operate the LV centre, and they are very keen to give the responsibility to the doctor as quickly as possible, and go back to their nursing home work. Third, some of the doctors would like to preserve their autonomy in handling patients, and therefore prefer to have the first-hand contact with patients, without any involvement from the LV centre nurse.

It is possible to question whether the arguments given are fully believed by the informants themselves, or not? According to Hammersley and Atkinson (1995:126), informants may give both *unsolicited* and *solicited accounts*. Not all answers are directly responses to the ethnographer's questions, but they may still be expressions that reflect the perspectives, concerns and discursive practices of the people who produce them. The fear of having the

neighbour on the line or the worrying about the display of personal data may be pseudo-arguments towards their expected involvement in the LV centre. It is the observations that balance these accounts, as the researcher gets a more complete picture of the practice during these than through the interviews. Neither the observations nor the interviews will give "pure" data free from potential bias (Hammersley and Atkinson, 1995:131), but with the balancing of interview data and observation data it is easier to approach a convincing way of interpreting the data.

In my observations there were typically something like 20 calls on one night to an LV centre in a municipality of 10000 people. Statistically, there is very little chance that a neighbour will call. But we can never know this for sure, the neighbour may be a person with poor health, or the nurse may know a lot of people, and anyway, the small statistical probability never guarantees that a special situation not will arise. The second argument, about the confidentiality problems, is also possible to illuminate from the observations. Most of the LV centres are located separately from the gathering areas, often in separate rooms, where available. It means that one does not see the telephone journal, by accident. Many nurses also fold the journal, which is really only a sheet of paper, so that the written data is not visible without unfolding the paper.

AUTHORITARIAN DESIGN OF LV CENTRES

The differences between the information handling in the various municipalities are results both of local and individual practices, but also political decisions. The municipal doctors ("kommunelegene") are formally responsible for the LV centre, and they have usually had control over the organisational design of the use of the LV centres. To what extent the nurses are supposed to get involved in the evaluation of the callers, has been decided by the municipal doctors. Hence, the municipal authorities have tried to prescribe how the practice of the LV centres is going to be.

Moreover, it is more difficult for the LV nurses to reach a consensus on changes in the use of the LV centres, because the operation of the centre is very much an individual task that is not discussed much in the nursing home department. The AMK centre, on the other hand, is operated by nurses that have more time to be concerned about practice in the centre, after all they sit there constantly when they are on AMK duty. They not only have the opportunity, but also the interest to discuss alternative strategies for practice in the centre, since it is a core task.

Because of the different social organisation of the LV centres at nursing homes and the LV telephones at AMK centres, the interprofessional rela-

tions between nurses and doctors develop differently. The nursing home nurses are subordinate to the municipal doctor, and these nurses are excluded from deciding practice in the LV centre. Decisions concerning the LV centres are largely made by the municipal doctor. The nurses at the AMK centre actually have more power because of their vast practice in the centre, and they have the opportunity to influence decisions more. It would be much more difficult to prescribe changes top-down, without involving the nurses, in an AMK centre than in an LV centre.

EXCESSIVE DEMAND FOR MEDICAL RESOURCES?

One of the basic ideas behind the development of the AMK and LV centres was to increase everybody's availability of medical resources. Because of the LV centres, people in need of a doctor will reach someone at the other end of the line 24 hours a day, without having to go via telephone answering machines, that contain messages about how to reach the doctor on duty. As we have seen in Chapter 3, the work in the LV centres in nursing homes has some consequences for the internal work procedures in the nursing homes. In this section, we will look at how the organisation of the emergency apparatus may change people's attitudes towards medical services. As elsewhere, the focus is on nurses' work, and how the LV centres are perceived among people in general. This is also important for the practice in the LV centres.

"PEOPLE CALL THE DOCTOR FOR NOTHING."

There seems to be a trend to make more use of professional medical resources than ever before. The barrier to call the doctor is lower among people, than it might have been before. As one nurse said,

> "Many old people ring "to have a chat", and it's become the practice for people to ring the doctor "for everything under the sun". It's not like it used to be, when it had to be something serious before people would ring the doctor" (nursing home nurse).

One municipal administration discovered a huge growth in people's need to contact the doctor when the availability increased, as one of the administrators described

> "The emergency phone service in the LV centre in Beecity opened on May 1st last year, and there's been an explosive rise in the number of enquiries since its introduction. From 80,000 to 90,000 without any special epidemics, in addition to 14,000 in the new LV centre in Apstown, which took some of the patient load" (municipal health administrator).

The LV centres have also become a reserve for the ordinary day-open doctor offices. Some of these offices actually recommend people to call the LV cen-

tre in the evening instead of the doctor's office in office hours when there is a heavy load on the office.

> "There's been a tendency for people to ring the LV centre in the evening - the service doesn't start before 15.15 - because they know they'll get a reply, which doesn't always apply when they ring doctor's surgeries during the day. The surgeries also "screen" patients" (nursing home nurse).

Many of the doctors spend a lot of their time with people who they do not define as ill. There are many medical questions of a more routine character (for health personnel) that nurses at the LV centre might answer as well as the doctors. In many municipalities, there are visiting hospital doctors working as doctors-on-call, to get some extra income. They get paid by the number of consultations, and according to one GP, it has happened that the LV centre nurses must actually hold doctors back to stop them for seeing all kinds of trifling problems:

> "It's more difficult to be on duty now because there are more requests than there used to be. Previously, people only rang the doctor when it was strictly necessary, but now it's a different matter. People used to be better brought up when it came to contacting the doctor, partly because of the stern local council doctors, for instance, parents of small children who scarcely dare do anything with their children. People aren't as accustomed to judging for themselves what might perhaps be wrong with a child, for example. 90% of what takes place in casualty is quick things, perhaps too many quick things as the years go by. They easily use the clinic for trivial matters instead of waiting till the next day, and if a doctor is there just to earn as much money as possible, he'll say yes to everything. I've known nurses to put their foot down when the doctor is too forthcoming, and they'll say "No, for Christ's sake! You've got to tighten up now, otherwise it'll be chaos". So they hold the lads in check" (GP).

The overuse of emergency resources has been identified as a social problem (Briar, 1985; Tanaka, Takano and Makamura, 1994; Malone, 1995), where the solution is not to be found in the emergency service itself. Increased social work intervention (Briar, 1985) and better primary health care services (Takano *et al.*, 1995) are suggested as remedies. In practice the LV centres may serve as one way to increase the provision of primary health care: Patients who in many cases would need an ambulance will instead be visited by the doctor at their home, at any time of the day. However, the problem of overuse might be only moved one level down the hierarchy, from the AMK centres' emergency phone to the LV centres. Considering the work situation for the LV nurses, an overuse of the LV centres will cause serious problems for the nurses who are responsible. They have to interrupt their regular work, and run to the phone to answer questions that could wait to the day after, or that the doctor needs to answer, anyway.

The question is if some of the work load on the LV centres should be handled by social workers, and not with the LV centres? Nurses in the LV cen-

tres (and also doctors) must to a greater extent than before relate to whole families of problems or to problems that are more social in character (Smith, 1968). The nurses in the LV centres get many phone calls that concern problems that are more social than medical. With the establishment of the LV centres, one might have established an institution that supplies "social workers", who are only a phone-call away. Considering that the nursing home nurse has a demanding job to do in her department, it is important not to overload this person with tasks that other practitioners could be doing.

CREATING HEALTHY "PATIENTS"

The LV centres may be one of those services that creates its own demand. Do the doctors and nurses become too available through the LV centres? Do people call the doctor "for nothing"? Piene (1991) discusses the way the use of new technology in the health services creates new patient groups, and the introduction of the LV centres could be a part of such a tendency. He uses the example of the pregnant woman with a narrow pelvis. It is a normal condition for a healthy woman, but because of new technology, she is brought into a quite new relation to the health services. For women in rural areas such a condition today will mean that she has to go to a regional hospital well ahead of the date when the birth is due, either for a Caesarean section or for provoking early birth (Piene, 1991:74). She has "suddenly" become a hospital patient, as a consequence of the possibility to use new technology: Ultrasound technology is quite new and there has also been a tremendous growth in the use of Caesarean sections the last 20 years.

Piene (1991) claims that because of the technological development, more advanced equipment is being used for instance for diagnostic treatment, making more *potential* patients undergoing ever more medical treatment. Piene uses mostly economic arguments to develop a critical reflection on the use of technology in the health services. However, there are several reasons to establish reflective decision situations regarding technological implementation. By increasing the availability of health resources, people will develop an even higher demand for the resources (Hughes, 1971:121), and this can be seen as an unintended consequence of the adoption of new technology (Merton, 1967).

According to Merton (1967), there are both manifest and latent functions in any design. The manifest function (purpose) or intended consequence of the LV and AMK centres is to help people get a doctor in an emergency. However, there are also latent functions, "being those which are neither intended nor recognised" (Merton, 1967:105). Some of these latent functions can be recognised as unintended consequences, which may be dysfunctional for the designated system, e.g. in terms of overload for the responsible operators. Excessive use of health resources, meaning the use of health resources by

people who do not, strictly speaking, need them, is one such dysfunctional unintended consequence of the increased availability, by means of the technologically based emergency system. However, the question of how many health resources that each one of us should have available, and at what cost, is a political and economic issue.

DISCUSSION: HEALTH BY TECHNOLOGY?

The focus in this chapter has been on how the introduction of the LV centres has changed the work for nurses in nursing homes and in AMK centres, with emphasis on how the practices of the LV centre have developed differently from the practices of the LV telephones in AMK centres. The LV centre technology is basically the same for the LV centres in the nursing homes and for the LV telephones in the AMK centres. As mentioned in this chapter the explanations for these differences are probably not technical, but social (depending on the social milieu among fellow nurses and nursing assistants), individual (varying from nurse to nurse), institutional (how the nursing home as an institution is different from a hospital's AMK centre), or interprofessional (the established division of labour, for example between nurses and doctors). Since this chapter is constructed around the differences between the practice in LV and AMK centres, these *differences* are emphasised. Nevertheless, on one hand, there are also many similarities between AMK centres and LV centres and on the other, there are also a lot of differences between the various AMK centres and the LV centres.

I have focused on non-technical issues in this chapter because the technology used in the LV and AMK centres are very similar. Hence, the variations discussed show how the implementation of one type of technology in different situations may contribute to dissimilar results on work. It also shows how this technology has limited determination capabilities when it is implemented in social and organisational settings. The technology cannot prescribe a practice as a purely technical matter, because the technological practice is embedded in networks of actors (Granovetter, 1985), who have different specific needs toward the technology (Pinch and Bijker, 1987). Thus the effect of the technology may be different from the original purposes for which these technologies were created (Badham, 1986), or the implementation of the technology may have unintended consequences (Merton, 1967). Still, it is with the application of radio and telephone technology that this organisation of the medical emergency is made possible.

People have certain ideas of what their job is about. Nurses in AMK and LV centres have ideas of what kind of patients they are supposed to work with and what should be the goal of that treatment. There is a great difference in the primary tasks of the nursing home nurses and the nurses in, for example,

the emergency wards in a hospital. New ideas on how to do work in these places may or may not conform with the established (tacit) standard procedures of the working place. When the ideas conform, the motivation and keenness for the new practice among the users are larger than when they do not, and there might as well be struggles against a change. When the LV centres were introduced in the nursing homes, their purpose did not at all conform with the priorities and working procedures developed in the nursing homes.

With the emotional commitment to some few patients that the nurses know very well, it is possible to develop a personal relationship between nurses and patients. The work on the AMK and LV centres, on the other hand, demands the quick judgement and action. The focus on *gender* has been raised in the discussions of nursing knowledge and rationality of caring (Wærness, 1984; Davies, 1995), and it is possible that the AMK and LV centre work is in conflict with the gendering of the nursing home work. According to Davies,

> "The path to masculinity entails a separation from others, the creation of a strongly bounded sense of self, an emphasis on individuality, a wish for power, agency and action, and for being a subject - making a difference in the world. The path of femininity, by contrast, involves a continuing experience of connection with others, a focus on interdependence, and a sense of self in reference to and in relation to others rather than as always autonomous and apart" (Davies, 1995:24).

With the introduction of the action- and decision-oriented LV centres in nursing homes, a "masculine" task was implemented in an working environment of feminine values. In practice, however, the LV centre work is given a role that is as limited as possible in the nursing home work, and the femininity of the work place is preserved. In fact, in at least one of the hospitals observed, the AMK centre is the hospital department with the largest share of male contra female nurses. The masculinity of action and agency in the AMK centres are also maintained by the ambulance coordinators, who usually are *(masculine) men*. The relative masculinity of the emergency centre work suggests a more masculine, action-oriented way of thinking for the nursing home nurses. The AMK centre nurses, on the other hand, work otherwise in the emergency ward, in which the orientation towards right and quick decisions and action are natural parts. Their work is more masculine from the point of departure. It means that the LV centre tries to impose or prescript a different practice (and attitude) among the nursing home nurses.

According to Galegher and Kraut (1990), there are two ways in which new technology is designed to interfere with human action, *prescriptive*, to direct human action and correct human foibles, or *permissive*, to allow current practices to be extended into new realms in which they had previously been impracticable. A prescriptive technology may be a group decision system

that imposes a model of group discussion in which individualistic idea generation precedes discussion and feedback from other group members. The system is designed in a special way because of an understanding that group discussion inhibits the quantity of original ideas that individuals generate in isolation (Galegher and Kraut, 1990). The word processor may be a permissive technology when working with this thesis, because it allows me certain editing alternatives.

To get a more balanced picture of the dialectic between technology and social systems, we need to add to Galegher and Kraut's (1990) concepts, that most technologies have *both* prescriptive and permissive qualities. When the LV centres are introduced in the nursing homes, the prescriptive qualities of the LV centres strongly direct how the nursing home nurses may work with the LV centre. They have to relate to the LV centre as an important telephone, that they have to man, even when it is not suitable. In the working situations of the nursing home nurses, the LV centres do to a very small degree give the nurses extra work alternatives or more effective strategies. Hence, the LV centre as introduced in nursing homes, is predominantly prescriptive. However, the LV telephones at the AMK centres expand the nurses capabilities, as they have the time and social support that is needed for the self confidence to operate the LV telephone more as intended; as a medical advisory service.

Going back to the dialectic relationship between technology and a social system, it is reasonable to think that there is several iterations between technological and social systems in the course of the introduction of the LV centres. When the LV centres are introduced, nurses struggle to be able to use the centres in a way that does not disturb their existing work, at the same time as administrative personnel struggle to get the LV centres to function effectively, and the doctors struggle to maintain their autonomy. In combination these social processes limit how the technology will be used, and which qualities within the technology that will come to the surface and be exploited. The result is that identical technology may provide scope for differentiated practices, as we have seen by comparing the LV centres to the LV telephones.

The LV centre in the nursing homes are reconstructed into different kinds of functions:

◊ The LV centre as the *unrestrained information mediator;* the nurse gets all available information from the caller and passes it on to the doctor, or in the worst case to the taxi driver, for him to take further action, and then goes back to the regular work of the nursing home department.

◊ The LV centre as the *doctor's anteroom;* the nurse only takes the caller's phone number, and mediates this to the doctor, and then moves as quickly as possible to the work that she is there for.

◊ The LV centre as a *medical oracle;* the nurse gets all necessary information from the caller, and uses her experience, available indexes (for example NI), and consultations with colleagues, if available, to give the caller relevant advice, and puts him over to the doctor if necessary. Typically this is the LV function is the one that one finds as LV telephones in the AMK centres.

These different LV centre functions all stem from one and the same intention of design. The different types are alternative practical functions of the LV centre technology. As suggested in this chapter there are several contextual factors outside the technical artefact itself that brings the latent functions into sight.

Because some municipal doctors will maintain the traditional *interprofessional* relation between nurses and doctors, some LV centres are practised as doctor's anterooms, and the LV centres are actually *reconstructed* as a service more for the doctors than for people that call the doctor. The doctor can avoid having regular nuisances at the line as they are handled by the nurse, but the nurse may not perform any medical judgements. Hence, people are directed to the doctor, as before, with the only difference that there is a telephone answering human instead of a telephone answering machine.

The constructivist notion of *interpretative flexibility* (Bijker *et al.*, 1987) is relevant to apply for the various uses of the LV centres. Interpretative flexibility means that the LV centre is open to more than one interpretation, or that "technological artefacts are culturally constructed and interpreted" (Bijker *et al.*, 1987:40), which means not only that there is flexibility in how people think of or interpret artefacts, but also that there is flexibility in how artefacts are designed. Since the LV centre artefact already is designed, it is how people perceive the artefacts that is relevant. As applied by the constructivists, one has to go to the first stages of design to be able to see the different possible interpretations of an artefact. In our case, we are able to identify at least some different interpretations because the same artefact is introduced in different social and organisational contexts. That the artefact has taken so various forms and functions, demonstrates that different interpretations are and have been possible.

The concept of interpretative flexibility allows us to go into more detail about how the variable latent functions of a technology become significant in practical terms. In the cases where the LV centre is interpreted as a doctor's anteroom, we may see that as a result of a process of definition between several actors. The municipal doctor, the nurses, the nursing home manage-

ment and the originators have different views about what the LV centre is, and ought to be, and while the nurses will have as little as possible to do with it, the nursing home management see it as a resource in the community that will justify the home's right to more resources in the next budget. The municipal doctors see it as a stabiliser for the doctor-on-call service, and looks forward to secure this service. The originators see it as a safer contact with health personnel on duty resource for people in rural districts.

When the LV centre has taken the form as the doctor's anteroom, it is probably in part because the municipal doctors have been strong in the network, and were able to, by the use of the argument of leaving the judgements to the knowledgeable medical profession, keeping nurses away from medical evaluative tasks. The nurses then want to use as little time as possible in the LV centre, because for example the learning potential is small, and the work in the department is queuing up. The implementation process comes to a "closure", as the "debate and controversy about the form of an artefact is [..] terminated" (Law, 1987), and the LV centre as a doctor's anteroom has come to practice. As the function is different from the intentions, a latent function is brought forward by the controversy about the implementation of the artefact in a nursing home.

CHAPTER 6

"YES, THE AMBULANCE IS ALREADY ON ITS WAY."

REDUNDANCY AND CLOSENESS IN THE COORDINATION OF AN AMK TEAM

The AMK centres in Norwegian hospitals answer emergency calls, number 113. The centres also coordinate resources in other medical emergency departments; ambulances, ambulance helicopters, doctors, other AMK and LV centres, and hospital departments. There are usually two or three people operating an AMK centre, and these operators have to make the necessary decisions very quickly, as information from a caller is received. But within the process from call-taking to taking action, there are several social-technical tasks that are coordinated and performed. This chapter describes and analyses the internal working of the AMK centre, the sharing of information, the communication and the development of mutual knowledge in the AMK team, and the connecting of external resources. How do the operators of the AMK centres manage to coordinate these resources? What kind of strategies do they use to secure the AMK team work, and which processes are used to coordinate the team? How is technology used in the team? The problem of automation versus team collaboration is discussed, comparing the AMK centre with other control room work.

The AMK[22] centre, as a centre of coordination, defines the main organisation of the acute medical services. The AMK centre is both an action *team* that performs relevant emergency operations and a connecting unit for other participants in medical emergency actions, ambulances, ambulance helicopters, doctors, other AMK and LV centres, and hospital departments. The analysis in this chapter is based on observation in three different AMK centres.

There are several different ways in which the work in the AMK centre is coordinated and performed. There are many different tasks that are performed in any AMK centre, and differences in how these tasks are carried out in the various AMK centres. However, this chapter discusses the properties that for me as an observer stand out as the more important, either because they are more or less unique for the AMK centre organisation, compared with other types of organisations, or because they seem to be important for the function of the AMK centres.

The basic task of the AMK centre is to coordinate external resources that carry out the practical emergency work in the field. Many of these coordination tasks could probably be performed by one single person. However, the AMK centre is designed to be able to also handle the larger accidents, and all the main AMK centres are manned by two or three operators. In actions where more than one AMK operator is involved, the internal coordination is a prerequisite for the external one.

This chapter is about the *internal* handling and coordination of those situations and coordination will be one of the central issues. Several definitions of coordination have been suggested, like “Composing purposeful actions into purposeful wholes” (Holt, 1989, in Malone and Crowston, 1991) and “Activities required to maintain consistency within a work product or to manage dependencies within the work-flow” (Curtis, 1989, in Malone and Crowston, 1991). Also Malone and Crowston’s (1991) very simple definition, “Coordination is the act of working together”[23], emphasises that coordination has something to do with the creation of a service or product where one is dependent on several actors. We tend to use coordination, cooperation and collaboration as terms for the same phenomenon. However, cooperation and collaboration require close contact between the parties involved, and collaboration emphasises slightly stronger the working together on a joint task (Hvinden, 1994:6). There are also differences according to whose perspec-

[22] I am dealing here with the AMK centres that are operated by two or more operators, except in the paragraph on continuity. The smaller AMK centres, that are operated by only one person, do not illustrate the social coordination that is of interest in this chapter.

[23] I would love to change one single letter in this definition, for the beauty of it: “Coordination is the *art* of working together”.

tive one takes. "What is coordination from the point of view of the operation of the organisation is cooperation from the point of view of the personnel" (Parsons, 1960:34).

Hence, the AMK centre coordinates the external resources in the emergency organisation, and people in the AMK team have to cooperate or collaborate to get this done. However, none of these concepts are specific enough to analyse how the tasks of the AMK centre are accomplished. The practice of the AMK team is characterised by the sharing of information, the development of common understanding and mutual knowledge; the creation of redundancy.

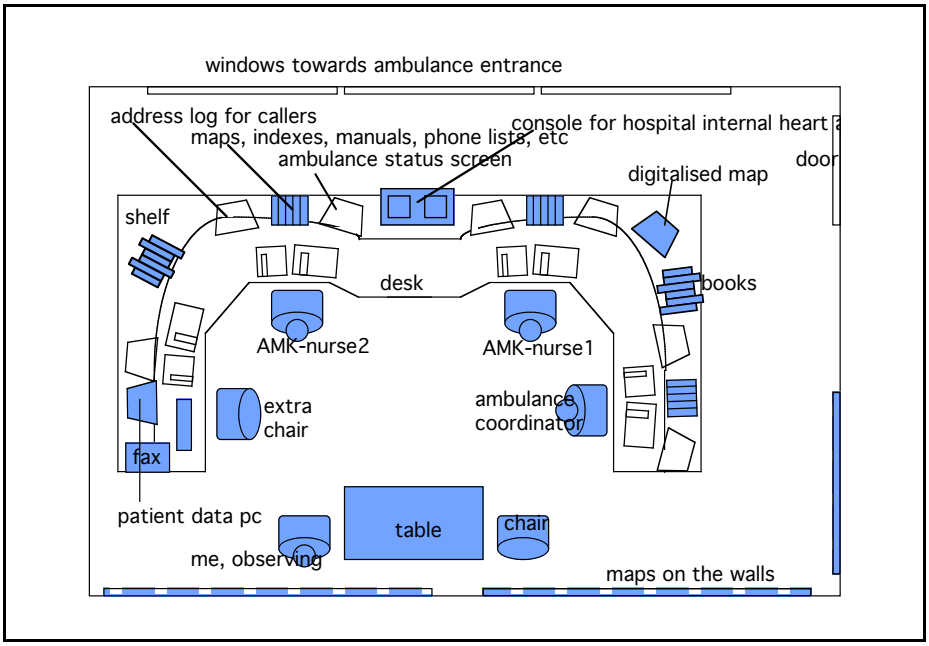
SHARING[24] INFORMATION

The AMK centre is, as also described in Chapter 5, attended by one or two nurses (AMK-nurse1 and AMK-nurse2) and one ambulance coordinator (AC). Most of the data is collected from an AMK centre where there are always two nurses, and one ambulance coordinator except at nights. The nurses work in the emergency ward when they are not working in the AMK centre, and the AC works 1/2 time in the AMK centre and 1/2 time as an ambulance driver. The AMK nurses have worked at least six months in the emergency ward before they can start as AMK nurses and the AC has experience as an ambulance driver.

[24] As claimed by Weick (1995:180) the use of the word "share" is problematic, as it can mean either to divide and distribute something or to hold something in common. When talking about sharing information, however, this differentiation seems to get blurred, as information is one of those commodities that you do not get less of when you give some of it away.

Figure-box 1

Spatial Organisation of the AMK Centre



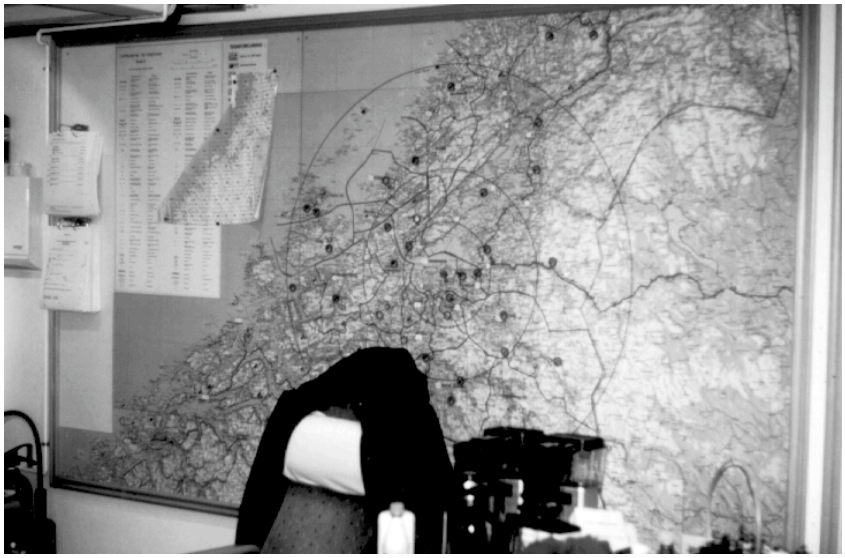
The spatial organisation of the AMK centre room in one of the AMK centres that is studied. In this AMK centre there are two nurses and one AC. All the work-spaces have identical screen displays and telephone/radio units.

The operators work in the same physical and social space, with the ability to observe each other's actions and work closely as a team. They also share the technical environment, as the working desks are equally designed for each of the operators. They share all informational displays: Each operator has individual screens for caller's addresses and ambulance status. In the AMK centre there are also two shared PCs, one with a digitalised map that visualises the location of any standard telephone[25] that is used for an emergency call. This PC is located between the AMK-nurse1 and the AC, and one other PC where one can access patient records. Figure-box 1 shows the physical design of this AMK centre. A similar organisation of information displays is found in civil transport aircraft cockpits, which provide duplicate flight instruments for the two pilots (Hutchins and Klausen, 1996).

[25] The location of cellular/mobile phones will not be shown on the map.

Picture-box 5

Map on Back Wall of the AMK Centre's Room



One important shared information display is the map on the back wall of the room of the AMK centre. The circles signifies range per time for the ambulance helicopter.

Moreover, the technical and individual abilities to collect information is helped by specific social abilities to share information and to make use of the information displayed. The use of the Listen-All function and the inclination to talk to oneself are two such abilities.

THE LISTEN-ALL FUNCTION[26] ("MEDHØR")

One of the most significant features of operation of the AMK centre is the Listen-All function. With this function, all incoming emergency calls can be distributed to all three operators. It is sometimes necessary that all resources (i.e. all three operators at the AMK centre) are directed to emergency situations. On an incoming emergency call, the answering nurse, can connect the Listen-All function, which will let the telephones of the other operators ring. Usually, it is the AMK-nurse1 who will answer the call in the first place, while the AMK-nurse2 and the AC will listen and be ready to join the action. This means that an open internal communication network is established in the AMK centre, that also involves the caller. The other activities are put aside as long as all three operators are busy on such actions, and usually only few actions are so demanding that all the three operators are needed. The AMK-nurse-1, or the one who answers the emergency call, will communicate with the caller initially, while the other operators will only listen and, if needed, perform other necessary actions. Typically the AC will call

[26] Not all AMK centres use the Listen-All function.

up the closest ambulance by radio immediately if there is an acute emergency. Then he will forward descriptions from the caller to the ambulance, while the answering AMK-nurse asks for these descriptions from the caller.

> A 4-year-old boy is hit by a car at Hilltown - a neighbour is calling; the boy can be heard crying in the background. The ambulance coordinator sends an ambulance immediately, the nurse does not need to ask him to. He registers the situation. The nurse continues to speak for a long time to get as much information as possible from the caller while the ambulance is on its way.

The decision to send the ambulance usually appears to happen as an implicit or tacit agreement between the nurse answering the phone and the ambulance coordinator. The other nurse will take part in the action if needed (if not, she will usually continue operating the LV telephone). The Listen-All function therefore makes it possible for the answering nurse to involve the other operators without having to spend time with instruction, command or delegation of tasks. The AC or the other nurse may request for an ambulance while the answering nurse holds the conversation with the caller, to get as much information as possible and to guide and calm down the caller. The requisition of ambulance can be agreed on via a nod of the head or a twinkle in the eye, but there are personal variations between different nurses and different ACs.

> "This depends a great deal on the chemistry - it's easier to coordinate like this with some nurses than with others, and they feel the same about us, too. Most of the time it is fine, but there are extreme cases" (ambulance coordinator).

The answering nurse will tell the caller that ambulance is on its way, so to speak at the same moment that the caller explains the emergency. The third person in the AMK centre may call the police or fire department if needed, while the call-taking nurse is still speaking with the caller. In many situations it is preferred that the nurse and the caller hold the line all the time until the ambulance shows up at the emergency location. All the information that the caller gives to her, the AC and other nurse might forward to ambulance personnel, fire department or other parts involved.

The distribution of responsibility seems to be floating in the situations described. Nevertheless, the basic distribution between AC and the nurses is that the nurses are supposed to scale the dimensions of the actions (typically decide the urgency degree) and the AC is responsible for the coordination of resources. But the responsibility is practically shared, and evaluations are open for negotiation:

> "If I'm in doubt, I'll ask: "You're exaggerating a bit now, aren't you?" Or the nurse may say something like that to me" (ambulance coordinator).

By these kinds of utterances, the operators are able to reach a working consensus on how they are going to perform actions properly, that is, well dimensioned. In the communication between the two pilots and the captain in

aircraft cockpits, Hutchins and Klausen (1996) found a similar tendency. On the background of shared information received by both pilots and the captain via the radio from the Air Traffic Control system (ATC), shared expectations of the next action are formed. When the captain does not respond as expected, one or both pilots will in some way communicate, by a look, a gesture or by words, that they expect a response from the captain. These interactions are only possible because the actors enter the situation with a considerable amount of shared prior knowledge about how things are supposed to go or how they typically go (Hutchins and Klausen, 1996).

TALKING TO ONESELF

The operators in the AMK centre work very closely together, and even if all of them is working with independent tasks, they are able to notice peripherally the actions of the others.

> The ambulance coordinator has some ambulance bookings of a fairly routine nature in front of him and is muttering to himself: "There's something or other that I've forgotten, whatever was it?" A lot of people ring the ambulance coordinator to book ambulances and it can get a bit hectic - "Scarcely time to breathe, you know". The nurse laughs (politely?). Shortly afterwards one of the ambulances rings and asks for information about a patient. "That was what I'd a feeling I'd forgotten, but now I've got everything under controlÖ" (ambulance coordinator).

The nurse sitting beside the AC has nothing to add in this case, and continues her own tasks. However, with a little laughter she acknowledges that she hears the AC's muttering, and the ambulance coordinator knows that the nurse would interfere if she knew what the tasks were that he had lost control over. The AC does not have to ask her explicitly.

As the AMK centres are designed with working places side-by-side and partly with backs against each other, the work of the others do not have to be visible if one turns towards one's own desk.

Picture-box 6

Working Spaces Side-by-side

As the operators in the AMK centres have their working spaces side by side, they are able to follows each others actions. Still, there is enough space between each working area to isolate on ones own operations.

Nevertheless, the hearing of each other's action is necessary for this kind of updating each other's information about one's own tasks. In the situation referred the AC is asking both himself and the nurse about some task that he had missed. The nurse is at that moment not talking to someone else, she is rather checking something on a computer screen. She is obviously hearing the AC's question, but she has no answer to it. The AC continues his search for the missed task, and discovers it after 5 minutes when he is reminded over the radio.

The talking-to-oneself is not generally performed by all nurses and all AC's at the AMK centres. It seems to be a personal way to work around the more complicated tasks, when things almost get stuck and one has to concentrate to sort things out. Especially the one AC that I described above worked this way. The function of peripherally informing the others of one's actions is automatically taken care of when one uses the phone - as the conversation is audible for the others in the AMK centre, when the Listen-All function is used in emergency calls. In other control rooms this facility has also been observed. In Heath and Luff's (1992) study of underground line control rooms in London, they notice how the controller produces talk which is often addressed to himself, "talking out loud", or "rendering private activities publicly visible[27]" (Heath and Luff, 1992:80). In their case, the controllers

[27] "Visible" is the term as used by the authors. One may in this situation rather use the term "audible".

have to "talk through the timetable", making public the changes they make on the timetables, both for others in the Line Control Room and for personnel outside the room. The controllers talk through their actions *as they are being accomplished*, making it possible for the others to take the necessary actions thereafter, like for example making public announcements for the travellers. The controller does not have to use extra time to perform this task, and the other operators do not have to disrupt their activities to be informed. The collaborative activity is not only dependent upon the sequential relationships between particular activities, but also upon the ways in which personnel shape their participation in the activities of their colleagues, even while they may be engaged in distinct and unrelated tasks (Heath and Luff, 1996).

These two mechanisms; the Listen-All function and the habit of talking to oneself, enable the sharing of information as things happen. One does not have to use a lot of time for briefing each other to give information. The establishment of shared knowledge as it happens, is a prerequisite for the coordination of the AMK centre.

COMMUNICATION IN THE AMK TEAM

The personnel at the AMK centre perform as a team. They work collaboratively and are referred to as one unit from outside. They also build a kind of team structure, in which they all work towards the same goal, to mobilise and coordinate the necessary resources in an emergency situation.

> There is a 113 emergency call at 10.15. A road accident in Selltown. At the AMK centre, AMK-nurse1 and the ambulance coordinator talk to the caller - AMK-nurse2 calls the Selltown LV centre on the radio. Two people are trapped. Nurse1 holds the line with the caller while she discusses whether to send an additional car (the Sellvalley ambulance). It is agreed to do so. The ambulance helicopter and the fire service are also called out. Nurse1 finds out as much as possible about the place where the accident has occurred (hectic atmosphere). It is a 60 km zone, a car has driven into the back of a bus. The Tellvalley and Sellvalley ambulances are on their way (because the Selltown ambulance is out on a trip to the city). 10.20: The doctor has arrived on the scene and they hand over control to him. The conversation between nurse1 and the caller ends. 10.22: The doctor calls on the radio: Cancel the Tellvalley ambulance. The AMK centre cancels it. 10.25: The external action network is established via Selbu. 10.37: The helicopter reports to say it has landed safely; AC rings the control tower at the airport. From the helicopter they report that it will arrive at the hospital in 12 minutes. Nurse1 requests specification from the helicopter personnel of the injuries so that she can report this to the emergency ward. Shortly afterwards the doctor rings and gives the names and dates of birth of the injured, which the ward needs to find their case records.

In the situation described, all the three members of the AMK-team participate in the same action, working as a really well-trained working group. No formal instruction is needed during the task of collecting information and coordinating external units. The AMK-nurse1, who is handling the call, can rely on the other team members' capability to perform the tasks of involving and coordinating other resources continuously, while she concentrates on getting as much information as possible from the caller, to be able to scale the actions to be taken.

COMMUNICATING AND UNDERSTANDING

The effectiveness of the way the team in the AMK centre works, depends on whether peripheral communication between the team members is correctly understood. In the AMK centres, the operators develop this understanding during the time they work together, by learning to know each other and the way people communicate. To use Goffman's terminology, they develop common *keyings*. According to Goffman (*Interaction Ritual Theory* and *Frame Analysis)*, actors try to control their environment and interpret what is going on. Keyings are needed so that the actors in any situation can interpret the meanings in the interaction (Goffman, 1974). Keyings are interpretation clues, and they say something about the frame in which the communication is conducted. A keying can for example be a facial expression that tells other people that the expression is meant ironically.

The typical effect of the common keyings in the AMK centre is that actions are being coordinated by the operators without any discussions, commands or instructions. Moreover, keyings are developed between people at the AMK centre and other units, like doctors and ambulances, as well. Between the AC and the ambulance drivers common sets of keyings are developed during practice as ambulance drivers, and the implicit understanding of each other is preserved and used also in the communication as ambulance driver and AC. Common keyings are also developed during the working relationships between nurses in the emergency ward and the AMK centre.

Between on-duty-doctors and nurses, keyings (like tone of voice) are developed through radio and telephone networks. These keyings will have less media richness (Daft, Lengel, and Trevino, 1987), as the telephone and radio omits all body language. Nevertheless, there are also examples of how keyings are developed in lean media communication. One such example is the use of "Smileys" on electronic mail on the Internet. The Smileys are faces (smiling, crying, etc.[28]) that are typed sideways after statements, and they offer sideways expressions of some basic emotions that colour and clarify the conversation via electronic mail (Sanderson, 1993). The Smileys may be

[28] Smiling :-) sad :-(shocked :-o yelling :-(O)

quite a banal example of keyings, but they illustrate how the development of communication clues is inevitable even in a very simple form of communication, like pure-text e-mail. Between the ACs and the ambulance drivers, much of the common understandings are developed during the close working relationships in the ambulance teams, and then applied in radio messages, so that the development of common keyings goes smoother in such a lean media.

The goal for the AMK operators is always to give complete messages that are correctly understood, and doing this quickly in emergency situations. Then, it is necessary that the nurse or the AC, as a sender of the message, must be aware of how her information is interpreted by the receiver, or, using N¯rretranders' (1991) terminology, what kind of *ex-formation* her *information* is made by the receiver. It is more important what the message receiver understands, than what the sender actually transmits of words and gestures. The sender cannot communicate her own total mental picture of the situation, and she has to know about the receiver's ability and way of interpreting the information that she passes on. Additional information, like body language, and the existence of common keyings, helps the sender to anticipate the receiver's interpretation. In the AMK centre, the close working relationship between nurses and the AC makes them able to develop keyings that extend the bandwidth of communication into the subliminal and peripheral monitoring capabilities of the human body.

The development of a common understanding in the AMK centre is especially important, considering the AMK centre operators as an *interdisciplinary* team. Although working in the same sector (health), the nurses and the ambulance coordinators represent their respective professions and occupations, the emergency ward and the nursing profession, and the ambulance service and the ambulance driver occupation, respectively. The centre should not be viewed as one structure, but as a meeting point for different professions. In addition to analyse how the operators perform their role within one social structure, a team, a facility, an organisation, or a profession (Hopkin, 1982:136), it is therefore relevant to look at the nature of several professions and teams, or structures, and to what extent the operators conform to, or identify with, others in the same structure. In the AMK centre it is necessary to find out how the nurses and the ambulance drivers develop their interdisciplinary communication.

The training of the AMK nurses is one of the mechanisms that makes it possible for the team to function. The training period involves work days with the ambulances (two days), the ambulance helicopter (one day) and with the doctor-on-duty car (one day). This means that the nurses have *some* inside knowledge on the other participants in emergency actions. All the nurses that operate the AMK centre have worked more than 6 months in

the emergency ward. There are 53 nurses that work in the emergency ward, and 35 of them have duties in the AMK centre. The ambulance coordinators, on their hand, have long experience as ambulance drivers and they work more intensively in the AMK centre than the nurses, as they work 1/2 time in the AMK centre and 1/2 time in the ambulance service. The ambulance coordinator is an especially interesting actor in the AMK centre, because he brings a new element into the AMK centre, among the nurses.

THE AMBULANCE COORDINATOR

The ambulance coordinator would not be a natural part of a hospital, if it was not for the AMK centre. With his presence, knowledge of ambulance personnel is brought into the AMK centre. He performs the jobs that are related to the coordination of ambulances, like the handling of regular (not acute) ambulance requisitions from doctors that send patients to hospital treatment. He also keeps track of the ambulances, with the help of radio conversations and status messages, that the ambulances transmit. These messages are also displayed on the nurses' desks as they are identical with the AC's display. From the AC's experience in the field, he has developed the local knowledge that may be needed to guide ambulance actions from the AMK centre.

> Someone rings 113 from Hombay and the ambulance is sent. The nurse does not know exactly where this is, but the ambulance coordinator has been there, so the caller doesn't need to explain.

The ambulance coordinator adds a local field knowledge to the AMK centre, that the nurses could not have, as it is developed from the experience of ambulance practice in the surroundings. Thus, the AC brings in complementary skills and abilities (cf. Nelsen, 1997). Since the AC comes from the ambulance service and is still an ambulance driver, it makes it easier for the ambulance drivers to relate to the work at AMK centre, as the ambulance strategies are better understood, and explained if necessary, in the AMK centre. Even if the nurses have had some days with the ambulances, they do not have the understanding that might be needed to grasp how the ambulance personnel think. Then the AC may perform the role as the ambulance drivers' spokesman:

> At 10.50 the Sea King (an Air Force Air Rescue helicopter) has arrived. The nurses complain (to one another) that the helicopter has not updated its status, not replied on the radio and not rung back. The ambulance coordinator says that perhaps more important matters turned up en route, so they had to put first things first.

The ambulance coordinator functions as an interface between the nurses and the ambulance drivers. As some of the ambulance drivers have duties as ACs they get to know the nurses who operate the centre. A good relation to the ambulance drivers is necessary to collect as much information as possible from the ambulance. Through the process of collecting a patient at a loca-

tion, the ambulance personnel gather information that may be important to bring forward. Often this information is only forwarded at short notice to the porter in the emergency department, and useful information may be lost (Hughes, 1980). With the AC at the AMK centre it is more natural for the ambulance personnel to relate to the people at the centre on a more informal basis, which means that extra information on incoming patients can be transmitted over the radio. Such information may be crucial to the best handling of the patient when arriving at the hospital.

Partly because of the AC, many of the ambulance drivers also pay purely "social" visits to the AMK centre when they have some spare time for example after a delivery at the hospital. Usually these visits are paid not because of anything particular, but probably because the ambulance personnel will have a little chat with the AC and the rest of the AMK team. During my observations, stories from the latest rescue operations are told, and perhaps discussed, during these visits. Hence, both the ambulance personnel and the AMK team get a kind of feedback from the other part. The ambulance personnel usually address the AC when they enter the room, but via the AC they get in contact with the whole AMK team. Now and then, an extra gesture is paid:

> The Roocity ambulance comes with "lefser" (griddle cakes). Usually they are from the bakery at Roocity, but this time they came from the Sawhill bakery. They say that the Roocity lefser are a bit better than those from Sawhill (but I think these are very good).

As such, the AC may also help to connect other ambulance drivers and the AMK nurses. In one of the AMK centres there had been a discussion whether or not to close the AMK centre for visitors, because there were so many people, not at least ambulance personnel, through the door of the AMK centre. The operators were actually disturbed by the traffic. However, it was decided to leave the AMK centre open for ambulance personnel and other visitors to avoid getting isolated and to keep the social contact with the ambulance personnel. This contact is maintained through the regular visits, so the ambulance coordinators and the nurses get to know the ambulance drivers very well. There is a friendly atmosphere with a joke now and then.

> An ambulance driver comes into the centre. He has delivered a patient and comes to get information about the next job (instead of getting it over the radio). "You're to go to the Psychiatric Nursing Home - but watch out they don't lock you up - just tell them you're there on a jobÖ.", the ambulance co-ordinator says, and the driver nods and smiles, as he gets the joke.

In this instance, the AC's joking invites the ambulance driver to get socially involved with the AMK team, and at the same time invites the nurses to see the humorous aspect of this kind of ambulance work. As suggested by Mulkay (1988:153) institutionalised joking may enable participants to engage in

collaborative activities which are critical for the existing structure. The joking permits all to join in laughter which in itself strengthens social cohesion (Coser, 1980:92). Not at least between the AC and the ambulance drivers who visit the centre, there are often joking, as if they play in front of an audience, the nurses. Many of the ambulance drivers and ACs are outspoken, often with witty comments at hand. It may come with their work in unpleasant and tragic emergency cases, as a way to protect own feelings, and to remain detached (Steele, 1989) to be able to cope with those situations: "Well, if you didn't laugh you'd cry" (Joyce, 1989). But the joking between the ambulance driver and the AC in front of the nurses is also typical for the way men have witty remarks, and the women laugh at them[29]. After all, the nurses are mostly women, and the ambulance drivers and ACs mostly men.

> AMK-nurse, holding the phone, turning to the AC: "There is a man here, who is about to faint.....". The AC breaks in quickly: "Ask them to call back when he *has*.....".

Nevertheless, the rather masculine humour in the AMK centre permits the team members and visitors to "share pleasures and collectivity to withdraw their focal attention from serious concerns" (Coser, 1960:95). It has an equalising function that helps to build the trust relationship between nurses and AC's that is needed to do the job in the AMK centre. During one of the observation periods I was doing video recordings, and there was some joking about it when people came on visits.

> One ambulance driver comes into the centre, and he notices the camera that I have on a stand in one corner opposite of the entrance. He asks, to anybody in the AMK centre: "What are you filming?" The AC answers "We are making one of those *Candid Camera* episodes - we are filming anyone that pays us a visit". The driver is to go, when the AC says: "Join us, I think you may be useful in *Da Capo*[30]". and there is huge laugher from all except maybe the ambulance driver himself, as he stops in the door, turning to the AC and saying: "I think you should sit more over there so that your ears don't get in the way", and there is laughter again, as he leaves.

In this little episode, the ambulance driver and the AC obviously play the "quick-at-reply" competition with the nurses as the audience. Although it may seem slightly ill-tempered, it is more the collegial conversational tone of the community of ambulance personnel. Also for the individual the use of humour may be applied as a coping strategy in emergencies, preventing intense negative reactions overwhelming the worker and disrupting effective functioning (Morgan, 1986:373). Through the joking, the operators may

[29] "A woman who has a good sense of humor is one who laughs (but not too loudly!) when a man makes a witticism or tells a good joke. A man who has a good sense of humor is one who is witty in his remarks and tells good jokes" (Coser, 1960:85). Of course, Coser's differentiation is to some degree outdated, as it belongs to the more traditional custom, than practiced in Norway 37 years later.

[30] Norwegian TV show with dance and singalong music, that is popular among elderly people.

have a more relaxed and distanced relation to the clients, and the social boundary between the clients and the operators, and the solidarity between the operators are confirmed (Hvinden, 1986:162). One little incidence from one of the AMK centres is a good example on how the operators, through the use of humour, create a distant emotional relation to the patients. There was a man with a broken leg rather far out in the woods in mid-winter, in a time when there was a lot of snow, and many impassable roads.

> There are two ambulance coordinators and two nurses in the AMK centre. Several regular ambulance requests are in line, and according to one of the ACs the next one is "a man at the far end of Forest Road, but I am not sure if the snow-plow has been there". The other AC responds "OK, we'll collect him in the springtime", and one of the nurses joins "Yeah, we'll get him as he bobs up in the spring thaw." and they all laugh. (Of course they sent out an ambulance to collect him within a matter of minutes.)

Naturally, the ambulance coordinator is not in the AMK centre just for fun. His main task is to keep track of the ambulances, at any time, and distribute the jobs to the ambulances in a best possible manner. The status messages that are transmitted from the ambulances give only very basic information of the availability of the cars. With the status messages, you can read if the ambulance is idle (at office), at the hospital, on the way to hospital with patient, or if they are on the way to get a patient. In the two latter status cases, there are colour codes for the urgency degrees; acute (red), urgent or normal (green). The limited information from the status messages in the communication between AMK and ambulances presupposes use of radio for detailed ambulance requisition and feedback, and geographical information. Additional information is exchanged simultaneously, and this information is available for anyone listening to the ambulance radio frequency.

The latter point is actually very useful, when the exact locations of the ambulances are not known, because it makes it possible for the closest car to get to an emergency location. Since calling up an ambulance is done on a common frequency for all ambulances, any ambulance driver that thinks he may be closer than the one called at, can report his location. If the AC does not get any of those messages, he will send one of the idle ambulances at the hospital or office. Also such a requisition will be audible for all ambulances, so they know about this action. In one incidence the personnel of the doctor-on-duty car (medical car) discovered that they were closer to a potential drowning accident than any ambulance. The medical car personnel are not obliged to listen to the ambulance frequency, but they often do, just in case. The medical car is equipped with emergency lights, and is driven by ambulance drivers, so an idle medical car is sometimes an option if it is close to an accident.

In the situation observed in one of the AMK centres, the fact that the personnel in the medical car responded on an emergency ambulance request, might have saved valuable minutes.

> There is a 113 call at 12.07. A man in the canal - fallen in near the railway station - is drifting outwards. It's -20^{0}C outside. The ambulance coordinator requests one of the idle ambulances, but the personnel in medical car no. 4 hear the request on the radio, and respond that they are rather close to the accident location, and that they can take the job. And the AC lets the medical car take it. AC: "You're to go down to the railway station, the canal, there's a man floating in the canal". 12.12: Nurse1 in the AMK centre rings the caller to get more details. 12.13: The medical car rings; the man is conscious. 12.15: Message from the medical car, they have got him into the car, put clothes on him, and they are on the way to the hospital with *two* patients. 12.19: the AMK centre rings the emergency ward to say there are two patients (one who had jumped in to get the other out). They joke in the ward: "Where shall we put them?" 12.21: The car arrives at the hospital.

Only eight minutes went from when the man was observed in the water until he was put into the medical car. Six minutes later the car arrived at the hospital with two patients, the rescued and the rescuer. During this operation there is almost continuous contact between the doctor's car, the AMK centre and the emergency ward. When the AMK centres have to involve several participants in an emergency action over some time, they may set up an external action network ("aksjonssamband"), so that all actors can follow all communication. These actors may include the caller on the accident location, the local ambulance, the local doctor, the local LV centre, ambulance helicopter, the AMK centre, or others. The continuous contact helps to coordinate the resources, and all relevant information that is gathered through the emergency action may be transferred to the emergency ward, so they are well prepared to take care of the patients in the moment they arrive.

DEVELOPING MUTUAL KNOWLEDGE

The ambulance coordinator introduces the nurses to the ambulance way of thinking and handling, as described. The nurses on their hand introduce the AC in their way of responding to medical problems. In their teamwork they develop a body of mutual knowledge while they still uphold their professional identity. This mutual knowledge is important in the AMK centre, because it makes possible a flexible organisation. Krauss and Fussell (1990) suggest three sets of mechanisms that communicators employ to establish the condition of mutual knowledge in their interactions; direct knowledge, category membership and interactional dynamics. The different mechanisms all have their meaning for the establishment for the working team. The direct knowledge mechanism depends on personal knowledge of other individuals, knowledge of what particular other people know. It refers to the way two

people who are physically present at some event (and mutually know this) assume that the salient aspects of that event is a part of the common ground. Also, direct knowledge often makes it possible for the speaker to extrapolate from what is directly known to draw inferences about what has a high probability of being known.

In the AMK centre it is first of all the common history of the team that produces a kind of mutual knowledge. Besides, individuals can often be assigned to social categories, and such category membership often predicts individual knowledge. It is reasonable to believe that persons belonging to the same occupational categories have some amount of mutual knowledge. In the AMK centres, first of all the two nurses will have mutual knowledge on the basis of category membership, namely nursing knowledge. (Of course, the AC also has medical experience, especially of emergency situations.) The third set of mechanisms for ascertaining common ground, grows out of the dynamics of the interaction process itself. Anything said at one moment can be assumed to be mutually known at the next moment. Thus, individual knowledge is transformed incrementally into mutual knowledge. Conversation (and similar interactive forms) permits communicators to formulate messages that are tightly linked to the immediate knowledge and perspectives of the individual participants. One of the devices by which mutual knowledge is developed this way is communication via the "back channel". The brief vocalisations, head nods and shakes, facial expressions, and so forth, produced by the participants who at that moment is nominally in the role of the listener, are a rich source of information about the state of the common ground. The development of knowledge happens in "the tacit dimension": The mutual learning from each other's practice demands inquiries about clues and what they indicate, but many of the clues that is used remain unspecified and may indeed be subliminal (Polanyi, 1983:31).

The continuous work in the AMK centre establishes mutual knowledge. It is especially seen in emergency actions that happen over some hours. All the operators in the AMK centre know almost everything about the emergency action. Usually, a call regarding the action may be answered by any of the three operators. Thus, mutual knowledge is developed out of the common history of the operation of the AMK centre, both the short history from second to second, and the history that is institutionalised through stories told, remembered and repeated by people who have common experience from earlier duties at the AMK centre. The stories are exchanged during the working hours in the AMK centres, and they also update nurses and ACs who have no first-hand knowledge of the situations referred to.

A similar narrative practice among photocopier technicians is discussed by Orr (1996). According to his research, the "war stories" recount the personal experience of one individual technician, whose competence is known and can

be considered along with other material (which may not be reliable and clear) about a specific Xerox machine (Orr, 1996:127). The stories are part of the work of preserving the knowledge acquired for the benefit of the community of technicians. As in the AMK centre, mutual knowledge is developed through the stories. The existence of mutual knowledge make possible a flexible way of organising the emergency work, as the operators acquire overlapping skills and abilities, they all reflects (to a certain degree) the whole AMK centre's work organisation, like a hologram.

REDUNDANCY

Because the operators in the AMK centre have much of their knowledge and competence in common, a *redundancy of functions* is established. The redundancy of functions makes it possible for the three operators in the AMK centres to perform each other's jobs, and share the parallel problem-solving in intuitive ways. A good description of the redundancy of function is presented by Hutchins (1990) in a case of large ship team navigation. In the navigation team of the large ship there are three separate jobs, but the nominal division of labour is normally not real. Most of the time there are "small problems being encountered and solved, small errors being committed and corrected, and little bits of interaction structure being broken and repaired" (p. 209). The team members help each other frequently with the different tasks, and the system would probably halt if this was not the case. The team members are not only responsible for their own jobs, but for all parts of the process to which they can contribute.

Hutchins (1990) demonstrates with examples how the team members will help each other and correct each other during the working operations, and he emphasises the flexibility and robustness of the system, and the people as a kind of "connecting tissue" that holds the hardware and the technological system together. According to Landau (1969), redundancy ("duplication" and "overlap") in administrative agencies is not necessarily signs of waste and inefficiency.

> On the contrary, it is becoming increasingly evident that large-scale organizations function as self-organizing systems and tend to develop their own parallel circuits: not at least of which is the transformation of such "residual" parts as "informal groups" into constructive redundancies. (Landau, 1969:356)

One of Landau's main points is that there is great potential in the redundancy, especially the ability of an organisation to suppress error and generate alternative action strategies. In an organisation structure consisting of the absolute minimum number of parts, error could not be detected. In terms of Merton's perspective, redundancy secures the availability of functional alternatives or substitutes.

But the variable distribution of labour can only be negotiated if the distribution of knowledge and ability is to some degree redundant. Emery and Trist (1972) argued that "redundancy of function" is necessary for the operation of adaptive, self-regulating systems in variable environments. Morgan (1986:99) called such systems "holographic", in the sense that the capacities relevant for the functioning of the whole are built into the parts. According to Morgan there are several strategies that have to be followed to create the holographic organization; "get the whole into the parts, create connectivity and redundancy, create simultaneous specialisation and generalisation, create a capacity to self-organise" (Morgan, 1986:97-98). According to Morgan (1986) the organisation of autonomous work groups is one good example of taking advantage of the "redundancy of function". Every member of the group possesses a set of multiple knowledge, and each of them is capable of doing the other's jobs and substituting them, if necessary. At any moment, any of the group members will have this ability. There are unused resources in the group, and there is also flexibility and a capability of reorganisation in every part of the system. The unused resources are constructs of overlapping distribution of knowledge.

The operation of the AMK centre has a lot of the characteristics of holographic organisation, where everyone knows "quite a lot" about the others task. How are the holographic-like characteristics of the AMK centre established? First, by making some parts of a joint task more visible to other participants, it is possible for all group members to follow each other's actions, and thereby take part in those actions. As described by Hutchins (1990:214), lines of communication and limits on observation of the activities of the other group members, have consequences for the knowledge acquisition process. Second, the awareness of the need for assistance is often a prerequisite for assistance. Because of the continuous presence in the same operations room, and by using the Listen-All function, it is easy for the call-taking or action-taking operator to signal her need for assistance, and even more important, for the other operators to register the call-taker's need for assistance.

> A 113 call from Meetown at 10.15; someone injured in a road accident. "An ambulance is on the way" says nurse1, who has answered the call. She knows that the ambulance coordinator has simultaneously ordered an ambulance. Nurse1 rings up again because the caller has hung up. She tries to get to know more about what has happened. The person is trapped by his foot - "Do you think you can get some others to help you?" - Nurse2 informs the police (to stop the traffic) and the fire service (to cut the injured person free). They try to contact the doctor in Meetown, but get no reply, so they contact the casualty office and are told that they already know about it. The ambulance coordinator ensures that the ambulance is supplied with information as it becomes available. When they at last get hold of the doctor they discover he has not been told of the accident. Later, they hear that the patient has been got out of the car and the members of the team wonder

> whether they should cancel the fire service, but they have been sent nevertheless, because of leaking petrol. All the time the caller is on the line, the Listen-All function is in use.

In this situation, the call-taking nurse does not have to worry about the requisition of ambulance, because she knows that the AC already is calling up the nearest or best available ambulance on the radio at the same moment that the car accident is reported. The three operators are all aware of the proper actions in an emergency case like this, and anyone of them could have handled the different tasks. They are always ready to take any necessary action when the call-taker uses the Listen-All function. The extent to which a system can benefit from the functional redundancy of its parts, will depend on the extent to which the parts are aware of the needs for redundant functioning (Hutchins, 1990:214-215).

Usually, in operation rooms, the technology has a key role in facilitating or expanding the horizons of observations of the group members. In the AMK centre the Listen-All function is one such technology. However, this function in itself would have no effect if all the operators were not able to understand the situation, decide relevant actions and perform those actions. It is this common understanding of proper actions and the ability to perform those actions that I will characterise as the basis for the holographic organising of the AMK centre. The redundancy developed through building up mutual knowledge and capabilities in the team work, make this way of organising possible.

In Hutchins' (1990) description of the navigation team, it is clear that the redundancy of functions is developed by a job advancement structure. The most experience team member, the "plotter" has previously had the two other jobs, first as "bearing taker", then as "bearing timer-recorder" (Hutchins, 1990:214). All newcomers are set to do the job as a bearing taker, and will later advance to bearing timer-recorder and then to plotter. Therefore the bearing timer-recorder will be prepared to assist and instruct the bearing taker. The plotter will also be able to assist and instruct the bearing timer-recorder.

In the AMK centres there is no career circle like the one in the navigation room. The two nurses have no specific internal experience distribution, and they may do each other's jobs without any kind of hierarchical delegation. The nurses are able to do most of the ambulance coordinator's jobs too, but the ambulance coordinator cannot do the medical evaluation work for the nurses. Moreover, there is practically no hierarchical relation between the nurses and the ambulance coordinator.

CONTINUITY

One of the important practices in the AMK centres is the way the operating nurses hold the line with the callers. Meanwhile the nurse may connect a doctor, an ambulance, another AMK centre or other resources with no disconnection of the caller. Also, as mentioned, there is a large degree of redundancy of functions (holographic organising) in the centre, which permits a "fluid" organising of the centre. The technology enhances this possibility by letting all the actors in the centre share information. There is also continuity in the duties that the nurses have. Many of the actions go on for some hours, and patients will often call back during the day. It makes the work easier when the same nurse completes an action that she initiated. This is impossible to ensure, but with overlapping duties, one minimises the problem of having several nurses operating different stages of one emergency operation. In large emergencies, one may stretch the duties to maintain continuity.

The job in the AMK centre demands continuous practice, both to preserve the mastery of the work and to adjust to new procedures or new technology. In the AMK centres that are continuously operated by two or three people there is time for such personal and collaborative development in between the actions, and quite a lot of the idle time is spent updating oneself and others. Stories of previous actions are told and thoughts about new procedures and technology are often exchanged. There are no permanent AMK teams that always work together. All nurses work with any other of the nurses and ambulance coordinators. Still, it is possible for the teams to instantly "be in tune", as they know more or less what the others know.

They are able to construct shared understanding by the distribution of knowledge in the AMK nurse and AC communities. In Lave and Wenger's (1991) concept "legitimate peripheral participation" the individual learner acquires skill to act by actually engaging in the process. Although the concept is thought of as a situation where the learner participates in the practice of an expert, and has limited responsibility, which is not true for the AMK centres, their idea is nevertheless relevant here: That learning is a process that takes place in a participation framework, not in an individual mind. The framework implies a constitutive role in learning for improvisation, actual cases of interaction, and emergent processes which cannot be reduced to generalised structures.

In the small AMK centres, personnel have no overhead time to spend on this kind of informal training, and they complain about that they get too little training. They also report that they would like to learn more on how they should relate to other people in the system (for example the police and the fire department) and which responsibilities the different parts have. These centres do not have an ambulance coordinator that would take care of some

of this contact. Further, there is little overlap of time between duties, to exchange experience and narratives, and little overlap (redundancy) in the operation of the centre. However, the request for formal training that is expressed is motivated by the uncertainty of operating the centre, especially because of frequent changes in the external organisation of participants in the emergency organisation. The problem of these centres is really the lack of learning possibilities in the actual work of the centre, because of small possibilities of collaboration and redundancy of functions. If the uncertainty is believed to be solved with formal training and courses, this is perhaps the consequence of the common assumption in our culture, that competence is developed behind the school desk.

DISCUSSION: AUTOMATION OR COLLABORATION?

This chapter has focused on the organisation of the AMK team, with emphasis on how the team members are coordinating actions where all are taking part. By the sharing of information and the constant communication, the team continuously develops the mutual knowledge that they need to coordinate their activities as they are accomplished. The ambulance coordinator brings ambulance knowledge into the AMK team, and he also has a liaison function to the ambulance service. Ambulance personnel visit the AMK centre regularly, and an extended community of work, where ambulance personnel and nurses in the AMK centre work together, is developed. With the development of mutual knowledge in the AMK team, redundancy of function is increased, which means that the members of the team may do much of each other's work in a competent way. Both the ambulance coordinator and the nurses may for example order ambulance requisitions.

Many of the functions in the AMK centre can be performed by any of the parts, which is a form of holographic organising (Morgan, 1986). As a contrast to the holographic way organising the AMK centres, there are examples of emergency centres where the tasks of call-taking and action-taking are divided between different departments or operators. I will discuss two such centres, where these tasks are separated, a public safety communications centre, presented by Smith and Whalen (1995), and an automated ambulance requisition system in the ambulance service in London, LASCAD, which is presented by Beynon-Davies (1995). The reason why I want to discuss these two other cases, is that the difference between them and the AMK centre points out some of the characteristic processes in the AMK centres. Further, there is a tendency to implement technologies to automate some of the work processes, that I have identified in the AMK centre. This has been done in the two cases that I use as counter-examples. There are also

plans to use more information technologies for the processes in the AMK centres (cf. Appendix 4 about "EMSIS").

The public safety communications centre (Smith and Whalen, 1995) is responsible for dispatching police, fire and paramedic assistance in response to citizen reports and complaints on 911 emergency and non-emergency lines. The authors focus on how talk (over the phone) is transformed to text by a call-taker and how the text is transformed back to speech by the dispatchers over the radio to for example police cars. Hence the call-taking and action-requisition is permanently split up and distributed into two separate instances. All information that is received by the call-taker from a caller is coded in a text string, which is transferred to a dispatcher via a computer system. The design of the text string is standardised according to the information that is required for the police to identify situations and people, so the call-taker has to make the received information fit into the in advance defined categories. The text string is the only information that is exchanged between the call-taker and the dispatcher.

The automated system in the ambulance service in London, LASCAD (Beynon-Davies, 1995), was designed to increase emergency effectiveness. It is a computer-aided dispatch system that automates many of the human-intensive processes of manual dispatch systems associated with the ambulance services in the UK. The manual dispatch system typically consists of call-taking, resource identification and resource mobilisation. In the computer-aided dispatch system, LASCAD, call-takers receive name, telephone number and address of the caller, and name, destination address and brief details of the patient. This information is transmitted over a network to an "allocator", which is a system that pinpoints the patient's location on a map display of areas within London (Beynon-Davies, 1995:177). Experienced ambulance dispatchers choose ambulances for each action and send patient details to small computer terminal screens on the ambulance dashboards. The ambulance crew is expected to acknowledge such messages, and the system will automatically alert the headquarters (HQ) if no acknowledgement is made. The system also detects ambulances heading in the wrong direction, and there are messages that tell HQ when the ambulance crew has arrived, when the ambulance is on its way to a hospital and when it is idle (Beynon-Davies, 1995:177).

The LASCAD project is an example of automation in the medical acute service, which has been discussed and criticised. On 26 October 1992, the system was driven too hard, because of overload of 999 calls, and claims in the press were made that 20-30 people may have died as a result of ambulances arriving too late. Much of the criticism has been attributed to weaknesses in the technical design of the system, that for instance it was giving incorrect vehicle information, leading to wrong resource allocation. It has

also been said that a reorganisation of sector desks over the preceding weekend may have caused loss of local knowledge. There was hostility towards the computer system among the staff, where people said they were alienated to the changes from the introduction of the system. In a public inquiry of LASCAD, it was commented that the management were naive in assuming that the simple introduction of a computer system would automatically result in changes in working practices (Beynon-Davies, 1995:177).

Both Smith and Whalen (1995) and Beynon-Davies (1995) describe systems where the redundancy in the centres was limited, by splitting and partly automating (especially in the LASCAD case) the different processes of the centre. The most important difference between these centres and the operation of the AMK centre, is that the AMK centre, as one unit, in one room, one person or team, handles the complete process from call-taking to action-taking, where the latter usually involves other resources as well. In the AMK centre, the person who is responsible for taking action, or solving some sort of problem, has direct first-hand knowledge of the problem, as it was described by the caller. In Smith and Whalen's (1995) case, the description of the problem is transferred from the call-taker to a dispatcher as a string of abbreviated text. Hence, the design of the text string, the possible alternatives of the different categories, is defining what information is relevant and what is not. In Beynon-Davies' (1995) case from London, the description of a problem is transferred as telephone messages (from a dispatcher) or as mobilisation instructions that are received by the ambulance radio. In both these cases the action-taker has no first-hand knowledge of the problem as it was described by the problem-holder.

Moreover, standardised status messages and text string abbreviations are both *abstractions* of the original problem definition. In the AMK centre the problem is handled as close as possible to the initial problem definition, or to the problem definer, the caller. In addition the AMK centre has the option to establish action networks, where there is an open network between all participants in an emergency action.

The Marxist critique of technology emphasises the deskilling of the workers as one effect of technological development. Along with such critique, Zuboff (1988) describes how automation in the process industry removes the operator's contact with the original chemical processes, and his knowledge is developed in relation to an automatic warning systems' problem definitions, more than the real-world problems (i.e. chemical, physical). The operator is not necessarily deskilled, as suggested by many Marxist theories (for example Braverman, 1974), but he develops other skills than the one of controlling the process directly. Where the traditional operator would understand from the smell and colour of a chemical mass under process that the temperature was too high, a new operator used to the automated control, would

learn that when the display showed such and such values, he would have to adjust such and such input parameters.

In addition to an abstraction, there are *spatial differentiation* in the cases of Smith and Whalen (1995) and Beynon-Davies (1995). The different stages of the emergency actions are taken care of by different actors in the emergency organisation. It is not the technology itself that defines the abstraction and specialisation, but it facilitates a separation of the tasks, by providing an automatic mediation between them (for example status messages or control signals through computer networks). As claimed by Feenberg (1991:122), technology itself has no autonomous logic of development. The concrete organising of the centres is not *defined* by technology, but developed interactively during some period of practice, in which technical artefacts may make some work strategies easier to apply than others.

Media richness theories (cf. Sproull and Kiesler, 1991) are examples of how technology pushes practice in a specific direction. In these theories it is claimed that the various media have different qualities and that they should be used for different tasks. Poor media channels, for example text strings, from Smith and Whalen's (1995) case, may be quick and precise for most situations, and they make it possible to stack the emergency actions in a priority system, when there is heavy traffic. But when there is an ambiguous case, the use of a text string as the only communication may be ineffective, because of problems of mediating an appropriate problem description. In such situations a richer back-up channel can help to solve those difficulties, and if practically possible, such an extra medium may be constructed by the users. With more flexible technologies, that are not implemented to separate the workers, it is easier to develop new practices.

The way the use of technology is organised in Smith and Whalen's (1995) and Beynon-Davies' (1995) cases, separates the different operators spatially, and thus makes it difficult for them to adjust their practice, even if they wanted to. How the technology is organised and implemented prescribes a practice rather rigorously because the separation of actors stop them from developing alternative work procedures. On the other hand, the non-separation in space and function in the AMK team, makes it possible for the team to develop their practice continuously. The intersubjectively shared representations permit, for example, a silent glance in this particular context to have the more or less specific meaning that a task is undertaken, as for example when the AC looks at the call-answering nurse to signify that an ambulance is sent. This complexity and subtlety of human interaction is difficult to imagine that any machine could become engaged in (Hutchins, 1996:25).

The adoption of these technologies, I would suggest, is one part of what Burns (1981) has called *managerialism*, the specification and (hierarchical) structuring of work tasks from above. According to Burns, it is the *collaborative system*, the ordering of tasks which is "sustained by commitment, trust and the habits of mind and conduct inculcated in training-on-the-job as an organisational infrastructure" (Burns, 1981:31), that really makes the organisation work. Further, he claims that it is impossible to combine this collaborative system with a strong managerialist organisation.

When these technologies are used to separate the work tasks and workers, the development of trust between the workers is made more difficult. Hence, the hindrances for constructing the collaborative working environment is made even stronger, as the technology is used to implement such a managerialism.

This chapter has put great emphasis on how the development of the work in the AMK centre is accomplished with the social closeness of the AMK team. The discussion above shows a contrastive situation through two studies of alarm centres where the coordination of emergency resources is not based on a tight team work, but on division of tasks and computer-aided information flow between the operators of the tasks. It is tempting to claim that the technology used in these centres will necessarily deskill the workers, by reducing their ability to develop understanding of the complete emergency organisation. However, it does not have to be so. It depends on the possibility for the operators to communicate outside the automated information channels, both for back-up, as would be useful in the event of the LAS-CAD break-down, or for the development of communities of practice (Lave and Wenger, 1991).

Hence, automation as described does not have to be a hindrance for collaboration, but then it has to give room for flexibility of practice, maintenance of additional communication channels, development of intersubjective commitment and trust. With the elimination of all organisational redundancy, such flexibility may get lost.

CHAPTER 7

THE COORDINATED CLIMATE

TOWARDS AN UNDERSTANDING OF REAL-TIME COORDINATION IN EMERGENCY SETTINGS

The previous chapter has illustrated that there are several mechanisms that make the team in the AMK centre able to perform their work. This chapter constructs a generalised concept of the form of organisation that we have identified in the AMK centres. Hence, the *coordinated climate* is a ideal type of organising, based on the basic characteristics of coordination in the AMK centre, the sharing of information and action, the consensus coordination, together with research in other centres of coordination. The aim of the chapter is to specify the characteristic organisational principles that make the emergency operations possible. The understanding of these principles is crucial for the successful implementation of information and communication technology in these work sites (and various forms of technology seem to be introduced in these settings whether or not such an understanding is developed). Is there such a thing as a coordination technology that can really facilitate coordination work of this kind?

Chapter 6 has focused on the processes in the AMK centre that are used to share information and develop a common ground for the team work. I have placed emphasis on the way the coordination is continuous between the team members. It makes it possible for the team to conduct externally-directed actions, without a strict division of labour or hierarchical delegation of tasks.

Team organisations with many similarities to the AMK centres, are found in control rooms in, for example, underground railways and airports. There is a growing body of studies of such control rooms, under the umbrella of CSCW, computer supported cooperative work. In this chapter I compare some of the characteristics identified in empirical studies of control rooms and my own observation of AMK centres. Then, the concept of "coordinated climate" is developed, an ideal type of emergency/control centre work, based on the study of the AMK centres and other studies of emergency centres, control rooms, and centres of coordination. The reason for constructing such an ideal model is to collect some of the empirical knowledge from several studies, and develop an understanding of the relation between this flexible form of coordination and the use of information and communication technology.

THE AMK CENTRE AS A CONTROL ROOM

Control room researchers focus on the emergent and flexible division of labour in control rooms of, for example, trains (the urban traffic control room in Paris (Filippi and Theureau, 1993) and Line Control Rooms in the London Underground (Heath and Luff, 1992)) and aeroplanes (the airport ground coordination centre (Suchman, 1993; 1996; in press), airline cockpits (Weick and Roberts, 1993; Hutchins and Klausen, 1996), and air traffic control (Harper and Hughes, 1993)). Many of the phenomena described in these studies are also observed in the AMK centre, although the AMK centre is more directed to and designed for *emergency* operations than day-to-day routine found in control rooms. Nevertheless, railway, tube and air traffic control rooms also have to handle emergencies, such as accidents and technical malfunctions. Both in the AMK emergencies and in the traffic control rooms, several individuals are involved and all of them are focused on more or less the same task: To operate the "room" as a team; effectively, continuously, and smoothly.

The operation of an urban traffic control room in Paris is studied by Filippi and Theureau (1993). They focus on the two logics of work sharing that are significant for the control room studied. In the first logic, each controller (a person) manages the disruptions occurring in his own sector. In the second logic, more than one controller in involved. The person who starts handling

the disruption is responsible for it during its entire course. Filippi and Theureau (1993) observe problems in multi-disrupted situations, and explains the difficulties by the fact that there is no logic for such situations. They are concerned about the need to study the "global dynamics of longer and more complex incidents", instead of focusing on the role of communication during 5 minute videotapes, only, as they criticise many control room studies for doing (Filippi and Theureau, 1993, p. 176). These authors believe in emphasising the activity of each individual *and* the collaborative activity *as such*, and outline two stages in the analysis of the control room: The first is the collaborative issue through the point of view of each individual, and the second takes on collective activity as a whole on its own, i.e. it should not be considered as the mere addition of the individual activities. I will come back to this at the end of the chapter.

By naming these situations and locations as *centres of coordination,* Suchman (in press) is able to include studies of other situations in the same discussion. For example in the medical field, Barley (1986) looks on CT scanners and radiology in general, Dugdale and Fujimura (Suchman, in press) study gender and the construction of knowledge in biomedical sciences, Hartland (1993) looks at electrocardiography and Jordan (1993) studies different (cultural) practices of child birth. As similar to the control rooms, it is "through the juxtaposition and interpretation of verbal reports, visual images and various forms of text, in real time, into provisional assessments of an emerging situation" (Suchman, in press) that the actors involved are able to coordinate their joint activity.

Heath and Luff (1992) focus on the emergent and flexible division of labour in the Line Control Rooms in the London Underground. In their study, they observe the coordination between the operators in such a centre, noticing especially how the operators are sensitive to each other's conduct. That sensitivity allows them to coordinate specific tasks and activities, and at the same time gather appropriate information to see the details of the current operation of the service. More specifically they focus on the coordination between the Divisional Information Assistant (DIA), who is responsible for providing information to passengers through a PA system and the Line Controller, who coordinates the running of the tube. The researchers refer to the partly parallel actions of the DIA and the Controller: The DIA does not wait for instructions from the Controller about which messages to give to the public, but announcements are delivered to passengers *as* Controllers are making adjustments to the service. According to Heath and Luff (1992) it is critical that announcements are delivered as quickly as possible, and the DIA's sensitivity to the Controller's actions, allows this form of organisation.

The DIA and the Controller have mutual access to the same information displays, and because of their location in the same room, they also have the possibility of peripherally monitoring the actions of the other. Both know what the other is doing, what he says, where he is looking, what he sees, and what he might have seen. The operators are constantly aware of each other's actions, also when they are themselves communicating with the outside world. An example is the DIA's use of headsets, which are usually not worn properly. By holding one side of the headset to one ear, he can simultaneously monitor the action of his colleagues (Heath and Luff, 1992) and be responsive to their action, if necessary. In some cases the operators "talk through the time table", making private activities publicly visible. By this act of "talking to oneself", the operators inform the others without having to establish mutual engagement with the colleagues, because that would disturb their ongoing accomplishments.

In Suchman's studies of Airport Operations Rooms, distribution of knowledge is produced by "out louds", apparently undirected comments on the situation, and questions asked "of the room" (Suchman, 1993; 1996; in press). Suchman explains this action by the workers' more or less implicit recognition that information can be relevant to one or more of their co-workers at any given time, and that co-workers may have answers to questions, because of their access to available information resources and social networks. Also a phone call may have more participants than the caller and call taker. In the Line Control Room in Heath and Luff's (1992; 1996) study, the Controller will coordinate a phone call with for example a signalman so that the DIA in the control room will register details in the talk that he should be aware of. The Controller emphasises, by volume and repetition, certain elements to the DIA.

Heath and Luff (1992) explain the *use of technology* as a secondary condition for the coordination of the Line Control Room. The knowledge and the natural history of the operation of the service, the socio-interactional organisation of individual tasks and activities and the continual distribution of information provides for the very possibility of using the tools and technology at hand. Nevertheless, technology is used for communication with personnel in other locations and for monitoring actions and situations. Suchman (in press) names the use of the latter form of technology "reading a scene", the task of grasping an emerging situation through the juxtaposition and interpretation of verbal reports, visual images and various forms of text, in real time. The operators are continuously implicated in practices of sense-making, using these technologies and other communicative and collaborative cues in the setting.

Although it is difficult to delineate the individual and the collaborative, the different personnel have distinct responsibilities, areas of jurisdiction and

specialised tasks. Those tasks are not undertaken by people of other occupations. Rather, the tasks are related sequentially, in a complex sense where the individual and the collaborative are tailored to preserve a mutually coordinated response to incidents and events (Heath and Luff, 1992). And "[..] even the most apparently individual tasks are ongoingly accomplished, moment by moment, with regard to the conduct and responsibilities of the co-participants", hence there is a continual "flow between the private and the public, between the individual and the collaborative [..]" (Heath and Luff, 1992:89). The operators are able to disattend sights, sounds and events that draw the attention of their co-workers, and to keep on with their business at hand (Suchman, in press).

From the control room studies it is especially the tasks of "reading a scene" and "talking out loud", that are similar in the AMK centres and the control rooms. The operators of the AMK centre will grasp an emerging situation through the juxtaposition and interpretation of verbal reports by the phone in Listen-All mode, visual images like maps and facial expressions and various forms of text, for example address screens, or "Norsk Indeks". The reading of a scene gives all actors continuous and instant perception and knowledge of what the other actors are doing, while the sharing of verbal and visual reports gives all actors updates on the status of action that one may presume is known by the others. The result is that the operators can react appropriately. Thus, the total non-separated work-space of the AMK centre provides an arena for common action.

Many of the characteristics of work in the AMK centre, that is recognised in holographic organising and control room work, may be analytically generalised in what I shall call "the coordinated climate",

THE COORDINATED CLIMATE

The analytical generalisation of the "coordinated climate" is based on the observations in the AMK centres and descriptions of other control rooms, and inspired by theories and concepts such as *holographic organising* (Morgan, 1986), *keyings* (Goffman, 1974), *collective mind* (Weick and Roberts, 1993) and *media richness* theories (cf. Sproull and Kiesler, 1991). None of these theories are fully able to describe and explain completely the working, collaboration and coordination of the AMK centre. With the coordinated climate I aim to include characteristics that are explained by other theorists and expand the view with observations from my field work. The Listen-All function is one of the most significant features of the AMK operation, where the whole working team is *focused* on the operation of one emergency situation. The habit of talking out loud is also one of the information-sharing activities, though more depending on person. Both of these techniques are

aiming at the sharing of information. The technology in the AMK centre is also mostly shared. Similar information displays are present on all the working desks and specialised displays are located as shared spaces. The technology is integrated not only as individual man-machine interfaces on the different operators' desks, but in the operation room as a social system.

The coordinated climate is to be considered as an ideal type, in Max Weber's (1922/1971) sense. It is a conceptualisation of the phenomenon that is observed in the AMK centres, but is neither an ethical ideal, an average type, nor an exact description of an empirical case. It is supposed to be a standard against which real-life examples of coordination may be compared and discussed. I will outline some of the basic features of the coordinated climate. Similarly, the "bureaucracy", as discussed by Weber is an ideal type, and states a logical extreme that is not real, but mental construct. The "coordinated climate" is not supposed to be *the* meaningful understanding of the processes in the AMK centres, but an attempt to establish a basis for more general concepts and theories that are relevant for the analysis of work in AMK centres and similar situations.

The main elements of the coordinated climate are as follows:

ACTORS

All the actors are involved, to varying degrees, in a common action and share the responsibility for this action. There is a "common focused gathering" (Goffman, 1981) where the actors are both the audience to the scene (i.e. to other's working tasks) as well as participants in it. It is a "contingent assembly of multiple lines of activity into a shared focus of attention" (Suchman, 1996:57). Thus, all the actors have a continuous and instant perception and knowledge of what the other actors are doing, and will be able to be responsive at very short notice and join an action, if assistance is needed. This is accomplished through discrimination and recognition of mutual relevance, i.e. that the actors partly concentrate on their work towards a specific individual task and partly pay attention to what other actors are doing, in a "peripheral participation" (Lave and Wenger, 1991). Newcomers are transformed into old-timers through developing an identity through knowledge, skills, and discourse, to a "community of practice" (Lave and Wenger, 1991).

ARENA

All actors share an arena for the common action. It is a worksite of "equipment and practice, specially constituted for the work at hand" (Suchman, 1996). All the actors have attained some competence on how action in this arena works. The arena remains with its basic characteristics even when operators are exchanged. The workspace is constructed so that there are no bar-

riers to mutual monitoring, for example no walls in the room that separate the actors.

COORDINATION AND COLLABORATION

The actors need to collaborate to fulfil many of their obligations. Coordination of these collaborative activities is performed as a result of non-hierarchical continuous team negotiation and consensus-oriented discussion, but the actors still may have some basic divisions of work responsibility. At any moment, workspaces constituted in the service of one line of activity may be redefined by or for another, as there are "multiple, interacting participating frameworks" (Suchman, 1996:57), made possible because the cognition in the practice is distributed - stretched over, not divided between - mind, body, activity and culturally organised settings (Lave, 1988). There is a "socially distributed cognition" (Hutchins, 1988; 1995; Hutchins and Klausen, 1996; Star, 1996; Raeithel, 1996).

INFORMATION

All information is available for all the actors (the information resources are shared). The actors have an interest to share information, as it is sometimes necessary for the completion of tasks. Though information is shared, it is displayed in a way for all actors so that they may disattend other activities, and still have all information individually available.

Since the characteristics are rather general, relevance of the coordinated climate is not limited to specific analysis of work in control rooms, or centres of coordination. One could also apply the concept to analyse how an improvising jazz band works together on a stage (cf. Eisenberg, 1990). Moreover, technology does not have to be involved in a situation to apply the coordinated climate as a measuring standard.

WHAT IS DIFFERENT ABOUT THE COORDINATED CLIMATE?

One of the most obvious parallels to the coordinated climate is the organic system of management, as presented by Burns and Stalker (1961). Organic management is characterised by

> "the contributive nature of special knowledge and experience to the common task of concern; the "realistic" nature of individual task, which is seen as set by the total situation of the concern; the adjustment and continual re-definition of individual tasks through interaction with others; the shedding of "responsibility" as a limited field of rights, obligations and methods; the spread of commitment to the concern beyond any technical definition; a network structure of control, authority, and communication".

> "[K]nowledge about the technical and commercial nature of the here and now task may be located anywhere in the network; this location becoming ad hoc centre of control authority and communication; a lateral rather than a vertical direction of communication; [..] a content of communication which consists of information and advice rather that instructions and decisions" (Burns and Stalker, 1961, p. 121).

Burns and Stalker (1961) developed their theory of mechanistic and organic management forms after the empirical study of industrial firms in England and Scotland. They were especially interested in firms where there was a high level of technological development in the business area, to see how these firms were handling the loss of market stability. The concept of "the collaborative system" was later introduced by Tom Burns, referring to the collaborative style of working in a hospital organisation (Burns, 1981). According to Burns, the whole organisation relies on this collaborative working,

> "....which requires not only a high degree of sensitivity and social skill but a quite explicit competence in work activities which demand and depend on synchronous or serial collective action which extends almost endlessly throughout the organisation" (Burns, 1981:4).

Neither Burns and Stalker's (1961) *organic management* nor Burns' (1981) *collaborative system* was developed specifically for smaller work group settings. Neither do they say anything about the technologies at work. However, with the reference to these works, it is obvious that many of the thoughts in the field of computer supported cooperative work (CSCW) and control room studies may draw on this part of organisational sociology.

The analogy of climate is used to signify that there is something in the air, something perceivable, for the observer. "Climate" is also used elsewhere in organisational studies, in "organisational climate" and "communication climate" (Falcione and Kaplan, 1984). According to Falcione and Kaplan (1984:288), organisational climate is measured in three ways in research, as an attribute belonging to an organisation, as an interaction of an organisation's traits or characteristics and the individuals' perceptions of these traits, and as a perceptual measurement-individual attribute. In the three approaches, climate is generally measured quantitatively, relating it to structural properties, individual perceptions of these, or the joint functions of these two. However, the multi-fashioned research on organisational climate has resulted in "muddy waters" (Falcione and Kaplan, 1984:300). More recently, research on organisational culture has to some extent taken over. Generally, culture is used for something that is long-term and difficult to change. Falcione and Kaplan (1984) suggest that the difference between organisational culture and climate is that culture may be viewed as a system of values, norms, beliefs, and structures that persist over time, while climate is the assessment of these elements at a given moment.

The coordinated climate may in this sense be put as one (or several) of the dimensions of organisational climate. Both structural and perceptional measures could be used to measure the coordinated climate, as with organisational climate. However, the coordinated climate is defined for a small setting, a group, a team, without any hierarchical structuring, and structural measurements may be difficult to apply accordingly. Besides, qualities of the coordinated climate type, may be most visible only in special situations, for example, large emergencies.

The coordinated climate is developed in organisations where *reliability* is given the highest priority. It is to understand how reliability in a team is established, that Weick and Roberts (1993) introduce the concept of the "collective mind", where the mind is viewed as an activity more than an entity (p. 360). They propose that it is the *heedful interrelating* between the operators (in their case, on flight decks) that is this collective mind.

> Contributing, representing, and subordinating, actions that form a distinct pattern external to any given individual, become the medium through which collective mind is manifest (Weick and Roberts, 1993:364).

Hence, the mind, as used by Weick and Roberts (1993) starts with action, and the collective mind is established through actions, or contributions, to a joint action in a group.

> A heedful contribution enacts collective mind as it begins to converge with, supplement, assist, and become defined in relation to the imagined requirements of joint action presumed to flow from some social activity system (Weick and Roberts, 1993:365).

Picture-box 7

Manual System for Keeping Track of Ambulances

As suggested by Weick and Roberts (1993), with a well developed "collective mind" one is not dependent on the most advanced technology to develop successful coordination. In the AMK centres the ACs are still using paper sheets to keep track of the ambulance jobs. These sheets are available for everybody in the AMK centre and they are easy to pass on to one another to share the handling of the cases.

According to Weick and Roberts (1993), the collective mind can mean more to how organisations differ than, for example, technology and structure. "A smart system does the right thing regardless of its structure and regardless of whether the environment is stable or turbulent (p. 377), which also means that the organic systems, as described above, have more fully-developed minds, because of their ability of adjustment and continual re-definition (Burns and Stalker, 1961:121).

The *coordinated climate* is based on many of the same assumptions as the *collective mind*. The main difference between the two concepts is that the coordinated climate includes the environment (*arena*), in which the collective mind is enacted. As proposed by Weick and Roberts (1993) technology is not that important for the collective mind, as a good collective mind will be able to work with any type of technology. Probably, Weick and Roberts have a point here, as too much emphasis has often been put on the exact specification of technology for work settings, more than the actual practice of the technology in the work setting. However, there is reason to believe

that the technology and how it is used in a social setting, will have significant value (positive or negative) on how fast a collective mind is developed in a team. As the arena is included in the concept of the coordinated climate, it is meant to signify that material structures (technology, architecture, and so on) do influence social practice. However, the well-functioning team is able to take out the potential of the social-material context in which the team work is situated. This means that the team is able to redefine the technology to suit the team practice.

TECHNOLOGY FOR A COORDINATED CLIMATE

How communication technology (radio networks and telephone) is used, is very important in the work of the AMK operators. Not least with the use of the Listen-All function, it is possible for the nurses and the AC to use the technology, radio or telephone, as a team. As we have seen in the LASCAD case (Beynon-Davies, 1995) and in the description of community emergency centres (Smith and Whalen, 1995), information and communication technology (ICT) is used very differently. ICT connects the actual work of the centre, between the call-taker and dispatcher in both these cases. There are few coordinated climate qualities in these cases, not because the (virtual) team is coupled with ICT, but because ICT is used in such a way that personal, intuitive, and peripheral information (for example the call-taker's perception of the caller's false intents) is missed. Although they share an arena, namely the ICT, and they may be interested to share all information, this ICT generated arena is designed in a way so that the different actors cannot know what the others are doing, and they have no way of gathering additional information. Text strings and status messages define all possible transmittable information.

The coordinated climate develops in the context of close interaction between people, but does not demand the existence of face-to-face interaction. However, the concentration of some kind of common action in a common arena, or workspace, is needed, hence the use of ICT must at least compensate for the lack of face-to-face interaction in some way, and create another kind of arena for interaction than, for example, the in-the-same-room situation of the AMK team. With the use of computer conferencing systems and other CSCW (Computer-Supported Co-operative Work) tools it is possible to conceive and construct variations of the coordinated climate. However, a condition for the coordinated climate is that the (mediated) communication happens in real time, so that the participants have the continuous and instant perception and knowledge of what the other actors are doing. For example electronic mail can be a good enough tool for many kinds of coopera-

tive work, as long as the team is able to keep the important collective actions on "the net", available for all actors in the team.

As we have seen in the case of the AMK centres, a lot of the communication between nurses and ambulance coordinators is of a more subtle kind, using plenty of non-verbal communication. The AMK teams are developed through the rich collaborative environment in the AMK centre, the common distributed displays, the sharing of information through these and other, shared displays, the physical gathering on the same side of the desk (Picture-box 6, page 134), the physical closeness, the focus on joint working tasks, and the varied channels of communication that are used. Much of the internal coordination is based on subliminal and peripheral monitoring capabilities within the human body.

The technology that is used in the AMK centres, is providing first, stable and partly redundant communication channels for the (external) communication between units in the emergency organisation, and second, useful tools for distributing information to all the operators at the AMK centre. For the *internal collaboration* in the AMK team, only pen and paper technology are added to the natural communication of face-to-face (FTF) communication and bodily signals. This extended FTF communication is necessary for the concept of the coordinated climate. Adopting an idea from Heath and Luff (1992:76), we must ask how one can organise technology in a social context in a way so that the intuitive, subliminal and social-cognitive aspect is developed and maintained.

As pointed out by Weick and Roberts (1993) above, a good team will be able to work well with any kind of technology. But that does not mean that the best team will not work even better with the best technology. However, it is a problem that technical artefacts are always designed with additional features that not necessarily is compatible with an already established well-functioning team practice. Further, when such a "well-designed" technical system is taken into use in practical settings, the features of the technology seem to be emphasised more that those manual ingenious, but simple, solutions that the team has worked out through their practice. The result is therefore sometimes that the good teams do not understand how good their manual practices are, and the presumably more technically elegant practices substitute the manual ones, with the result that some of the understanding that was connected to the manual practices get hidden in a black-box technical gadget and is lost for newcomers (cf. Zuboff, 1988, for the analysis of such tendencies in chemical industry).

There are both individual and collaborative activities being performed in the control rooms, and technology is often implemented to support the individual and collaborative tasks, through the point of view of each individual. But

as suggested by Filippi and Theureau (1993:176), the collective activity may be treated *as a whole on its own*, i.e. it should not be considered as the mere addition of the individual activities. These totally collective activities consist of the subtle team processes, the peripheral participation and the awareness of each others tasks and needs, and the development of these capabilities. When technology is used to support the team work where such qualities are important, care must be taken not to substitute these manual practices that contain such purely social collective functions that may get lost in the technical version of the practice.

CHAPTER 8

THE EMERGENT NATURE OF TECHNOLOGY-MEDIATED CARE

REFLECTIONS AND CONCLUSIONS

The construction of the AMK and LV centres was, among others, motivated by the possibilities in the new information and communication technology. However, the field work showed that the social, professional and institutional factors are very important for how the technology can be used. The AMK and LV centres are operated in a way strongly influenced by established practices in the institutions in which they are installed. The nurses that work the centres well, can do it mostly because they are professionally confident, individually motivated, socially supported and because the work in the centre is a core activity in the institution. The effective use of the centres demands focused social coordination that is developed over time. The technology is rather simple and is only used to *support* the team work, for example by providing information to all the team members simultaneously. This emergent form of coordination (coordinated climate) seems to demand a balance between centralisation and decentralisation of the centres, as such institutional aspects to some extent constrain possible organising strategies. Hence, the study of use of technology has to incorporate the importance of, for example, institutions and professions even when addressing micro relations and practice in ethnographic research or when isolating networks in constructivist approaches.

Chapters 3-6 have discussed how work in AMK and LV centres is practised by nurses and ambulance coordinators. The objective of this discussion has been to achieve a better understanding of the practice in these emergency communication centres, and how the use of radio and telephone technology works in this medical emergency setting. This final chapter starts by a short review of the previous discussions, and then relates those discussions to the governing idea of the thesis. Chapters 3-6 have emphasised several topics:

In chapter 3, the location of the LV centres in nursing homes was found to be problematic, because of the conflict with the nursing home work. The LV centres have to be adjusted to the institutional and individual constraints of the nursing homes. It was claimed in this chapter that the LV centre is too often handled like a switchboard, without any performance of competent medical guidance, because of lack of commitment to the LV centre from the nurses that man it.

On the LV telephones, that are operated by AMK nurses in the AMK centres, the nurses are undertaking evaluation, of categorisation of help to the callers. The nurses may use medical indexes, like "Norsk Indeks" (NI) to evaluate patients. It was claimed in Chapter 4 that the nurses have always performed evaluating tasks like these, even though these tasks have not been formally acknowledged as a nurse's job. The LV telephone gives the nurses extra occasions to act as advice-givers and evaluators, a task which they take very seriously and which they perform with care. However, with the regulating aspects NI, the doctors (i.e. the Norwegian Medical Association[31]) do not only give the nurses occasions to perform evaluative tasks, but the doctors keep a certain degree of control over the nurses' work.

There are substantial variations between the various LV centres and LV telephones concerning how callers are handled. According to Chapters 3 and 4, more help is usually given from the LV telephones than from the LV centres. In Chapter 5, several explanations were suggested; that the social contextual integration of the LV telephone provides better grounds for evaluations, since the nurses may discuss difficult cases; that the nurses who operate the LV telephone have better continuity and stability of their work and have developed higher competence in the specific kind of tasks, and that do not have to run back and forth between the centre and the nursing home department; that the nurses in the nursing homes are not interested in the unpredictable emergency work; and that the introduction of the LV centres was forced upon the nursing home nurses, so that they had a negative relation to the LV centres from the start.

[31] "Den norske lægeforening"

In Chapter 6, the internal coordination of the AMK centres was discussed. Three characteristics with the work in the AMK centres were discussed in particular: The sharing of information, the communication between the team members and the development of mutual knowledge in the team. It was claimed that there is a certain subtle communication that the team members use to coordinate their activities during actions, when tasks have to be performed quickly, smoothly and without discussions in the team. This form of coordination between the team members was compared with two other emergency centres, a public safety communications centre in the US (Smith and Whalen, 1995) and the system of ambulance control in the London Ambulance Service, LASCAD (Beynon-Davies, 1995). In both these cases, the task of taking calls and directing ambulances is split into several separate tasks, and performed by different persons or systems. The coordination between these units is implemented by a computerised transfer of status messages and text strings, which means that they do not have the flexible division of responsibility found in the AMK centres in Norway. It was concluded at the end of Chapter 6 that the separation of workers and work tasks may eliminate much of the flexibility and redundancy that is needed for the development of a safe emergency service with knowledgeable operators, either with or without the use of sophisticated (coordination) technology.

In Chapter 7 the work in the AMK centre was compared with work in control rooms, for example in airports, airline cockpits and underground trains. Further, an ideal type of emergency room coordination was constructed, "the coordinated climate", drawing on the observation of the AMK centres and control room studies.

One of the basic theoretical foundations for this thesis, as described in Chapter 1, is that the relationship between "society" (or specific social systems) and "technology" (or specific technical systems) may be viewed as dialectic. Technological systems have certain influences on social systems and vice versa, and even though it is often impossible to distinguish sharply and see those systems apart from each other, as claimed in the constructivist seamless web perspective, it is possible to see how the technical designs and practices influence social practices and vice versa.

From the previous chapters, several interactions between technical and social systems have been discussed. On the top level of analysis, there are basically two interactions that are studied in the field:

◊ Use of communication technology is constrained by social and institutional practices: For example, the existing nursing home practices constrain the possibility of establishing the LV centres as real service telephones.

◊ Communication technology may facilitate and constrain new forms of co-ordination. In the emergent practice of the AMK centres it is possible to exploit technology for the performance of core activities, but in which interpersonal communication is maintained through a focused, intensive team coordination. New forms of coordinated efforts emerge in the management of emergency medicine.

PRACTICES CONSTRAIN OUTCOME OF TECHNOLOGY

In the nursing homes, the objective of work is rather clearly defined, caretaking of elderly. The patients stay there for long time, and a rather static practice may result from this. That the nurses actually work with certain kinds of practices and that there are certain tasks that are given more priority than others in the nursing homes, makes it difficult to establish a completely new practice. Hence, when the LV centrals were implemented in nursing homes, many nurses did not want to have anything to do with them. However, they could not define or interpret the centres away. This is consistent with Merton's reminder about the objective components of social situations: "If men do *not* define real situations as real, they are nevertheless real in their consequences" (Merton, 1976:177). Even though the nursing home institutions are not static in their practice and philosophy, it may still work that way for the nurses that work there.

We may analyse this situation from a structural side, applying Orlikowsky's (1992) adaptation of Giddens (1984) structuration theory on information technology. As mentioned in Chapter 1, it is possible to consider technology as one kind of structural property of organisations (Orlikowsky, 1992:405). The structural property of the LV centre does not go along well with the already established structural properties, such as task priority and standard procedures, of the nursing homes. There is no way to exactly predict how a new technology will exhibit structural properties on an existing practice, and often too hasty conclusions are drawn on the basis of design qualities of the mere technical artefacts. For example, one could predict that operating the LV centre would not take more than some 40-50 minutes of effective work during an evening shift, and that there would be no problem in combining that work with the other work in the department. However, such an assumption has probably been erroneous in many nursing homes because of the unpredictable nature of the LV centre (after all it is an *emergency* service).

Many nursing home nurses feel that the work on the LV centre has been pushed upon them (cf. Chapter 3), and as many of them say, they still do

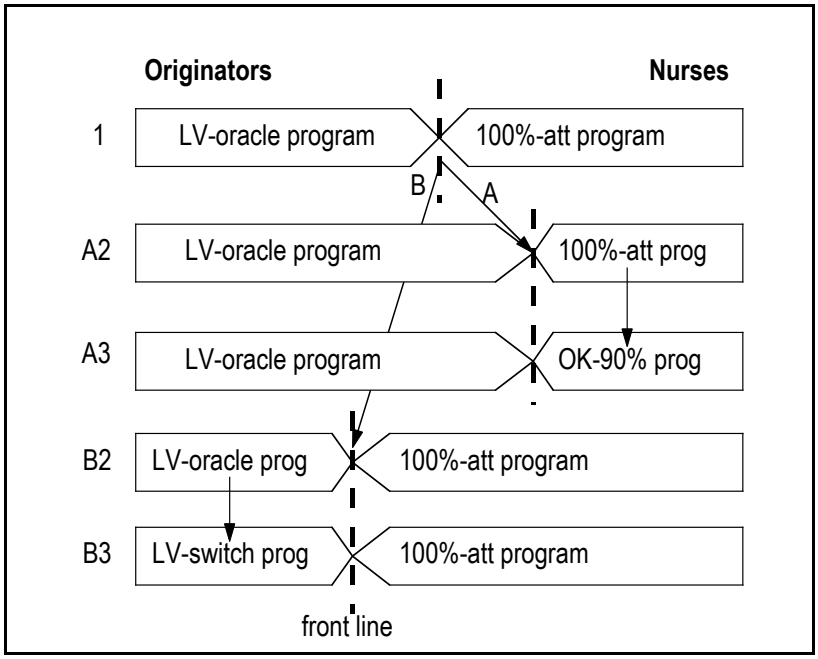
not like to man the centres. Other nurses say that they like the work because they get to know how the doctor works in diagnosing. Some of these nurses also develop the LV centre work more in the direction intended, as they are willing to spend time in evaluation tasks, instead of directing all the calls promptly to the doctor. Applying a dialectic perspective to these differences, it is possible to see how the nurses, given their professional, social and individual interests, respond to the technical injunction with various strategies. Some nurses exploit the possibility to increase their competence, but others respond to the new work responsibility with a minimum effort strategy, spending as little time as possible manning the LV centre, hence reducing the centre to a switchboard, or a doctor's anteroom. This function may also be useful, but it was not the full intention with the LV centre design.

Even though constructivist perspectives have mainly been applied to technology *design processes*, one may also analyse the present situation of the LV centres with an actor-oriented approach. Moreover, since we consider technology as both technical artefacts and their use, one can say that the last part of the technology design process is always left to the user. With the *seamless web* analogy (Hughes, 1987), we view the *machine-practice-interaction* as part of the design process of technology. In the case that the nurses use little time with the LV centre, they actually *reconstruct* the technology in which they are a part. Instead of viewing the minimum effort strategy of the nurses as a reply to the forces of the technical system, as in the dialectic perspective above, this development may be viewed as a continuous development in the seamless web in which the nurses and the LV centre are parts.

According to Latour (1992) it is impossible to observe things apart from people, but we may study *programs of action*, where some sections are "endowed of *parts* of humans, while other sections are entrusted to parts of non-humans" (Latour, 1992:254, his own italics). Looking at the LV centres in the nursing homes, there is a front-line between the *LV-centre-as-an-oracle program* (LV-oracle program) and the *LV-centre-as-a-switchboard program* (LV-switch program), and some of the nursing homes manage to apply the LV-oracle program together with the practice in the nursing homes (following the designers' intentions).

Figure-box 2

Programs of Action in the Introduction of LV Centres



Two programs in the development of the LV centre: The LV-oracle program from the originators' intentions and the 100%-att program from the nurses are not compatible, and the frontline between the two programs is changed during the emerging practices, in which political processes are a part. There are two possible outcomes; A2, the LV centre as an oracle, and if the nurses admit that the nursing home does not need 100% attention, the 100%-att program can be redefined to a "OK-let's-say-90%-is-enough" program. In the other outcome, B2, the LV-oracle program is squeezed and redefined to the LV-switch program (adopted from Akrich and Latour, 1992:263).

But the practice in the nursing homes also follows programs, and what we have seen in many nursing homes is the front line between *the-nursing-home-demands-100%-attention program* (100%-att program) and the LV-oracle program. Only by redefining the 100%-att program, the front line between these conflicting programs may be moved in the designer-intended direction, towards the LV-oracle program. The redefinition of the 100%-att program is a political process in relation to the nursing homes and the municipal health authorities. It has obviously had various outcomes in the different municipalities. In Figure-box 2 the process between the two "paradigms" or "programs" (Akrich and Latour, 1992) is showed, and also how the "losing" programs may be redefined, as a new strategy of either the nursing home or the LV centre is taken. As discussed earlier, referring to Button's (1992) critique of constructivism (cf. page 13 in this thesis), a problem with this approach is that we may end up with a story that the users (nurses) often will not recognise.

It makes sense to apply Galegher and Kraut's (1990) discussion of permissive and prescriptive technologies and Orlikowsky's (1992) use of Giddens' (1984) structuration theory on technology, to the implementation and use of parallel technologies or strategies. For example, the radio networks between LV centres and the doctor-on-call is not constraining or prescribing how the nurse is supposed to contact the doctor, because there is still telephone and mobile phone connections as before. Even though communication via radio constrains possible forms of communication, the actual introduction of a radio network between doctors and nurses does not constrain the nurses' actions. However, establishing the LV centres in nursing homes has certainly led to restrictions to nurses action, or their freedom in work, because the LV centres demand certain actions now and then. The nurses *have* to run to get the phone, as discussed in Chapter 3.

In the AMK centres, additional technology is adjusted to the already existing practices, because the AMK centres keep their focus of work rather independently of the use of *new* technology. When new technology is put into the AMK centre, this technology is supposed to ease the work for the operators. Every now and then there are changes within the operation of radio and telephone networks, but these changes are embedded in the practice of the centres, as a development of this practice, not as a means of restricting it. Heath and Luff (1996) have studied underground control rooms and remarked:

> "The use of various tools and technologies is embedded in the accomplishment of simultaneous and overlapping activities, which themselves are dependent upon an indigenous socio-interactional organisation that provides for their production, intelligibility, and coordination" (Heath and Luff, 1996:124).

As in the AMK centre, technologies are embedded in the accomplishment of the activities, for which the centre was dedicated.

However, the LV centres at nursing homes have to be seen in the nursing home context more than the AMK centres have to be seen in a hospital context, since the nursing home nurses share their duty between the nursing home unit and the LV centre. What we have found, in Chapters 3 and 5, is that the practice of the LV centre has no natural belonging, or embeddedness, in nursing home work. Hughes (1971) discusses the transformation of professions in the health sector, with emphasis on the nurses place in the system, and what the occupation of the nurse is. The social role that the nurses play is in relation to other medical occupations, and of course to the patients. Nurses have always among others filled the role to give the patients "physical and spiritual comfort" (Hughes, 1971:314), but new work tasks are included in the nurses' occupation, and there is an ever stronger emphasis on the purely technical organisation of work (Burns, 1981).

Hughes (1971) is concerned about this evolution, and criticises the development towards more technical instrumentality in the nurses' work. For Hughes it is important that the nurses never make the error of studying the technicalities apart from persons. However, the reaction from many of the nursing home nurses towards the LV centre goes along with Hughes' argument, as they are concerned about their patients, and how in some cases patients must be left alone when they have to run to answer the phone at the LV centre. The fact that one is working with people makes it difficult to prescribe a best practice of for example the LV centres. Because of this, as Mills and Moberg (1982:475) claim, there have to be certain differences of technology implementation in the service sector and the industrial sector. There are many strong influential factors in the social, institutional, professional and individual contexts of the technologies, that the outcome of establishing LV centres at the nursing homes is very uncertain.

NEW TECHNOLOGY FACILITATES AND CONSTRAINS COORDINATION

The AMK centres are operated as a completely different service from most of the LV centres. Being staffed by two or three people, the AMK centres show examples of very advanced interpersonal team collaboration, as discussed in Chapter 6. When I was observing work in the AMK centres, I was looking for the way they were using communication technology to coordinate their work. However, what I saw was that the important coordinating mechanism, was an extreme orientation among the team members towards the task performance of the team as a whole. Besides, anybody in the centre would know at almost any time the status of different actions, if there were any. The technologies that were used to serve the purposes of the internal coordination in the centre were the Listen-All function, that makes it possible for all the team members to listen to an incoming emergency call, and the shared or common information screens. For the actual coordination between the team members, only the social technologies of talking, listening, looking and moving were used, and used intensively in some periods.

I have compared the internal coordination of the AMK centres with two other emergency communication centres where the actual coordination between team members has been technologically implemented, a public safety communications centre (Smith and Whalen, 1995) and the ambulance control system, LASCAD, in London (Beynon-Davies, 1995). In these two cases, some of the team coordination that is developed with the use of bodily multiple channel communication in the AMK centres, was substituted by text strings and status messages, that are mediated via computer networks. These mechanisms are the factual communication between the different parts of the

emergency centres, call-taking and dispatching. Since there is no alternative to using this communication channel, the working practice is forced into procedures with the text strings and status messages, hence *constraining* practice dramatically. However, the constraining capabilities of these technologies is not really qualities with the technical solutions in itself, but with the use of the technology[32] in a specific context. As with the cases of Smith and Whalen (1995) and Beynon-Davies (1995), it is not the text string and status message procedures that constrain the possible work practices of the emergency centre operators, but the fact that there are no alternative strategies for performing their work tasks.

DEDIFFERENTIATION

In the health service, it is impossible not to include professional interests as related to changes. Chapter 1 referred to Rueschemeyer's (1986) discussion on dedifferentiation. As proposed from the initiators of the emergency system, the "Hordaland Model", it would be possible with this new organisation to give people better availability of health resources, without having to use the doctors' competence unnecessarily. By putting nurses in the front line of all emergency services, as a first screening instance, people would get in touch with a competent advisor, that would give proper advice, or if necessary, forward the inquiry to the doctor-on-call, or send an ambulance.

Could the nurses' performance of these new tasks increase the nurses' competence and confidence, for example closer to what is considered doctors' competence? Is there a dedifferentiation between the nurses and the doctors, which actually means that nurses and doctors perform more similar tasks, because of the new emergency organisation? Is there more autonomy (Freidson, 1970; Abbott, 1988) for the nursing profession after the introduction of the AMK and LV centres?

As we have seen in Chapters 3 and 5, the *nursing home nurses* have only a slight chance to perform a lot of evaluation tasks in the LV centres, because of too little time, insecurity and too little support from their colleagues, or because the municipal doctor has strictly emphasised that all medical questions must be forwarded directly to a GP. Some of these nurses like to listen a bit to the doctor's conversation with the patient, to make sure that the communication is established, but also because they can grasp some of the essence of diagnosing by listening to the doctor-patient conversation.

[32] If one includes not only technical artefacts, but also the "use of technical artefacts" in the definition of technology, this explanation is unnecessary.

The nurses at most of the AMK centres, on the other hand, are not afraid to use their competence by giving callers advice, and they also have the time and social support for doing that. Besides, "it is our job". It is interesting that the nurses who operate the LV centres very much admire the AMK centre nurses for their professional performance, even though they may have the same basic competence and even experience (since many of the nursing home nurses have hospital experience). However, their work tasks are very differently coupled with their general professional and social practice.

From the observations I conclude that the dedifferentiation between the doctors and nurses is only to a minor degree initiated by the LV and AMK centres. As concluded by Hughes (1977; 1980; 1988), nurses have always been doing evaluative tasks independently of doctors, before the doctors' involvement with the patients. That is what is happening at the AMK and LV centres also. Besides, the doctors manage to keep control with the nurses' evaluative tasks with "Norsk Indeks" (NI), in which these evaluative questions are specified for the nurses. On the other hand, nurses that attend the LV telephones terminate many of the inquiries, as they are able to help the caller to a specification (diagnosis), and when there is nothing serious, only give advice according to that, on the phone.

In these calls, the LV telephone gives the nurses an opportunity to act rather independently of the doctor, though of course, the use of the NI is still there, but not compulsory. With the trust in their own competence and various helping aids, the nurses are actually doing a doctor's job, or more precisely, doing a job for the doctor. Even though there are some of the nursing home nurses that do these jobs in the LV centres, this nurse accomplishment is mainly observed at the LV telephones in the AMK centre. There is a tendency towards dedifferentiation between nurses and doctors in these situations, but the professional confidence that is needed in these tasks is developed by the medical collaboration and assistance, in the AMK centre or the emergency ward. Nevertheless, the LV telephone gives the nurses another opportunity to perform such independent evaluations, and where it is up to the nurse, if and when the doctor should be involved.

I also introduced the possibility of dedifferentiation between nurses and ambulance coordinators in the AMK centre. As discussed in Chapter 6, there is an intensive exchange of experience and knowledge between the nurses and the ambulance coordinator, and the abilities to do each other's tasks is significantly developed. However, the nurses who operate the AMK centres work most of their duties in the emergency ward and the ACs work 1/2 time as ambulance drivers. Therefore, they preserve their respective professional abilities and responsibilities, even though they work very close together in the AMK centre, with strongly overlapping duties. It is therefore a dedifferentiation in the sense that the nurses and ambulance coordinators learn to do

many of the tasks of the other, but it is not a dedifferentiation in which the nurses' and AC's professions melt together.

This parallel differentiation and dedifferentiation seems to serve as a social extension of the AMK centre both to the emergency ward, via the nurses, and to the ambulance service, via the ambulance coordinator. Through this social extension, it is possible to maintain effective and personal working relationships with the involved actors outside the mere AMK centre. The internalised joking between the ambulance drivers and the AMK team, and between the emergency ward and the AMK team, are good indicators of this.

In one of the larger AMK centres, there is a growing separation of attending the LV telephone and the emergency calls. It is said that there is too heavy traffic on both of these to let same persons attend them. Moreover, there are plans to automate more of the work on the AMK centre, and it is possible that many of the flexible, redundant work responsibilities that is described in Chapters 6 and 7 are impossible to maintain in this AMK centre. The discussion of centralisation versus decentralisation is unavoidable.

DECENTRALISATION OR CENTRALISATION

In Norwegian society in general (among people and government) maintenance of decentralised public services is highly valued, as the rural parts of Norway with very low population density are supposed to have the same quality of service as the urban areas. Decentralisation of health services is nearly always viewed as positive, while centralisation of the services is considered negative, as necessary evils forced upon health care by lack of resources and demands for rationalisation (Gammon, 1993). Therefore, when the "Hordaland Model" of the emergency service was planned, it was meant to decentralise the service, which was a politically correct strategy. Every municipality was going to have their own emergency service, and one of the ideas behind it was to get enough local knowledge into these centres to make it safer and more effective to send the doctor to peoples' homes.

One of the points made in the criticism of the LASCAD system is very interesting, when comparing the system with how the AMK and LV centres work. In the LASCAD breakdown, the loss of local knowledge was reported as a possible problem. Consider that the London ambulance service covers a population of several million people, and to handle the work load they made a system to automate the ambulance requisitions and guidance. Consider then the regular municipal LV centres, serving a population of 10000 to 20000 people and getting only 10-20 phones during a regular evening shift, a work load not large enough for a single person. There is certainly local

knowledge among the nurses, but for many of them the working situation (Chapter 3) does not allow them to use it, except maybe for guiding an ambulance or the doctor to the right geographical spot, for which you do not need a *nurse*. In the AMK centres, on the other hand, the work load is large enough to employ two to three people, and local knowledge is not at least brought into the AMK centres with the ambulance coordinators, with their field experience from the practice as ambulance personnel. While the AMK personnel manages to develop their confidence to use the local knowledge they have, the non-continuity and the lack of social and institutional anchoring of the work tasks make this more difficult for an LV nurse, even if she possesses more local knowledge.

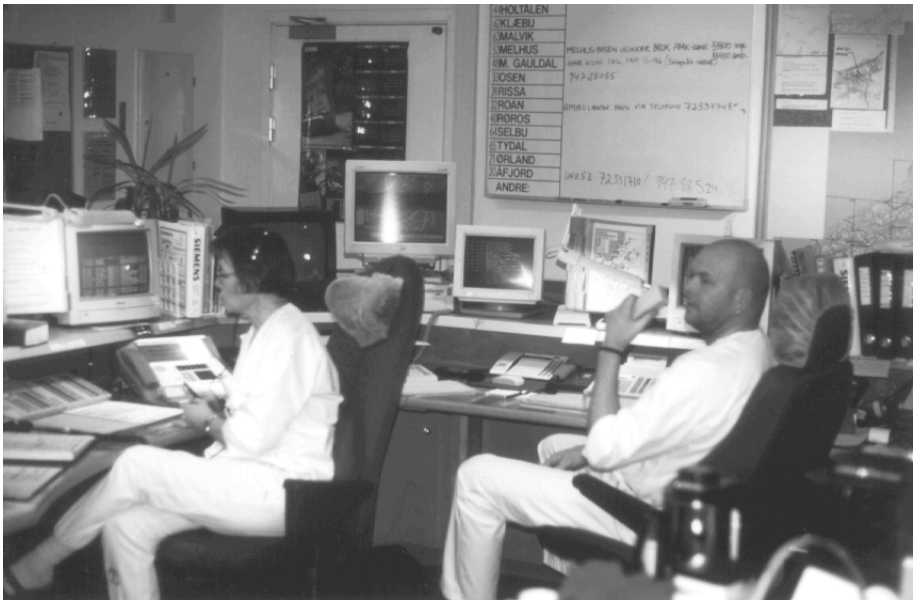
The use of information systems make possible a centralisation of the activity, as all incoming calls may be structured into a data base system, like LASCAD. In the largest AMK centre in Norway, they are now not able to use the Listen-All function, because there are too many incoming calls. The three operators cannot leave their tasks for another 113 emergency call, as there are more of them coming all the time. It seems that this specific AMK centre is moving towards automated practice, like a small scale LASCAD, and it is also planned to extend the coverage area to about one million people. Hence, significant features of the flexible organisation of the AMK centres (the coordinated climate) may be difficult to practice when the centre gets too large, with too much traffic.

SUPPORTING THE INTERACTIONAL STREAM OF ACTIVITY

Chapters 6 and 7 have focused on what sometimes has been called *socially distributed cognition* (Hutchins, 1995; Hutchins and Klausen, 1996) in the AMK centres, the improvisation that is based on individual professional and social competence. The actions of the operators in the AMK centre are never completely independent. Even when one person performs a separate regular task, he or she is never unavailable to assist another actions, more or less instantly.

Picture-box 8

Instantly Assisting Another Action



With the closeness to each others activities, the operators in the AMK centre may assist in each others actions instantly. With turning and movable chairs, the operators may instantly move both physically and mentally back and forth between various ongoing actions.

The separation of the various tasks and different operators, in space, in hierarchy (delegation) or by the use of technology (automation) often makes these improvisational team supportive activities difficult to perform. For example, in the LASCAD case, the separation of the call-takers and despatchers made it impossible for the operators to improvise with manual systems when the information system broke down.

The LASCAD system, like the Norwegian AMK centres, are after all designed to handle emergencies, or emergent processes, that are difficult to treat as general static structures. Every case is an exception, and has to be handled according to that. A flexible division of responsibility between the operators and a high level of redundancy of their access to information and competence make it possible for any of them to always perform the first most needed task in an emergency action. This interactional stream of activity is characteristic for a coordinated climate (Chapter 7). An information system may obstruct this organisation of the work, in the process of efficiency and control, if it does not allow for this flexibility and redundancy. I propose that it can be necessary to leave many of the subtle interactive processes, the peripheral awareness of each others tasks, to be left to social (or inter-human) coordination mechanisms to maintain a true secured emergency centre.

COMBINING PERSPECTIVES

As claimed by Misa (1994), in the study of technology, applying a macro perspective often results in technology determinism, and applying a micro perspective often results in constructivist theories:

> "To invoke "technology" on the macro level of analysis, is to compact into one tidy term a whole host of actors, machines, institutions, and social relations. To expand "technology", on the micro level of analysis, is to regain the complexity and messiness of the compacted whole. Insofar as people are necessary parts of the networks, to say that "technology" causes social change is really to say that people - through the sociotechnical networks they create and sustain - cause social change" (Misa, 1994:141).

It is hard to escape the sociological debate on structure and agency, as moments from one side can always be used to criticise the other: Constructivists believe too much in the interpretative flexibility of technology, and functionalists believe too much on the inevitable intended or unintended *consequences* of technology. By emphasising how structures make actions possible (Giddens, 1984) it is possible to go a step further.

But to study how structures make action possible, one has to observe practice closely, in the way ethnographers do. By observing work, ethnographically, and in addition taking into account the structural (institutional, professional, technical) constraints that all workers at least *feel* subordinate to, one is better able to understand the duality of technology, at least for one type of context.

> "[S]ince technologies exist as objects in the realm of action, one cannot hope to understand a technology's implications for structuring without investigating how the technology is incorporated into the everyday life of an organisation's members" (Barley, 1986:81)

I have tried to do so for the Norwegian medical emergency centres.

With the AMK centres it was possible to follow how the workers developed their way of practising team work and using *technology for facilitating the coordination* team and external emergency resources. Further, it has been shown how the *intense social interactions can support* both medical decision making and the mastering of technology. The "social vacuum" connected to the LV centres in some nursing homes may have been one of the reasons for the reluctance towards it among nurses.

◊ The practice of the LV centres was usually more constrained by *institutional* factors than the AMK centres. In fact, these institutional constraints did not only make it difficult for the nurses to engage in the LV centre work, but they also made in difficult to study this work (as described in Chapter 2).

◊ The *professional* division of labour is interesting, because the LV centres serve as intermediating units between doctors and patients. It has been suggested that nurses might have taken over some of the doctors' work, but then we have seen that nurses have actually always performed such evaluation (diagnosing) tasks. (However, these tasks are not always formally acknowledged.)

◊ The idea from the social constructivists, that it is impossible to see the technical apart from the social and the social apart from the technical, must not stop us from acknowledging and applying the knowledge of professions and institutions that is developed in sociology.

◊ The social constructivist approaches is however needed to understand the flexibility of outcome of technology implementation and use. With an anti-essentialist view of technology (cf. Grint and Woolgar, 1997:36) one may emphasise the existence of competing interpretations of technological capacity.

With the use of observational methods it is possible to better understand how people develop their technology (i.e. use of techniques) in natural settings in and among institutions, professions and social settings. When applying an observational method, the time perspective becomes clearer, as any action has an *emergent* nature. Moreover, the emergent nature of these practices that we study today is what may construct the structures that may be taken for granted tomorrow. As suggested by Archer (1995:65), it is *time* that links structure and action. It is difficult to study both action and structure at the same time, but we can observe work both in arenas where practice is emergent (AMK centres) and where practice is strongly connected to, or constrained by, established structures (LV centres).

As the title of the thesis suggests, there may be such things as caring machines. It may of course seem contradictory, but it may also trigger further discussion on the technological and social implications on one hand, and on agency, structure and time aspects, on the other. This brings me to the final issue:

CARING MACHINES

As suggested by Archer (1995) and Reed (1997), the relation between agency and structure is "time". This signifies that structures are created as an autonomous process, and it may be so, that the structuring is happening automatically, and that agency has influence on the direction, in which structuration goes. However, I propose that the relation between structure and agency is more of a *time equivalent*.

The structuration of agency (or practices) is accomplished during a time equivalent, which means that there is no automatic structuring without activity, and the more intensive this activity is, the less time is needed for the process of structuration. In the intensive working situation of the AMK centres, agency is developed into structures[33] (rules and resources) during a rather small period of time. At the LV centres on the other hand, the intensity of the LV centre practice is rather small, so a consistent practice has to be upheld during a longer period of time to develop such structures.

Initially, when technical artefacts are implemented in for example nursing homes, a dialectic relation is developed between the social and the technical systems. The nurses, already embedded in institutional and professional structures, "struggle" against the designers' imperatives in the technical systems. But during a time equivalent, i.e. during the nurses' practice with the technical artefacts, the dialectic is metamorphosed to a more stable structure (of practice or work). Since the nurses in the nursing homes have very little work intensity in their LV centre practice, because of little traffic and because it "is the other work that they are there for", the structuration may take very long, as mentioned. Then, the dialectic antagonism between the nursing home practice and the LV centre technology is prolonged, the LV centre practice does not get well embedded in the nursing home, and the nurses do not really get the chance to develop a caring function within the LV centre work. The antagonism between the mere imperatives of the technological interface, as opposed to nursing home practice, is too strong.

With the high intensity of the AMK centre work, on the other hand, the use of new technology is effectively structured to social practices. The "climate" analogy (in the presentation of the coordinated climate), signifies that there is something in the room, a structural or cultural contextual factor. These contextual practices are really the practice that has *emerged* during intensive team work over time, and that has transcended the dialectic between the technical and the social elements in the AMK centre. This practice is to be considered as a structure, in which both human actors and technical artefacts work. Because a structure is developed, it is possible to exchange team members, without changing the practice in the AMK centre. The technology (artefacts and how they are used) are parts that are taken for granted by the human actors, and they are therefore capable of putting the focus on the core

[33] When the term "structure" is used, it is a tendency that it signifies the constraining things that hinder personal initiatives and freedom. One thinks about hierarchical structures, or the "iron cage" (Weber) of bureaucracy. As claimed by Giddens (1984), however, structures also facilitate action, and as we tend to still think about hierarchies we may think "Yeah, OK, he's right: There are some things you can do with the hierarchy that you cannot do without". Upholding this view of structure is a hindrance for the understanding of how structures really facilitate action. The actor networks of Latour (1987) are also structures in which the social construction of scientific facts are negotiated.

of the work, medical advice service and resource coordination, instead of being distracted by technical interfaces.

By the time equivalent, some of the responsibility for the structuration process is put onto the actors. Through the intensity of their activities, within an *action scope* defined by already established structures, the actors develop practices and new structures. Also when new technology is introduced in the work place, the *interpretative flexibility* of this technology still allows the workers an action scope.

Caring machines are created when the nurses through their intense activity are able to transcend the technological interface. As the caring is the focus of work (agency) and the machinery is the medium through which this work is mediated (structures; rules and resources), caring machines[34] are the ultimate aim of the emergency medical communication centres. I have shown how caring machines are developed from an initial care-machine dialectic, by the human actors' intense practice, in which structures emerge. These structures are emergent in their nature, and define an action scope in which agency takes place. When communication technological structure is implemented in an existing institutional structure, the actors push these structures forward, and develop a new joint emergent structure, which defines the realm of new practice.

Hence, both structures and practices (agency) are emergent. New technological implementations will always be embedded in these emergent structures and practices, and will therefore be emergent together with the context in which it is introduced. The technical system alone has no mission before it is established and then reconstructed in this practice-structure relationship. Only with a prior understanding of these practice-structure contexts will we be able to develop good caring machines and other functioning machines.

[34] The term machine does not mean that it is something that is necessarily cold and impersonal.

APPENDIX 1

"LV CENTRE, NURSE SPEAKING."

THE EXPERIENCE OF THE LV CENTRE, AS DOCUMENTED BY A NURSING HOME NURSE[35]

Rather more than five years ago, the nurses where I work were given new tasks. This was one of the first local authorities in the country to start operating an LV emergency phone service from a nursing home, based on the "Hordaland Model". After many years working on rehabilitation, senile dementia and residents in need of nursing, we were now, in addition, going to have to man an LV phone. There was no lack of opposition from us when we heard of the plans. Our everyday life, with 30 residents, was busy enough already.

An LV emergency phone service based on the "Hordaland Model" means that people can ring the local authority nursing home when they urgently require a doctor, a midwife, a community nurse, or an ambulance. When the doctor's surgery closes in the afternoon, those who need help will no longer have to hear a telephone answering machine. The call will be taken by a nurse. At the AMK centre in Bergen, a radio communication system has been designed to link the emergency medical resources. The nurses are trained in the use of this system. It is important that the patient gets help on the spot, since it is often too late when he or she reaches hospital.

Together with midwives, municipal doctors, ambulance staff, the Fire Service and the community nursing department, we were given information about

[35] This text was written by one of the nurses that works in one of the first LV centres that was established. The text is written in 1993, five years after the introduction of the LV centre at that nursing home. I would like to give my greatest acknowledgements to this particular nurse (who wants to be anonymous), first for showing me this personal document, and then for letting me reprint it in its full length.

this new teamwork. Those employed at the nursing home were also briefed; that was important. We nurses in the nursing home were given practical and theoretical training. We thoroughly learned the instruction booklet prepared by the AMK centre. Everything was well organised for inexperienced people. We attended a three-day course at Haukeland Hospital, spending one afternoon at the centre to see how they tackled the requests for help. It scared us a bit that the nurses were to be the "keys" in this work. Would we manage to arrange for help rapidly in an emergency? I thought back to the time I was an anaesthetist when administering anaesthetics was a nurse's task - everything went well, nevertheless.

Officially, the LV phone begins operating at 15.00 hrs. and continues until 07.00 hrs. However, people ring all day long when they need a doctor, a midwife, etc. We serve two local authorities, with a total population of about 16,300 - many more at holiday time. Two nurses come onto the afternoon shift, one at 14.30 hrs. and another at 15.00 hrs. One of these mans the telephone until 18.30 hrs.[36], when we give each other a report on the situation. After several hours at the telephone, it's good to get out onto the ward. From 21.00 hrs. until 07.00 hrs. the next morning, there is one nurse on duty. She carries a bleeper and mans the telephone in addition to her work on the ward.

The nurse manning the telephone makes a note of requests every time the doctor who is on call takes contact. The radio link is tested both ways. We are anonymous nurses who take the telephone, answering: "LV nurse". Requests are noted on two different forms, depending on which local authority the caller is ringing from. The information is only passed on to the person or service concerned. All the filled-in forms are kept in a locked cupboard, which only the nurses have access to. We get a number of enquiries and confidential information. "You're a nurse, what do you think?" A note is made of the time, the client's name, date of birth, phone number and address, and the name of the person ringing, We request information on previous illnesses, medicines, temperature, etc. Key words are written down along with why medical help is desired. The requests are ranked according to degree of urgency - emergency, urgent, can wait. This assessment is a nurse's task. We have to recall experience and learning we thought we had forgotten. When nurses are being trained, everyone is thinking the same thing: "Will I manage to recognise the right symptoms so that those who need medical help most get it first?"

After the request has been dealt with, we note the time and sign the enquiry. With 20-30 requests in a few hours, it is important that the forms are carefully filled in. Often, both nurses assess individual requests. It's good to be

[36] The other nurse mans the LV centre from 18.30 to 21.00 (researcher's note).

two on duty. There's a special feeling of fellowship on the late shift. The nurses feel a sense of solidarity in this demanding work which we cannot share with the others who are on duty.

In emergencies, an alarm can be sounded which doctors, ambulances and the fire service hear simultaneously. When an accident occurs, information is often sparse and confusing at first. We are then able to give doctors and ambulances reports over the radio, while they are en route to the scene. Radio communication is used by other people than health personnel, so personal information must only be given in emergencies. We call up on the radio and ask, for instance, the doctor to contact us by telephone. It may be vital to use the radio.

The telephone rings one afternoon. An 8-year-old boy has cycled off the quay, straight into the sea.. He could be seen at a depth of 3-4 metres. The doctor and the ambulance drove along the fjord with blue lights flashing. The ambulance helicopter was called out. Information about a landing place went fine, because I knew the spot well. When an accident occurs, it is important that we remember to say that they must listen for the phone so that we have a chance to give messages. I spoke again to the lady who rang and said they must try to get the boy up into a boat. A youth then jumped into the sea. With help from others on the quay, the boy was pulled out onto the land. It was spring and the water was cold. The helicopter took the boy and the young man was driven home. I read about the accident in the paper, where it said that the boy wanted a new bicycle. For several nights, I dreamt about someone who fell into the sea without getting help.

Is this a job for a nurse? We often get this question from local authorities that are still planning an emergency phone service based on the "Hordaland Model". The municipal doctors say "Yes".

There's a call on a mobile phone. A 42-year-old man has stopped his car because he feels so ill. He's sweating, feeling sick and experiencing pains pressing up towards his throat. He's ringing to ask whether he can have an appointment with the doctor when he's rested a while; he thinks he can continue driving when he's been sick. I look on the map to see where he is and I tell him that there's an ambulance nearby that can drive him to the surgery. The doctor's at the surgery and I report an urgent case. The man was admitted to hospital for observation for an incipient heart problem.

One of the two local authorities we serve has about 12,000 inhabitants and has one doctor on afternoon-evening-night call. The nurse can make an ambulance requisition without asking the doctor. In urgent cases, the ambulance takes the patient to the doctor's surgery, which is close to the ferry quay. This saves time for both patient and doctor. When a patient is to be admit-

ted to hospital, we are dependent upon the ferry; in other words there's only one road to town. The midwife also has to use the ferry to reach K-town, because she has a large district to cover. It gives a feeling of security for those who "are waiting" that they can call us at any time of the day or night. The nurse always knows where the midwife is, or she can get a message through on the radio.

With about 95 safety alarms, there's a lot of contact with old people. We have information on the computer and can talk to them at the same time as we read the screen. It gives a sense of security for old people who live alone to know that we can put them in touch with the community nurse when they press the alarm.

In this work, we come into good contact with patients. It's perhaps easier to express yourself to someone you can't see? Some people just seem to have a need to chat a while with a nurse. There are also questions about medicines, allergies, rashes, whether children can be taken out; it's quite unbelievable what people ring and ask about.

One evening, there's the calm voice of a boy saying, "I didn't get a reply from L-Town surgery today. They're apparently not out here on Wednesdays. Now I'm going to kill myself this evening if you can't help me." It seemed inconceivable to me. A youth of 20 who couldn't be bothered to live any longer. We talked for a while and I assured him that the doctor had time. Fortunately, the doctor who was on call knew the boy, and he got help.

No difficulties in this job? Well yes, but the problems have to be solved as you go along, if the system is to function. Initially, the reporting routine was taken a little too lightly by those who came on duty in the afternoon. This was quickly corrected. It is important that everyone who has to do with the emergency phone receives training and follows the instruction book.

How important it is to take people who ring seriously I learned one Saturday evening five years ago. There was an anguished woman's voice on the phone crying out, "My sister's taken a whole lot of sleeping pills and "vival"[37]. You've got to send a doctor to her. She rang just now and said she was depressed and couldn't stand it any longer. I can't get in touch with her. It's engaged all the time. She must have taken off the receiver. Help her, otherwise I'll report you to the police. I'm ringing from town, there's only me who knows about it." The other nurse knew the address. She went with the doctor so that the lady would get help as quickly as possible. The ambulance was called out. The nurse said afterwards that the husband was working in the garden while listening to the Eurovision Song Contest. He seemed

[37] Tranquiliser ("angstdempende medisin").

surprised when a doctor, nurse and ambulance turned into the drive. The doctor spoke to the woman. She seemed to be in good form. She said, smiling, that she hadn't taken any tablets and it was wrong to come to her. Not long afterwards, the doctor reported back at the surgery, to waiting patients. The ambulance driver didn't mince his words when he reported back. Ambulances were for ill people! I couldn't get any peace of mind as I sat there. The doctor asked me to ring the lady, but the phone was still engaged. It's better to give assistance once too often - I'd just learnt on the course. My job is to report about a patient, and I'd done that. I rang the doctor again. He drove down to the lady for the second time; she lived close to the surgery. Not long afterwards, I was asked to send an ambulance. The lady had fallen asleep. I heard later that evening from the AMK centre that she was in poor shape when she was admitted. She had taken pills, in addition to having diabetes with a blood sugar level of mostly 0. Her sister rang the day after and thanked me for helping. I've often thought about this just over 40-year-old mother of four children. Would she have got help before it was too late if the emergency phone hadn't become operative a few weeks earlier?

The LV emergency phone system based on the "Hordaland Model" has now become established by law. I hope other nursing homes have the same experience as we do, that nurses are keen to get jobs there. We've got a better professional atmosphere. Our feedback is positive, that this is an important job for a nurse.

APPENDIX 2

NORSK INDEKS

NORWEGIAN INDEX FOR MEDICAL EMERGENCY ASSISTANCE

The two next pages are reprinted from Norsk Indeks (NI) with the kind permission of the publisher.

NOT IN THIS PDF VERSION!!

APPENDIX 3

OMSORGSMASKINER

SUMMARY IN NORWEGIAN

Stadig mer forskning fokuserer på utviklingen og bruken av teknologi, ikke minst i forbindelse med den stadige mer utbredte bruken av informasjons- og kommunikasjonsteknologi. Mange av disse studiene har vært motivert av ønsket om å vise til de fantastiske mulighetene som organisasjoner (særlig bedrifter) har ved å nyttiggjøre seg nyvinningene (se f.eks. Davidow og Malone, 1992 og Scott Morton, 1991). Mange samfunnsvitenskapelige studier har imidlertid inntatt en mye mer kritisk holdning til de teknologiske nyvinningene. Innenfor sosiologien er det flere slike tilnærminger.

SOSIOLOGISKE PERSPEKTIVER PÅ TEKNOLOGI

I de funksjonalistiske tilnærmingene fokuseres det på hvilke effekter de tekniske systemene har på brukerne av dem, og spesielt hvordan alle systemer medfører uintenderte konsekvenser, blant annet ved at de nye systemenes *latente funksjoner* (Merton, 1967) trer fram i dagen etterhvert som systemene kommer i bruk. I disse studiene betrakter man de tekniske systemene som makrostrukturer som følger sin egen utvikling mer eller mindre uavhengig av brukerne (dvs de er teknologideterministiske).

I Marxistiske tilnærminger unngår man en ensidig determinisme ved at teknologiene antas å være i *dialektisk* motsetning til de sosiale systemene. Spesielt betraktes teknologiske nyvinninger som kapitalistenes middel for å beholde sitt herredømme over arbeiderklassen. I nyere perspektiver (se f.eks. Winner, 1977; 1986, Hirschorn, 1984; Feenberg, 1991) påpeker man at det er de *kulturelle verdiene* som er knyttet til teknologidesign som medfører uheldige konsekvenser (som for eksempel degradering av arbeidskraft), og ikke teknologien i seg selv.

Tilsvarende fokuserer de sosialkonstruktivistiske studiene (Bijker, Hughes og Pinch, 1987; Bijker og Law, 1992; Law, 1991) på hvordan den teknologiske utviklingen eller de teknologiske innovasjonene ikke følger naturlige utviklingsveier, men konstrueres i nettverk av aktører som hver på sin måte presser fram sine interesser i forhold til et teknologisk artefakt. Mange av konstruktivistene benekter et skille mellom tekniske og sosiale systemer (eller aktører). De mener at det er umulig å egentlig separere det tekniske og sosiale, og velger i stedet å betrakte de totale relasjonene som et *sømløst vev*. Konstruktivistene bruker spesielt historiske studier av teknologi-utvikling for å identifisere aktører i slike vev, og dermed undersøke hva som ligger bak de løsninger som velges i utviklingen av tekniske artefakter.

I de senere årene er det blitt flere forskere som ved å bruke etnografiske studier av teknologisk praksis undersøker hvordan tekniske og sosiale aktører samhandler. I disse studiene er man i motsetning til de konstruktivistiske tilnærmingene mer opptatt av bruken av teknologi enn utviklingen av den. Men i samme ånd som konstruktivistene er man opptatt av å vise hvordan den teknologiske praksis i sterk grad utvikles ved hjelp av sosiale mekanismer, for eksempel i arbeidsgrupper, og hvordan tekniske praksisimperativer rekonstrueres i daglig sosial praksis (se f.eks. Suchman, 1987; Hutchins, 1988; 1990; 1995; Hutchins og Klausen, 1996; Heath og Luff, 1992; 1996; Orr, 1996; Engeström og Middleton, 1996)

Alle disse tilnærmingene har viktige bidrag til sosiologiske studier av utvikling og bruk av teknologi. Imidlertid ser det ut til at det er vanskelig å skape en teoretisk syntese av teorier som bygger på såpass forskjellige antakelser. I denne avhandlingen kombinerer jeg imidlertid deler fra teoriene ved et feltstudium der én type teknologi benyttes i flere ulike kontekster, slik at både aktør-perspektiver og struktur-perspektiver blir relevante. Et empirisk felt som gir denne muligheten er bruken av *medisinske nødmelde-sentraler* i Norge.

DEN MEDISINSKE NØDMELDETJENESTEN

I løpet av de siste 10 årene har det skjedd store endringer i organiseringen av den norske medisinske nødmeldetjenesten. Man har tatt i bruk moderne teknologi (datateknologi og radio- og telefonsamband) for å sikre at folk skal få den akutthjelpen de trenger når uhellet er ute eller når de er alvorlig syke. Arbeidet med den nye modellen, den såkalte Hordalandsmodellen (fordi den ble først forsøkt i Hordaland), ble påbegynt for cirka 20 år siden, initiert av overlege Paul F. Forstrønen ved Haukeland Sykehus. Den samme doktor Forstrønen inviterte meg i oktober 1994 til å bruke den medisinske nødmeldetjenesten som studieobjekt i min doktorgrad, som jeg da allerede

var i gang med. Jeg sa ja til dette, og har i løpet av de siste 2,5 år arbeidet med dette feltet.

Det som er nytt med Hordalandsmodellen er at den introduserer nødmeldetjenester på flere nivåer i helsevesenet: *Kommunale legevaktsentraler* betjener henvendelser til lege, og disse sentralene er vanligvis plassert på sykehjem (p.g.a. at dette som regel er den eneste kommunale helseinstitusjon). Regionale (interkommunale) *akuttmedisinske kommunikasjonssentraler* (AMK-sentraler) betjener den medisinske alarmtelefonen, telefonnr 113. I tillegg utfører mange AMK-sentraler også legevaktsentral-funksjonen. For å skille mellom legevaktsentralene på sykehjem og den tilsvarende funksjonen på AMK-sentralene, har jeg kalt den sistnevnte for *legevaktstelefon* (ikke en separat sentral). AMK-sentralene bemannes vanligvis av to til tre personer, en eller to sykepleiere og en eller to ambulansekoordinatorer (ambulansesjåfører som jobber 1/2-stilling på AMK-sentralen). Legevaktsentralene, derimot, har ingen fulltids bemanning, men betjenes av sykepleier som er ansvarlig for legevaktsentralen samtidig med vanlig vakt på sin sykehjemsavdeling.

Ved hjelp av intervjuer av sykepleiere, leger og administrativt personell, samt ved å utføre kvasideltakende[38] observasjoner i seks legevaktsentraler og tre AMK-sentraler, har jeg fokusert på sykepleiernes praktiske bruk av kommunikasjonsteknologi, i forhold til arbeidets sosiale, individuelle, profesjonelle og institusjonelle kontekst. Selve teknikken bak AMK- og legevaktsentralene er den samme overalt, selv om AMK-sentralene har flere innkommende linjer og betjenes av flere mennesker. Dette gjør det mulig å fokusere på de kontekstuelle sidene ved teknologibruk.

I lys av de ovenfor nevnte sosiologiske tilnærmingene til teknologi ville jeg undersøke hvordan sykepleiere var i stand til å rekonstruere teknologien i forhold til sin etablerte arbeidspraksis, i forhold til de sosiale forhold i arbeidet, og til institusjonelle og profesjonelle begrensinger. I tillegg ville jeg undersøke hvordan ibruktakelsen av den nye teknologien kunne medføre endringer i disse forholdene, for eksempel sykepleiernes profesjonelle rolle i forhold til legene.

Rent generelt ville jeg undersøke hvordan bruken av kommunikasjonsteknologi endret helsevesenet og hvordan man i helsevesenet ville endre innholdet i et slikt teknologisk system idet det ble tatt i bruk. Det som er spesielt interessant med kommunikasjonsteknologi innenfor denne delen av helsevesenet er at man bruker teknologi, ikke bare

[38] Observasjonene har vært utført etter en "flue-på-veggen"-modell, men som en aksept av at ens egen tilstedeværelse alltid har en effekt på de studerte (Hammersley og Atkinson, 1995), har jeg valgt å kalle denne type observasjon for kvasideltakende. Man deltar ikke i selve arbeid-saktiviteten til de studerte, men man har likevel en virkning på deres praksis.

for å gi folk raskest mulig medisinsk nødhjelp, men for å mediere omsorg og trygghet. Ikke minst gjelder dette for legevaktsentralene, hvor folk ringer for å få tak i lege, men hvor det kan ofte være nok at de får faglig medisinsk veiledning via telefonen av en sykepleier.

Grunntanken bak studiet er dermed å undersøke den dialektiske interaksjonen mellom en medisinsk, og til dels omsorgsfokusert, serviceorganisasjon og en teknologisk mediering av denne funksjonen.

SAMME TEKNIKK - ULIK PRAKSIS

Det viser seg at praksisen ved legevaktsentralene på sykehjem og legevaktstelefonen på AMK-sentralene er svært ulik selv om disse i utgangspunktet skal betjene den samme funksjonen, nemlig gi folk tilgang til lege, evt. medisinsk rettledning via telefonen dersom dette synes tilstrekkelig. Mens sykepleierne på legevaktstelefonen ofte bruker mye tid for å gi råd til innringerne, og ofte løser problemene deres uten å involvere vakthavende lege, setter mange sykepleierne på sykehjemmene sine innringere nesten direkte over til lege.

Med utgangspunkt i observasjonene på AMK- og legevaktsentraler er det mulig å tilskrive denne forskjellen i praksis til hvordan teknologien er forankret i arbeidspraksis, i den sosiale og institusjonelle konteksten, og til individuell motivasjon. Legevaktsentralen har ingen naturlig plass innenfor sykehjemmets oppgaver, og i tillegg viser den seg å være et ikketema i den uformelle utvekslingen mellom sykepleierne. Enkelte av sykehjemsoppgavene er vanskelig å avbryte ved en eventuell oppringning, og dette skaper et prioriteringsdilemma: "Enhver telefon kan være et akuttilfelle!" og det må reageres deretter. Sykepleierne har ikke tatt jobb på sykehjem for å betjene en slik legevaktsentral, slik at motivasjonen blant enkelte er svak: "Det er ikke dette jeg ble ansatt her for!"

Legevaktstelefonen på AMK-sentralen, på den annen side, er meget tett forankret i aktiviteten på sentralen ellers, dvs. betjeningen av det medisinske nødnummer 113 og ambulansekoordineringen. Det er svært tette praksisrelasjoner mellom sykepleierne og ambulansekoorinatoren (AK) på sentralen, og ansvarsfordelingen mellom sykepleierne og til dels også mellom sykepleierne og AK er meget fleksible. Selv om én av sykepleierne har hovedansvaret for legevaktstelefonen, er det den mest tilgjengelige sykepleieren som i praksis betjener telefonen, og dessuten er det ofte flere henvendelser på en gang, slik at begge sykepleierne må ta dette ansvaret (så lenge det ikke er akutte aksjoner på gang). I betjeningen av akuttaksjoner (113) deltar ofte alle på AMK-sentralen (hele AMK-teamet). I tillegg til at begge sykepleierne i praksis deler på oppgavene, hjelper de hverandre

dersom det er vanskelige vurderinger som må tas uten lege. Også skriftlige hjelpemidler (indekser, gifttabeller, etc) brukes dersom det er nødvendig.

Det som viser seg ved sammenligningen av legevaktsentralene og legevaktstelefonene er at den samme teknologien brukes i ulike kontekster og fyller dermed forskjellige roller. Dersom vi bruker "teknologi" for å betegne de tekniske artefaktene sammen med bruken og kunnskapen om dem, kan man si at et og samme tekniske artefakt utvikles i sin sosiale kontekst til ulike teknologier. Det som skiller legevaktsentralen og legevaktstelefonen er hvordan arbeidet er sosialt forankret i arbeidet som sådan, hvordan arbeidet med den er i kontinuitet med det andre arbeidet, hvordan arbeidet eller funksjonen er innpasset i institusjonsmessig praksis og hvordan arbeidet varierer i forhold til individuell motivasjon.

REDUNDANT ANSVARSFORDELING

Den mest sosialt forankrede bruk av tekniske ressurser finner vi i AMK-sentralens behandling av alarmtelefoner (113). I enkelte tilfeller krever slike telefoner at hele AMK-teamet arbeider sammen. I den sentralen hvor jeg har brukt mest observasjonstid, består dette teamet av 3 personer, to sykepleiere og en ambulansekoordinator. Fokus for studiet av arbeidet i AMK-sentralen er hvordan operatørene ordner sin interne koordinering, herunder hvordan de deler informasjon og hvordan de kommuniserer med hverandre, med vekt på hvordan de kombinerer tekniske og sosiale praksiser i koordineringen.

Det er spesielt to typer teknologi som brukes for å dele (eller distribuere) informasjon: For det første, "medhør"-funksjonen gjør det mulig for hele teamet å lytte til innkommende 113-telefoner. Felles arbeidsplass-arkitektur med identiske informasjons-display (dataskjermer) for alle, gir alle den samme informasjonen til enhver tid. Ikke bare er det mulig for teammedlemmene å få all informasjon samtidig, men ethvert medlem kan også anta at de andre er like oppdatert som en selv. For det andre er det enkelte som snakker med seg selv, idet de utfører oppgaver, og på den måten oppdaterer de andre i hva man gjør og tenker. Den svært intense sosiale organiseringen, hvor tre personer arbeider nær hverandre, og stort sett med de samme oppgavene, over lengre tid, skaper en felles kommunikasjonsform. Selv om man representerer hver sine miljøer utvikler man "nøkler" ("keyings" i følge Goffman, 1974) som forteller i hvilken "ramme" kommunikasjonen skal forstås. Slike nøkler utvikles også via andre medium enn ansikt-til-ansikt-kommunikasjonen på AMK-sentralen, for eksempel mellom ambulansekoordinatoren og ambulansesjåførene via radiosamband. Disse nøklene gjør det mulig å effektivisere informasjonsutvekslingen fordi man ikke trenger mye kontekstuell tilleggsinformasjon. Ambulansekoordinatoren er svært viktig på sentralen fordi han bringer

ambulansesjåførenes kompetanse inn på AMK-sentralen og han er en del av deres miljø og dermed et bindeledd mellom sykepleierne og ambulansepersonellet. Mange misforståelser unngås fordi ambulansekoordinatoren er i stand til å forklare ambulansepersonellets strategier der de avviker fra sykepleiernes.

Selv om sykepleierne og AK representerer forskjellig kompetanse er man i stand til å øke den kunnskapsmessige eller funksjonsmessige redundans eller overlapping (Hutchins, 1990; Emery og Trist, 1972; respektivt) på sentralen. Det vil si at teammedlemmene blir i stand til å utføre hverandres oppgaver (jfr. Morgans begrep om "holografisk organisering", 1986). Det er denne redundansen (overlappingen) som gjør det mulig for en organisasjon å improvisere operasjoner selvstendig (Landau, 1969) og er derfor av største betydning for håndtering av alarmaksjoner i AMK-sentralen. I mer automatiserte sentraler (kfr. Smith og Whalen, 1995; Beynon-Davies, 1995) har man delt opp arbeidsoppgavene strengere og erstattet de manuelle (sosiale, team-baserte) koordineringsmekanismene med datastyrte informasjons- og instruksoverføringer. På denne måten er redundansen redusert, i tråd med vanlige systemutviklingsprinsipper, men man har tapt den fleksibilitet som ligger i overlappende funksjoner og kompetanse. Dermed blir disse mer teknologibaserte alarmsentralene mer sårbare, noe som blant annet kom fram ved et sammenbrudd i ambulansetjenesten i London (Beynon-Davies, 1995).

DET KOORDINERTE KLIMA

En rekke studier er gjort av kontrollrom for tog (Filippi og Theureau, 1993; Heath og Luff, 1992), fly (Weick og Roberts, 1993; Hutchins og Klausen, 1996) og flyplasser (Suchman, 1993; 1996; i trykken; Harper og Hughes, 1993), hvor det er mange likhetstrekk med organiseringen vi finner i AMK-sentralen. Spesielt er det også i disse studiene påpekt hvor viktig det er at de forskjellige operatørene har en viss oversikt over hva andre operatører holder på med, og at man kontinuerlig arbeider i forhold til andres pågående aktiviteter. På bakgrunn av disse studiene har jeg skissert idealmodellen (Weber, 1922) "det koordinerte klima". Poenget med denne modellen er å samle viktige egenskaper ved kontrollrom- eller vaktsentral-arbeid for å få en bedre forståelse av hvordan teknologi kan implementeres i slikt arbeid. I det koordinerte klima har aktørene oppmerksomheten i samme fokus, og er i stand til å sanse hverandres aksjoner i en perifer deltakelse (Lave og Wenger, 1991). Arenaen hvor arbeidet skjer er konstruert slik at aktørene har tilgang til slik deltakelse blant annet ved at det ikke er barrierer mellom arbeidsplassene. Koordinering skjer fortløpende ved at det er flere deltakerrammer som spiller på hverandre (Suchman, 1996), og som er gjort mulig ved en "sosialt distribuert kognisjon" (Hutchins, 1988; 1995; Hutchins og Klausen, 1996; Star, 1996; Raeithel, 1996).

Det koordinerte klima har flere likhetstrekk med Burns og Stalkers (1961) "organic management", Burns' (1981) "collaborative system" og Weick og Roberts' "collective mind". I alle disse konseptene legges det vekt på hvordan ansvar og forpliktelser fordeles fortløpende mellom de involverte arbeiderne, og hvordan fordelingen muliggjøres ved utvikling av tillit mellom dem. Et poeng med disse tilnærmingene er at det vektlegges at organiseringen er en aktivitet som ordnes kontinuerlig og fleksibelt mellom de ansatte. Spesielt Weick og Roberts (1993) legger vekt på at dersom det kollektive sinnet er etablert (og smart) spiller det ingen rolle hva slags teknologi det er som brukes. I det koordinerte klima er imidlertid arenaen inkludert i konseptet, og teknologien er en naturlig del av denne arenaen. "Klima" betyr således at det ligger noe "i luften" eller at det er noe i rommet, og det innebærer en aksept for at romlige og tekniske løsninger ikke er uvesentlige for hva slags arbeidsrelasjoner som skapes. Teknologien i det koordinerte klima må ikke gripe inn i den sosiale organiseringen slik at den separerer arbeiderne, ansvaret og funksjonene, men den må øke det felles bevissthetsrommet, for eksempel ved å gjøre informasjon tilgjengelig i for alle.

KONKLUSJON

I denne avhandlingen var utgangspunktet dialektisk, at eksisterende praksis ville begrense hvordan kommunikasjonsteknologi kunne brukes, og at kommunikasjonsteknologi kunne gi mulighet for ny praksis. Men det har vist seg gjennom studiet at bruk av teknologi må være i fokus på arbeidsplassen dersom ny praksis skal oppstå. Dersom teknologibruken blir en perifer del av praksisen og lite forankret i arbeidets kjerneaktivitet (slik som på legevaktsentralene) er det lite sannsynlig at store endringer skjer. Dette gjelder også sykepleiernes muligheter til å øke sin autonomi (i forhold til legene) ved bruk av sentralene: Bare når bruken av den nye funksjonen blir intens, greier sykepleierne å sette sin kompetanse i sentrum, og bruke sin faglige dyktighet via det tekniske grensesnittet. Denne effekten ser først og fremst ut til å komme på AMK-sentralene, hvor intensiteten og kontinuiteten i arbeidet er svært høy, og hvor bruken av teknologi er fokusert og sterkt sosialt forankret i AMK-teamets praksis.

Som foreslått av Archer (1995) og Reed (1997) er det mulig å finne relasjonen mellom handling og struktur gjennom tidsbegrepet. Dette gir da et uttrykk for at strukturer skapes på grunnlag av handling etterhvert som tiden går. Imidlertid gir dette et noe automatisk bilde at denne struktureringen. Med utgangspunkt i dette studiet vil jeg si at dannelsen av strukturer skjer via en tidsekvivalent, dvs. at det ikke er noen automatikk, men at det kreves intensitet for å skape strukturer. Med strukturer menes det her både regler og ressurser (ifølge Giddens, 1984). Den initielle dialektikken mellom for

eksempel tekniske og sosiale systemer, overbygges av en praksisstruktur som utvikles å grunnlag av intens praksis med teknologien situert i sitt sosiale system, hvor de tekniske artefaktene redefineres (retolkes) i sin bruk. Den lave intensiteten ved legevaktsentralene fører til at en praksisstruktur utvikles svært sent, og siden det er denne som muliggjør handling, blir det vanskelig å utvikle en god praksis. På AMK-sentralene utvikles praksisstrukturene svært hurtig på grunnlag av intens praksis, basert på allerede eksisterende strukturer, som teknologi, kompetanse og profesjon. Ved introduksjon av nye tekniske løsninger, må disse komme inn som en støtte til utviklingen av en slik praksisstruktur under utvikling, dvs. at designere av tekniske systemer må gi rom for tolkningsmessig fleksibilitet idet de tas i bruk.

OMSORGSMASKINER

Først når man lykkes med å skape gode praksisstrukturer, greier man å bruke teknologien fornuftig. Dvs, maskinene brukes for å formidle hjelp og omsorg, og den nye teknologien formes til omsorgsmaskiner. Disse maskinene er ikke å betrakte som kalde og umenneskelige, men som bruk av avansert teknologi for utnyttelse av menneskelig kompetanse.

APPENDIX 4

SUGGESTIONS TO FURTHER RESEARCH

This study has been an explorative one, and many of the topics that have been discussed will be able to study further, both in LV centres (diversification of work tasks) and AMK centres (distributed cognition in a team work setting). Besides, a study of the consequences of the organisation of the medical emergency centres may be performed in a more macro perspective.

I have discovered that there are a good deal of frustrations with the LV centres in nursing homes, and that the reasons for these frustrations are varied. In a continued research on the LV centres, I will suggest that these frustrations are focused and that the empirical material is collected from LV centres all over the country. Because of the great amount of LV centres, one may develop categories so that the use of quantitative methods can be applied to see if there are general trends on these topics

A new information system, EMSIS - Emergency Medical Services Information System, is being introduced to support the registration of emergency calls and calls for doctor assistance, and transferring information between nurses, ambulance coordinators and ambulances. The use of status messages between ambulances and AMK centres is also integrated in the system. The introduction of the system would be very interesting to follow on the background of an automation-team-work discussion. The motivation for the system is to effectuate and secure the work in the AMK centre, and the question is if, and how, the system will be better than the current more manual practice. Will the operators be able to maintain the flexible coordination also when using this system?

Picture-box 9

Emsis Display

The use of Emsis requires two or three screens for the ability to display both maps and status windows.

According to Heath and Luff (1996:98), many system development projects fail because of their "insensitivity to the ways in which individuals ordinarily interact and collaborate in the workplace". In my observations in the AMK centres, I have seen how the operators are able to handle quickly without any fancy technology, but with the use of advanced interpersonal coordination, telephone, radio, maps, pen and paper. Any further development of the work practices should be motivated by greater safety and higher speed, not by the pure wish of exploiting some kind of technology. If you have seen an ambulance driving in an emergency, you may notice that there is possibly no more seconds to save during the ambulance journey. However, each second saved in the coordination of the emergency service, for instance in the AMK centres, may be saved safely. With the effective human coordination, as described in chapter 6, many of the AMK centres represent good examples on the sufficiency of good team work. The possible implementation of new technology must support this practice.

To study the use of EMSIS in several different AMK centres, one may be able to develop further the emergent practice of technological systems in practical work settings.

REFERENCES

Abbott, Andrew (1988) *The Systems of Professions: An Essay on the Division of Expert Labour*, Chicago: University of Chicago Press.

Akrich, Madeleine (1992) The De-Scription of Technical Objects, *Shaping Technology/Building Society*, Bijker and Law (eds.), Cambridge Ma: MIT Press, pp. 205-224.

Akrich, Madeleine and Bruno Latour (1992) A Summary of a Convenient Vocabulary for the Semiotics of Human and Nonhuman Assemblies, *Shaping Technology/Building Society*, Bijker and Law (eds.), Cambridge Ma: MIT Press, pp. 259-264.

Archer, Margaret S. (1995) *Realist Social Theory: The Morphologic Approach*, Cambridge UK: Cambridge University Press.

Argyris, Chris and Schön, Donald A. (1978) *Organizational Learning: A Theory of Action Perspective*, Reading Ma: Addison-Wesley.

Axelsen, Thorbjørn (1976) *Det tause sykehuset*, Oslo: Norwegian University Press.

Badham (1986) *Theories of Industrial Society*, London: Croom Helm.

Barley, Stephen (1986) Technology as an Occasion for Structuring: Evidence from Observations of CT Scanners and the Social Order of Radiology Departments, *Administrative Science Quarterly*, vol. 31, pp. 78-108.

Bateson, Gregory (1972) *Steps to an Ecology of Mind*, New York: Ballantine.

Berg, Ole (1991) Medikrati, hierarki og marked, *Mellom idealer og realiteter. Studier i medisinsk sosiologi*, Oslo: Ad Notam, pp. 147-175.

Berger, Peter L. and Luckmann, Thomas (1966) *The Social Construction of Reality - A Treatise in the Sociology of Knowledge*, London: Penguin Books (1991).

Beynon-Davies (1995) Information systems "failure': the case of the London Ambulance Service's Computer Aided Despatch project, *European Journal of Information Systems*, vol. 4, pp. 171-184.

Bijker, Wiebe E. (1987) The Social Construction of Bakelite: Toward a Theory of Invention, *The Social Construction of Technological Systems*, Bijker, Hughes and Pinch (eds.), Cambridge Ma: MIT Press, pp. 159-187.

Bijker, Wiebe E., Thomas P. Hughes and Trevor Pinch, eds. (1987) *The Social Construction of Technological Systems*, Cambridge Ma: MIT Press.

Bijker, Wiebe E. and John Law, eds. (1992) *Shaping Technology/Building Society*, Cambridge Ma: MIT Press.

Braverman, Harry (1974) *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century*, New York: Monthly Review Press.

Briar, Katharine Hooper (1985) Emergency Calls to Police: Implications for Social Work Intervention, *Social Service Review*, Dec., pp. 593-603.

Brubaker, Rogers (1984) *The Limits of Rationality: An Essay on the Social and Moral Thought of Max Weber*, London: Rouledge.

Burns, Tom (1981) *Rediscovering Organsation: Aspects of Collaboration and Managerialism in Hospital Organisation*, Edinburgh: Department of Sociology, University of Edinburgh.

Burns, Tom and G. M. Stalker (1961) *The Management of Innovation*, Third Edition 1994, Oxford: University of Oxford Press.

Button, Graham (1992) *The Curious Case of the Vanishing Technology*, Technical Report EPC-1992-138, Cambridge: Rank Xerox Research Centre, also published in *Technology in Working Order*, Button (ed.), London: Routledge, 1993, pp. 10-28.

Callon, Michel (1987) Society in the Making: The Study of Technology as a Tool for Sociological Analysis, *The Social Construction of Technological Systems*, Bijker, Hughes and Pinch (eds.), Cambridge Ma: MIT Press, pp. 83-103.

Carpenter, Mick (1993) The Subordination of Nurses in Health Care: Towards a Social Divisions Approach, *Gender, Work and Medicine*, Riska and Wegar (eds.), London: Sage Publications, pp. 95-130.

Carter, Pippa (1995) Writing the Wrongs, *Organization Studies*, vol. 16, issue 4, 1995, pp. 573-575.

Clegg, Stewart R. (1995) Parker's Mood, *Organization Studies*, vol. 16, issue 4, 1995, pp. 565-571.

Coffey, Amanda and Paul Atkinson (1996) *Making Sense of Qualitative Data*, Thousand Oaks Ca: Sage Publications.

Conrath, David W. *et al.* (1983) *Evaluating Telecommunications Technology in Medicine*, Dedham Ma: Artech House.

Coser, Rose Laub (1960) Laughter Among Colleagues. A Study of the Social Functions of Humor Among the Staff of a Mental Hospital, *Psychiatry*, vol. 23, pp. 81-95.

Coser, Rose Laub (1980) Some Social Functions of Laughter, *The Pleasures of Sociology*, L. A. Coser (ed.), New York: New American Library.

Daft, R. L. and Lengel, R. and Trevino, L. K. (1987) Media Symbolism, Media Richness, and Media Choice in Organizations: A Symbolic Interactionist Perspective, *Communication Research*, vol. 14, no. 5, pp. 553-574.

Davidow, William H. and Michael S. Malone (1992) *The Virtual Corporation*, New York: HarperCollins.

Davies, Celia (1995) Competence versus Care? Gender and Caring Work Revisited, *Acta Sociologica*, vol. 38, pp. 17-31.

Den norske lægeforening (1994) *Norsk indeks for medisinsk nødhjelp*, Stavanger: Åsmund S. Lærdal A/S.

Durkheim, Emile (1897/1951) Suicide: A Study in Sociology (Le Suicide: étude de sociologie), New York: Free Press.

Durkheim, Emile (1978) Samfunnet og tingene, (from “Le suicide”), *Handling og samfunn*, Østerberg (ed.), Oslo: Pax Forlag, pp. 193-194.

Einthoven, Wilhelm (1906) Het Tele-Cardiogram, *Nederandsch Tijdschrift voor Geneeskunde*, vol. 50, no. 22, pp. 1517-1547.

Eisenberg, Eric M. (1990) *Jamming: Transcendence Through Organizing*, Communication Research, vol. 17, no. 2, pp. 139-164.

Ellefsen, Bodil (1995) *Når organisasjon og yrke møtes*, Oslo: Department of Sociology, University of Oslo.

Ellefsen, Bodil (1996) Instrumentelle og formålsrasjonelle sykepleiere? *Vård i Norden*, vol. 16, no. 3, pp. 22-28.

Elstad, Ingunn (1995) Er der noko frå før?, *Et kvinnefag i moderniseringen - Sykehuspleien mellom fagtradisjon og målstyring*, Elstad and Hamran (eds.), Oslo: ad Notam, Gyldendal, pp. 77-150.

Emery, Fred and Eric Trist (1972) *Towards a Social Ecology*, London: Plenum Press.

Engeström, Yrjö and David Middleton, eds. (1996) *Cognition and Communication at Work*, Cambridge UK: Cambridge University Press.

Falcione, Raymond L. and Elyse A. Kaplan (1984) Organizational Climate, Communication, and Culture, *Communication Yearbook 8*, Bostrom and Westley (eds.), Beverly Hills: Sage Publications, pp. 285-309.

Feenberg, Andrew (1991) *Critical Theory of Technology*, New York: Oxford University Press,.

Filippi, Geneviève and Jacques Theureau (1993) Analyzing Cooperative Work in an Urban Traffic Control Room for the Design of a Coordination Support System, *Proceedings of the 3rd European Conference on CSCW 13-17 Sept. 1993, Milan*, Michelis, Simone and Schmidt (eds.), Durdrecht: Kluwer Academic Publishers, pp. 171-186.

Freidson, Eliot (1970) *Profession of Medicine: A Study of the Sociology of Applied Knowledge*, Chicago: The University of Chicago Press (1988 edition).

Freidson, Eliot (1994) *Professionalism Reborn. Theory, Prophecy, and Policy*, Chicago: The University of Chicago Press.

From, Sigurd, Lilly Ann Stenvold and Thore Danielsen (1993) Telemedicine Services Integrated into a Health Care Network - Analysis of Communication Needs in a Regional Health Care System, *Telektronikk*, vol. 89, no. 1, pp. 12-22.

Galegher, Jolene and Kraut, Robert E. (1990) Technology for Intellectual Teamwork: Perspectives on Research Design*, Intellectual teamwork: Social and technological foundations of cooperative work*, Galegher and Kraut, and Egido (eds.), New Jersey: Hillsdale, pp. 1-20.

Gammon, Deede (1993) Restraining and Facilitating Factors in the Diffusion of Tele-Medicine - An Interview Study, *Telektronikk*, vol. 89, no. 1, pp. 78-84.

Gans, Herbert J. (1968) The Participant-Observer as a Human Being: Observations on the Personal Aspects of Field Work, *Institutions and the Person. Papers Presented to Everett C. Hughes*, Becker, Geer, Riesman and Weiss (eds.), Chicago: Aldine Publishing Company.

Garfinkel, Harold (1967) *Studies in Ethnomethodology*, Cambridge UK: Polity Press.

Giddens, Anthony (1976) Functionalism: Après la tutte, *Social Research*, vol. 43, pp. 325-366.

Giddens, Anthony (1984) *The Constitution of Society*, Cambridge UK: Polity Press.

Gilje, Nils and Harald Grimen (1993) *Samfunnsvitenskapenes forutsetninger*, Oslo: Universitetsforlaget.

Goffman, Erving (1974) *Frame Analysis: An Essay on the Organization of Experience*, Boston: Northeastern University Press.

Goffman, Erving (1981) *Forms of Talk*, Philadelphia Pa: University of Pennsylvania Press.

Goldberg, L. C., F, Baker and A. H. Rubenstein (1965) Local-Cosmopolitican: Unidimensional or Multidimensional?, *American Journal of Sociology*, vol. 70, pp. 704-710.

Gouldner, Alvin W. (1957) Cosmopolitans and Locals: Toward an Analysis of Latent Social Roles -1, *Administrative Science Quarterly*, vol. 2, no. 3, pp 281-306.

Granovetter, Mark S. (1985) Economic Action and Social Structure: The Problem of Embeddedness, *American Journal of Sociology*, vol. 91, no. 3, pp. 481-510.

Grint, Keith and Steve Woolgar (1997) *The Machine at Work: Technology, Work and Organization*, Cambridge UK: Polity Press.

Gudmundsdottir, Sigrun (1995) Forskningsintervjuets narrative karakter, translated by Egil Eikseth, orig: The Narrative Nature of the Research Interview, *Curriculum Inquiry*, Autumn 1995.

Habermas, Jürgen (1984) *The Theory of Communicative Action*, Vol. 1: Reason and the Rationalization of Society, Boston: Beacon Press.

Hammersley, Martyn and Paul Atkinson (1995) *Ethnography. Principles in Practice*, 2nd edition, London: Routledge.

Hamran, Torunn (1991) Effektivitetens grenser - Kan kommunikasjonsteknologi erstatte muntlig rapport i en sykehusavdeling?, *Mellom idealer og realiteter. Studier i medisinsk sosiologi*, Album and Midré (eds.), Oslo: ad Notam, pp. 55-84.

Harper, R.H.R. and John A. Hughes (1993) 'What a F-ing System! Send 'em All to the Same Place and Then Expect Us to Stop 'em Hitting': Making Technology Work in Air Traffic Control, *Technology in Working Order*, Button (ed.), London: Routledge, 1993, pp. 127-144.

Hartland, Joanne (1993) The Use of "Intelligent" Machines for Electrocardiograph Interpretation, *Technology in Working Order*, Button (ed.), London: Routledge, 1993, pp. 55-80.

Heath, Christian and Paul Luff (1992) Collaboration and Control. Crisis Management and Multimedia Technology in London Underground Line Control Rooms, *Computer Supported Cooperative Work*, vol. 1, no. 1-2, pp. 69-94.

Heath, Christian and Paul Luff (1996) Covergent Activities: Line Control and Passenger Information on the London Underground, *Cognition and Communication at Work*, Engeström and Middleton (eds.), Cambridge UK: Cambridge University Press, pp. 96-129.

Hirschhorn, Larry (1984) *Beyond Mechanization: Work and Technology in a Postindustrial Age*, Cambridge Ma: MIT Press.

Hopkin, V. David (1982) *Human Factors in Air Traffic Control*, AGARDograph no. 275, Neuilly-sur-Seine.

Hughes, David (1977) Everyday and Medical Knowledge in Categorising Patients, *Health Care and Health Knowledge*, Dingwall, Heath, Reid and Stacey (eds.), London: Croom Helm, 128-140.

Hughes, David (1980) The Ambulance Journey as an Information Generating Process, *Sociology of Health and Illness*, vol. 2, no. 2, pp. 115-132.

Hughes, David (1988) When Nurse Knows Best: Some Aspects of Nurse/Doctor Interaction in a Casualty Department, *Sociology of Health and Illness*, vol. 10, no. 1, pp. 1-22.

Hughes, Everett C. (1958) *Men and Their Work*, New York: Free Press.

Hughes, Everett C. (1971) *The Sociological Eye. Selected Papers on Institutions and Race*, Chicago: Aldine-Atherton.

Hughes, Thomas P. (1987) The Evolution of Large Technological Systems, *The Social Construction of Technological Systems*, Bijker, Hughes and Pinch (eds.), Cambridge Ma: MIT Press, pp. 51-82.

Hutchins, Edwin (1988) Organizing Work by Evolution and by Design, *Conference on Work and Communication*, University of California, San Diego, July 1988.

Hutchins, Edwin (1990) The Technology of Team Navigation, *Intellectual Teamwork: Social and Technological Foundations of Cooperative Work*, Galegher, Kraut and Egido (eds.), Hillsdale NJ: Lawrence Erlbaum Associates, pp. 191-220.

Hutchins, Edwin (1995) *Cognition in the Wild*, Cambridge Ma: MIT Press.

Hutchins, Edwin and Tove Klausen (1996) Distributed Cognition in an Airline Cockpit, *Cognition and Communication at Work*, Engeström and Middleton (eds.), Cambridge UK: Cambridge University Press, pp. 15-34.

Hvinden, Bjørn (1986) *Kolleger imellom: Arbeidskulturen i servicebedriften*, Oslo: Norwegian University Press.

Hvinden, Bjørn (1994) *Divided Against Itself. A Study of Integration in Welfare Bureaucracy*, Oslo: Scandinavian University Press.

Jackson, Norman (1995) To Write, or Not to Right?, *Organization Studies*, vol. 16, issue 4, pp. 571-573.

Jeffrey, Roger (1979) Normal Rubbish: Deviant Patients in Casualty Departments, *Sociology of Health and Illness*, vol. 1, no. 1, pp. 90-107.

Jordan, Brigitte (1993) *Birth in Four Cultures*, revised edition, Prospect Heights Ill: Waveland Press.

Joyce, David (1989) Why do Police Officers Laugh at Death?, *The Psychologist*, Sept., pp. 379-381.

Keddy, Barbara, Margaret Jones Gillis, Pat Jacobs, Heather Burton and Maureen Rogers, (1986) The Doctor-Nurse Relationship: An Historical Perspective, *Journal of Advanced Nursing*, vol. 11, pp. 745-753.

Kelle, Udo and Heather Laurie (1995) Computer Use in Qualitative Research and Issues of Validity, *Computer-Aided Qualitative Data Analysis: Theory, Methods and Practice*, Kelle (ed.), London: Sage Publications, pp. 19-28.

Kimberly, J. R. and M. J. Evanisko (1981) Organizational Innovation: The Influence of Individual, Organizational, and Contextual Factors on Hospital

Adoption of Technological and Administrative Innovations, *Academy of Management Journal*, vol. 24, no. 4, pp. 189-213.

Krauss, Robert M. and Fussell, Susan R. (1990) Mutual Knowledge and Communicative Effectiveness, *Intellectual Teamwork: Social and Technological Foundations of Cooperative Work*, Galegher, Kraut and Egido (eds.), Hillsdale NJ: Lawrence Erlbaum Associates, pp. 111-145.

Kusterer, Ken C. (1978) *Know-How on the Job: The Important Working Knowledge of "Unskilled" Workers*, Boulder, Colo: Westview Press.

Landau, Martin (1969) Redundancy, Rationality, and the Problem of Duplication and Overlap, *Public Administration Review*, vol. 27, pp. 346-358.

Latour, Bruno (1987) *Science in Action*, Cambridge Ma: Harvard University Press.

Latour, Bruno (1991) Technology is Society Made Durable, *A Sociology of Monsters, Essays on Power, Technology and Domination*, John Law (ed.), London: Routledge.

Latour, Bruno (1992) Where are the Missing Masses? The Sociology of a Few Mundane Artefacts, *Shaping Technology/Building Society*, Bijker and Law (eds.), Cambridge Ma: MIT Press, pp. 225-258.

Lave, Jean (1988) *Cognition in Practice*, Cambridge UK: Cambridge University Press.

Lave, Jean (1996) The Practice of Learning, *Understanding Practice: Perspectives on Activity and Context*, Chaiklin and Lave (eds.), Cambridge UK: Cambridge University Press, pp. 3-32.

Lave, Jean and Etienne Wenger (1991) *Situated Learning: Legitimate Peripheral Participation*, Cambridge UK: Cambridge University Press.

Law, John, ed. (1991) *A Sociology of Monsters: Essays on Power, Technology and Domination*, London: Routledge.

MacDonald, Keith M. (1995) *The Sociology of Professions*, London: Sage Publications.

Malone, Ruth E. (1995) Heavy Users of Emergency Services: Social Construction of a Policy Problem, *Social Science and Medicine*, vol. 40, no. 4, pp. 469-477.

Malone, Thomas W. and Kevin Crowston (1991) *Toward an Interdisciplinary Theory of Coordination*, TR#120, Cambridge Ma: Center of Coordination Science, MIT.

Mannon, James M. (1976) Defining and Treating "Problem Patients" in a Hospital Emergency Room, *Medical Care*, vol. 14, no. 12, pp. 1004-1013.

Martinsen, Kari and Kari Wærness (1991) *Pleie uten omsorg?*, Oslo: Pax Forlag.

Marx, Karl (1849) Wage Labour and Capital, *Karl Marx: Selected Writings in Sociology and Social Philosophy*, Bottomore and Rubel (eds.), Harmondsworth: Penguin Books (1963).

Marx, Karl (1873) *Capital*, Afterword to the Second German Edition, Oxford: Oxford University Press, World's Classics (1995), pp. 7-12.

Marx, Leo and Merritt Roe Smith (1994) Introduction, *Does Technology Drive History?*, Smith and Marx (eds.), Cambridge Ma: MIT Press, pp. ix-xv.

Merton, Robert K. (1967) *On Theoretical Sociology*, New York: The Free Press.

Merton, Robert K. (1968) *Social Theory and Social Structure*, 1968 Enlarged Edition, New York: The Free Press.

Merton, Robert K. (1976) *Sociological Ambivalence and Other Essays*, New York: Free Press.

Miles, Matthew B. and A. Michael Huberman (1994) *Qualitative Data Analysis*, 2nd ed., Thousand Oaks Ca: Sage Publications.

Mills, Peter K. and Dennis J. Moberg (1982) Perspectives on the Technology of Service Operations, *Academy of Management Review*, vol. 7, no. 3, pp. 467-478.

Misa, Thomas (1994) Retrieving Sociotechnical Change from Technological Determinism, *Does Technology Drive History*, Smith and Marx (eds.), Cambridge Ma: MIT Press.

Morgan, Gareth (1986) *Images of Organization*, Beverly Hills: Sage Publications.

Moustakas, Clark (1994) *Phenomenological Research Methods*, Thousand Oaks Ca: Sage Publications.

Mulkay, M. (1988) *On Humour: Its Nature and Place in Modern Society*, Cambridge UK: Polity Press.

Nelsen, Bonalyn J. (1997) Work as a Moral Act: How Emergency Medical Technicians Understand Their Work, *Between Craft and Science: Technical Work in U.S. Settings*, Barley and Orr (eds.), Ithaca: ILR Press/Cornell University Press, pp. 154-184.

NESH (1994) *Forskningsetiske retningslinjer for samfunnsvitenskap, jus og humaniora*, Oslo: Den nasjonale forskningsetiske komité for samfunnsfag og humaniora.

Noble, David F. (1979) Social Choice in Machine Design: the Case of Automatically Controlled Machine Tools, *Case Studies in the Labour Processes*, Zimbalist (ed.), New York: Monthly Review Press, pp. 18-50.

Nymo, Birger J. (1993) Telemedicine, *Telektronikk*, vol. 89, no. 1, pp. 4-11.

Næss, Sturle and Kari Wærness (1995) *Fra pasient til bruker*, notat 115, Centre for Social Research (Senter for Samfunnsforskning), Bergen: University of Bergen.

Nørretranders, Tor (1991) *Mærk Verden - En beretning om bevidsthed*, Gyldendal, Denmark.

Orlikowsky, Wanda (1992) The Duality of Technology: Rethinking the Concept of Technology in Organizations, *Organization Science*, vol. 3, no. 3, pp. 398-427.

Orr, Julian E. (1996) *Talking About Machines. An Ethnography of a Modern Job*, Ithaca: ILR Press/Cornell University Press.

Ot.prp. (1988-89) nr. 26, *Om telekommunikasjoner i helsetjenesten, herunder medisinsk nødmeldetjeneste*, Oslo: Ministry of Social Affairs.

Parker, Martin (1995a) Critique in the Name of What? Postmodern and Critical Approaches to Organization, *Organization Studies*, vol. 16, issue 4, 1995, pp. 553-564.

Parker, Martin (1995b) Angry Young Man has Egoistic Tantrum, *Organization Studies*, vol. 16, issue 4, 1995, pp. 575-577.

Parsons, Talcott (1960) A Sociological Approach to the Theory of Organizations (first published in 1956), *Structure and Process in Modern Societies* (Parsons), New York: The Free Press.

Pedersen, Steinar and Unni Holand (1993) Telemedicine as a Health-Political Means, *Telektronikk*, vol. 89, no. 1, pp. 48-50.

Piene, Hroar (1991) Ny medisinsk teknologi. Til nytte eller besvær?, *Helsevesen i knipe*, Piene (ed.), Oslo: ad Notam, pp. 73-93.

Pinch, Trevor J. and Wiebe E. Bijker (1987) The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other, *The Social Construction of Technological Systems*, Bijker, Hughes and Pinch (eds.), Cambridge Ma: MIT Press, pp. 17-50.

Polanyi, Michael (1983) *The Tacit Dimension*, Gloucester, Ma: Peter Smith.

Posner, Tina (1977) Magical Elements in Orthodox Medicine, *Health Care and Health Knowledge*, Dingwall, Heath, Reid and Stacey (eds.), London: Croom Helm.

QSR (1994) *The One-Page NUD·IST Manual*, Melbourne: Qualitative Solutions & Research Pty Ltd.

Raeithel, Arne (1996) On the Ethnography of Cooperative Work, *Cognition and Communication at Work*, Engeström and Middleton (eds.), Cambridge UK: Cambridge University Press, pp. 319-339.

Rafto, T. (1955) *Telegrafverkets historie 1855-1955*, Bergen: John Griegs Boktrykkeri.

Reason, Peter (1994) Three Approaches to Participative Inquiry, *Handbook of Qualitative Research*, Denzin and Lincoln (eds.), Thousand Oaks Ca: Sage Publications, pp. 324-339.

Reed, Michael I. (1997) In Praise of Duality and Dualism: Rethinking Agency and Structure in Organizational Analysis, *Organization Studies*, vol. 18, issue 1, pp. 21-42.

Richards, Lyn and Tom Richards (1994) Using Computers in Qualitative Research, *Handbook of Qualitative Research*, Denzin and Lincoln (eds.), Thousand Oaks Ca: Sage Publications, pp. 445-462.

Richards, Lyn and Tom Richards (1995) Using Hierarchical Categories in Qualitative Data Analysis, *Computer-Aided Qualitative Data Analysis: Theory, Methods and Practice*, Kelle (ed.), London: Sage Publications, pp. 19-28.

Robboy, Howard and Bernard Goldstein (1991) Emergencies as Routines, *Current Research on Occupations and Professions*, vol. 6, pp. 83-98.

Rueschemeyer, Dietrich (1986) *Power and the Division of Labour*, Cambridge UK: Polity Press.

Rushing, William A. (1962) Social Influence and the Social-Psychological Function of Deference: A Study of Psychiatric Nursing, *Social Forces*, vol. 41, pp. 142-148.

Sanderson, David W. (1993) *Smileys*, compiled by Sanderson, text by Dougherty and Sanderson, Sebastopol Ca: O'Reilly and Associates.

Scott Morton, Michael S. (ed.) 1991, *The Corporation of the 1990s: Information Technology and Organizational Transformation*, New York: Oxford University Press.

Singleton, Enrica K. and Frankie C. Nail (1984) Autonomy in Nursing, *Nursing Forum*, vol. 21, no. 3, pp. 123-130.

Smith, Dorothy E. and Whalen, Jack (1995) *Texts in Action*, unpublished paper, University of Toronto and University of Oregon.

Smith, Harvey L. (1968) Crisis in an Institutional Network: Community Health Care, *Institutions and the Person. Papers Presented to Everett C. Hughes*, Becker, Geer, Riesman and Weiss (eds.), Chicago: Aldine Publishing Company, 157-164.

Sorokin, Pitrim A. (1978) Materialitet og symboler, (from "Social and Cultural Dynamics", 1937-1941), *Handling og samfunn*, Østerberg (ed.), Oslo: Pax Forlag.

Sproull, Lee and Kiesler, Sara (1991) *Connections, New Ways of Working in the Networked Organization*, Cambridge Ma: MIT Press.

Star, Susan Leigh (1996) Working Together: Symbolic Interactionism, Activity Theory, and Information Systems, *Cognition and Communication at Work*, Engeström and Middleton (eds.), Cambridge UK: Cambridge University Press, pp. 296-318.

Steele, Carolyn (1989) In Defence of "Black Humour", *The Psychologist*, Nov., p. 488.

Stein, Leonard I. (1967) The Doctor-Nurse Game, *Archives of General Psychiatry*, vol. 16, pp. 699-703.

Strauss, Anselm L. (1987) *Qualitative Analysis for Social Scientists*, Cambridge UK: Cambridge University Press.

Suchman, Lucy A. (1987) *Plans and Situated Actions: The Problem of Human-Machine Communication*, Cambridge UK: Cambridge University Press.

Suchman, Lucy (1996) Constituting Shared Workspaces, *Cognition and Communication at Work*, Engeström and Middleton (eds.), Cambridge UK: Cambridge University Press, pp. 35-60.

Suchman, Lucy (1997) Centers of Coordination: A Case and Some Themes, in *Discourse, Tools, and Reasoning*, Resnick, Saljo and Pontecorvo (eds.), New York: Springer-Verlag.

Sykepleien (1996) (Norwegian Nursing Union Journal) no. 10, May 28th, pp. 14-15: Har DU knappe-angst?

Sygeplejersken (1989) (Danish Nursing Union Journal) no. 10.

Sørensen, Bjørg Aase (1995) *Sykehjem - Velferdsstatens bakgård? Noen resultater fra en trekantundersøkelse blant beboere, pårørende og ansatte ved et sykehjem i Oslo*, notat 10/95, Oslo: Arbeidsforsknings-instituttet.

Sørensen, Knut H. (1988) *Hva kan sosiologien lære oss om teknologien?*, STS-arbeidsnotat 3/88, Trondheim: Centre for Technology and Society (Senter for teknologi og samfunn), University of Trondheim.

Tanaka, Atsuko, Takehito Takano. and Keiko Makamura (1994) Inappropriate Use of Emergency Ambulance Services and the Implications for Primary Health Care in Japan, *Health Promotion International*, vol. 9, no. 4, pp. 259-268.

Tribe, Laurence H. (1973) Technology Assessment and the Fourth Discontinuity: The Limits of Instrumental Rationality, *Southern California Law Review*, vol. 47, pp. 617-660.

Watson, Jean (1985) *Nursing. The Philosophy and Science of Caring*, Boulder: University Press of Colorado.

Weber, Max (1922/1971) *Samfunssvitenskapen "objektivitet"* (Gesemmelte Aufsätze zur Wissenschaftslehre, 1922), *Makt og byråkrati*, Oslo: Gyldendal Norsk Forlag, pp. 157-220.

Weber, Max (1925/1968) *Economy and Society*, New York: Bedminster Press.

Weick, Karl E. (1995) *Sensemaking in Organizations*, Thousand Oaks Ca: Sage Publications.

Weick, Karl E. and Karlene H. Roberts (1993) Collective Mind in Organizations: Heedful Interrelating on Flight Decks, *Adminstrative Science Quarterly*, vol. 38, pp. 357-381.

Weitzman, Eben A. and Matthew B. Miles (1995) *Computer Programs for Qualitative Data Analysis*, Thousand Oaks Ca: Sage Publications.

Whalen, Jack, Don H. Zimmermann and Marilyn R. Whalen (1988) When Words Fail: A Single Case Analysis, *Social Problems*, vol. 35, no. 4, pp. 335-362.

Wheeless, Virginia Eman, Lawrence R. Wheeless and Sharon Riffle (1989) The Role of Situation, Physician Communicator Style, and Hospital Rules Climate on Nurses' Decision Styles and Communication Satisfaction, *Health Communication*, vol. 1, no. 4, pp. 189-205.

Wilkinson, Barry (1983) *The Shopfloor Politics of New Technology*, London: Heinemann Educational Books.

Winner, Langdon (1977) *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought*, Cambridge Ma: MIT Press.

Winner, Langdon (1986) *The Whale and the Reactor: A Search for Limits in an Age of High Technology*, Chicago: The University of Chicago Press.

Wærness, Kari (1982) *Kvinneperspektiver på sosialpolitikken*, Oslo: Norwegian University Press.

Wærness, Kari (1984) The Rationality of Caring, *Economic and Industrial Democracy*, vol. 5, pp. 185-211.

Zuboff, Shoshana (1988) *In the Age of the Smart Machine - The Future of Work and Power*, New York: Basic Books.

Østerberg, Dag (1984) *Sosiologiens nøkkelbegreper og deres opprinnelse*, Oslo: J. W. Cappelen.

Østerberg, Dag (1988) *Metasociology: An Inquiry into the Origins and Validity of Social Thought*, Oslo: Norwegian University Press.

Østerberg, Dag (1993) *Fortolkende sosiologi 1*, Oslo: Norwegian University Press.