COMMUNICATION IN SOS ALARM

AND THE POSSIBILITY OF ENHANCEMENT.

ABSTRACT

When an accident is happening most of the time it is the person on the street that is reporting this to SOS Alarm, the instance that is controlling, for example, the ambulances. To ensure that as few mistakes as possible are made it us crucial that the communication between the caller and the ambulance via the SOS Alarm is as efficient as possible. Communication between the caller to SOS Alarm and the ambulance is done by passing through the operator at the SOS Alarm station and then on to the ambulance. Is this the way that it should be handled or are there optional ways that could be used? The technology has evolved since the system used today was installed and today cellular phones are very common and it is not unusual that it is possible to take pictures with these phones. Is this something that could be used to enhance the way information is sent between the caller and the ambulance? These are questions that this thesis tries to answer by using studies at SOS Alarm and Ambulance centrals as a foundation for the arguments.

Keywords: Communication, images, enhancing technology.

ACKNOWLEDGEMENT

Initially I want to thank SOS Alarm in Jönköping. They have helped me understand much about their work. They were very helpful and tried to answer all my questions and help me out with getting a grip of how the organization worked and how a day at the work could be like. I also want to thank the personnel at the ambulance central in Karlskrona who took time to let me interview them to get another view of the situation. Not to forget is my supervisors who have been a great resource for me and this project by giving feedback and support. Finally I want to thank my girlfriend who is always a great support and for believing in this thesis and me.

INFORMATION

This thesis has been conducted at the School of Engineering at Blekinge Institute of Technology in spring 2004 as the final exam for my master in Human Work Science with emphasis on Computer Science.

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CHAPTER 1 INTRODUCTION

My education has awoken a genuine interest for me about design of applications that are adapted to the needs of the user to ensure that it will be a natural part of their work and not an obstacle. How the communication is to take place in different situation and between different instances is one of the central aspects and that is why this thesis is focusing at communication. Good or bad communication can be the difference between a failure and a success. SOS Alarm provides an interesting environment for studies and reasoning about how the communication is working in that instance and what possibilities that are available for enhancement for the communication. When an ambulance is dispatched there is need for speed and mistakes could have dire consequences for the persons that are in need of the medical care provided by the medical team in the ambulance. Therefore is it crucial that technology used in this area is adapted to the users and those demands that are set for it in such environment it is to operate in. There have been projects launched and finished that tried to develop something that would benefit the ambulance dispatching in terms of making it quicker and more reliable but have ended in failure[1]. One example being the London Ambulance Service where the system developed failed within two weeks from the installation. Which in turn caused many problems as it is crucial that these systems are working correctly to ensure that help arrives to the scene of the accident within reasonable time. I believe that it is a much higher rate of success if the focus is narrow and the organisation is changed one bit at the time. By doing this there is time for feedback an evaluation of each part so to make sure that there are no critical flaws in the solution.

The communication that takes place betweeen the dispatcher and the units in the fields, most commonly ambulances, is of different types which all have their specific characteristics. These are ways of communciation that have been used for a long time and are stil quite fit for the, radio being one example. There are different kinds of communications but in this thesis the word communication is referring to interaction between people, not people and machines even though this communication takes place with the help of technology. As the focus will be set on the communication going on between people the aspect of Human Computer Interaction (HCI)[2] will not be the most important theory. Computer Supported Cooperative Work (CSCW)[3] is much closer at hand as it is closer to the focus for this thesis. The technology has evovled though and there are ways of communication availible todaty that was not when the system used today was developed. This thesis will analyse the methods of communication used today, and discuss if there are any alternatives.

[1] Hougham M. 1996.
[2] For definition and more reading see http://www.hcibib.org/
[3] For definition see http://www.hyperdictionary.com/dictionary/Computer+Supported+Cooperative+Work

1.1 THE SOS ALARM

All county councils in Sweden have an agreement with SOS Alarm, which is the company I cooperated with during my thesis, concerning alarms, directing of ambulances and different resources the county council place at their disposal. SOS Alarm does not own any ambulances by themselves.

The Ambulance operation in a county council, including ambulance helicopters, could be managed by the county council themselves or by private contractors.

The tasks for employees are to judge the need of an ambulance, prioritise so to use the resources the best way possible, alarm and direct the ambulances and give advices to the person who is placing the emergency call. The SOS-operator, who performs an interview and/or prioritises, judgment and counselling in health- and medical issues, is subject to the law of health and medical care. Quick actions taken concerning illness and accidents often leads to shorter and more successful rehabilitation time.

SOS Alarm uses a medical Index to be able to pass better judgment and give more accurate advices. This index is a unique support system for the SOS-operators to help them make better decisions. It is also helpful to be able to give correct information and suggestions to the caller who places the alarm call. It also contains questions that should be given to the person calling and information that helps the operator to make quick decisions about what actions to take, for example to dispatch an ambulance. The medical index is often controlled and updated continuously.

Each SOS-central has their own doctor who is responsible for the medical part and who will aid the central with his knowledge. For the central management for SOS Alarm there is a senior consultant who has the overall medical responsibility. If a medical decision in a certain errand is exceeding the SOS-operators competence or education the call could be connected to such higher medical competence – a specially trained nurse or a doctor.

The medical care connected to ambulances will in the future become a larger part of the emergency treatment and less a transport resource. Knowing this is the reason that the competence of the ambulance medical treatment is steadily increasing. I the meantime do the reconstruction of the medical service result in a higher need for patient transports, not only inside county councils but also between different medical care regions. That is why the county councils fleets of ambulances must be used in as an effective way as possible.[4]

[4] http://www.sosalarm.se/112/112_areas.asp?ID=19

CHAPTER 2 BACKGROUND

2.1 RELATED WORK

There have been studies performed at instances operating with ambulances earlier than this thesis and not just in Sweden. The world of ambulances and Alarm centres is large however and there are still areas that are waiting to be explored. Houghham[5] writes about a project launched in London where a new system was introduced that did not work out at all and was shut down just short after the start up. That gives a good example of the importance of making sure that technology that is introduced in such a sensitive environment as this, considering the demands from the public that no mistakes are done, is well designed and fitted for the task at hand.

Maria Normark at KTH in Stockholm who has been working with projects at SOS Alarm as well[6] presented several writings one of them a Licentiate Thesis giving an overview of how the SOS operators work, the relations in-between operators and how technology is affecting the work performed. It gives a good understanding of the work performed at SOS Alarm and the technology that is involved in performing the tasks at hand. She does also bring up the aspect of awareness in different situations. One of these examples is mutual awareness, other being general, peripheral and social, and that is something that is connected to this thesis as it is linked to the theory about the connection that is set up between the caller and the ambulance personnel, even though that this connections goes though another instance and another person. These two instances needs to share the awareness of the scene of the accident in as detailed way as possible. If it is possible to make sure that the personnel in the ambulance experiences the same thing as the caller, i.e. is aware of the same things, the base for decisions would be much better and provide more accurate and detailed decisions. Maria brings up the question of how awareness that is present at real meetings can be copied to long distance situation.

> *"How can we record the steps in the corridor, the schedule outside the meeting rooms, the informal encounters in the hallway, etc so that we can get the same kind of awareness at a distance?"*[7]

She uses a quote from Schmidt that connects the idea of mutual awareness to CSCW.

> *"From a CSCW perspective, the crucial point about the concept of mutual is to understand how mutual awareness is produced, i.e. (1) how information to mutual awareness is provided and acquired by members*

[5] Hougham M. 1996
[6] For publications see References.
[7] Normark M. 2002.

of the cooperative ensemble, and (2) how the characteristics of the work setting constrain and provision and acquisition of information pertaining to mutual awareness."[8]

The idea of mutual awareness is interesting and is highly connected to the idea of enhancing the communication performed in SOS Alarm as this could, in the prolong, contribute to the research performed in this area. Maria's thesis is also a great compliment to this thesis as it will give a good understanding for the SOS Alarm that could be well used when reading this thesis.

Mårten Pettersson, one of my supervisors has also performed his Ph.D in cooperation with SOS Alarm and the focus in his Licentiate has in this case been set on the cooperation in the room (which Maria also treated in her Licentiate), the usage of the maps and how the function of listening in to a call is used in this setting[10]. Even though this is not directly connected to this thesis there are interesting aspects that could be considered. The cooperation taking place in the SOS centre itself could be compared to the cooperation between the central and the units in the field to fins similarities and differences. These could be used to try to understand what adaptations that has to be done to reach a level of awareness over distances that are similar to those in the central itself.

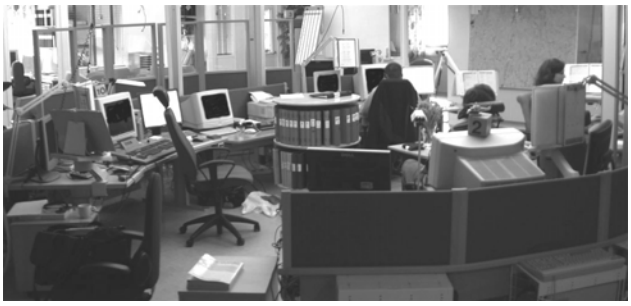
Martin Bowers and Wastell[12] has conducted a research at the UK Ambulance Control Centre with the focus set on the interactions in between the technology, the cooperative work of the personnel and the ecology of the control. The interaction between the personnel at the centre is related to the interaction taking place between the operator and the ambulance personnel and the one between the caller and the operator. This is relevant in the same way as Mårten Petterssons work is nut also in the sense that it considers the ecology of the scene. By bringing new technology to use it could be an asset to ensure that the ecology at the scene where it is presented is adapted to the new technology to ensure that these two will not be in conflict with each other. Making use of, for example, images in a environment where images are hard to handle because of something like the presence of much light from outside could lead to a situation where the technology is unusable because of the ecology. Therefore it is important that this aspect is considered even though that will not be done in the scope of this thesis. First it has to be resolved if images is of any use before it is time to start thinking of how well the ecology of the scene where it will be used is adapted to this new feature.

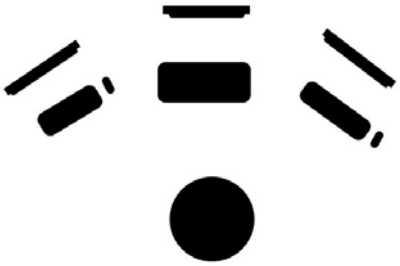
[8] Schmidt 1998
[10] Pettersson M. 2002
[12] Martin D, Bowers J, Wastell D. 1997

Also there is a new system under development today that goes under the name RAKEL[13] which will improve the way communication is developed. This system will not be used as a reference in this thesis but it can be interesting to know that things are happening in the world of SOS Alarm and they are open for new ideas to improve the possibilities to handle situations fast and correct. It will be said though the RAKEL system might contribute to the ideas presented in this thesis concerning the usage of images as there might be support for such technology implemented in this system. This is something that puts the argument in this thesis in a good position as the usage of images obviously is not something that has been rejected at a theoretical phase.

2.2 ECOLOGY

SOS Alarm in Jönköping contains four different stations which all have different main-tasks. Having a main task implies that during normal circumstances the person working at that station has one specific task, for example handling ambulances or receiving 112-calls. These are not fixed activities though, if, for example, too many 112-calls arrive at the same time so the person responsible for answering these can not take them all the persons working at the other stations will help out. Each station contains of three screens, one for the main program which is used for managing calls and information acquired through these calls, one for monitoring the ambulances and one screen that is seldom used but where the user can find unusual information. Such as what symptoms different toxic substances give. Having three screens ensure that there is no need for the operator to have to switch between different programs to get different kinds of information, as it is all accessible at the same time. The computers together with the specially developed keyboard used for the main program and ordinary keyboards and computer mouse for the other two screens are the most frequently used artefacts. The three screens are positioned right in front of the operator with the main screen in the middle and the screen for monitoring the ambulances at the right side. As all operator as place with their backs to each other there is a space in the middle of the seating that is reachable for all operators. This space is used by placing a small cabinet with folders containing useful information. This way it is easily accessible for all operators. Because of the small distances between the different operators it is





Figur 1 - Workstation

[13] http://www.sou.gov.se/rakel/

easy to monitor the activity that is going on around you as an operator which is something that is used very often in this line of work.

Technology used

There is a lot of contact with different units included in the area of responsibility for an operator at SOS Alarm and this contact is handled by using different technologies which briefly will be explained here.

Radio is one of the tools used and its positive aspects are that it is fast and free of charge. Once a system of radio transmitters and receivers are purchased there is no fee for the amount of traffic that is sent between these. There are radios in each ambulance and there are hand-held units available as well. It is also possible to contact other instances as the Police by using radios as long at the correct frequency is used. Negative aspects are that it is easy for other people to listen to the conversation as tong as they have a receiver themselves and the type of communication that is done over radio is not always the best adapted to the situation.

Cellular phone is also a way that allows the operator to contact the units in the field. This is a way of communication that is good for longer conversations where something has to be discussed, explained worked out or if information that is sensitive, i.e. should be kept from those who are listening to the radio traffic, has to be handled. Listening to traffic between two cellular phones is much harder than listening to the radio traffic. One of the down sides here is that there is a quite substantial fee for each minute used which in a company as large as SOS Alarm adds up to a large sum each year.

MobiText is a way of communication that allows the operator to send a printed slip of paper to the ambulance where there is information about the assignment printed. This paper is printed in the car and the information contains only text so it no a time consuming way of communicating but it is not possible to give instant feedback to these slips unless another way of communication is used synchronously. The positive aspect of these is that it is an asynchronous communication, which will be discussed further later in the thesis.

Levels of communication

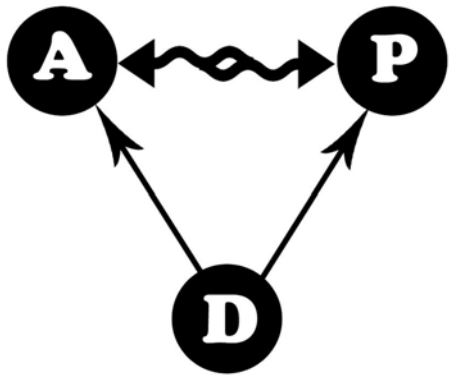
When communication is taking place there are three different aspects of what it is that is happening. What is said, the message; how the communication is done, simplex, duplex and so on (these expressions are explained later); and the technology used to handle the message that is to be transmitted. Sometimes there is no technology present but the focus of this thesis is such that there is always technology present. The focus will be directed to the two last aspects mentioned here, how communication is done and by what technology. What is said is secondary here and will not be discussed even though logs often gives example of what is said as it is hard to present a communication without actually including the message. The idea is to analyse these levels of

communication to see if there is a possibility to introduce a new way to apply technology or ways of communicate.

2.3 FOCUS OF PROJECT

The person working with organising the ambulances has a lot of contact with the different units. This contact can be carried out in different ways, all depending on what the dispatcher, the name of the person responsible for managing the units in the field, wants to achieve with the call. The units that are contacted by the dispatcher are mainly ambulances but it does happen that there is contact with, for example, police units even though this is not a frequent situation. This communication is an important phase in the organisation as it is through this communication that the information is passed on to the ambulance units giving the directions where to go, how fast and what they can expect. In other words, this is essential information for the ambulance personnel if they are to be able to perform their jobs.

Initially the focus was appointed to the communication that is held between the Dispatcher [D] and the different units that are at his disposal, Ambulances [A] and those who are not under his area of responsibility but available for help if possible, Police units [P] but was later narrowed down to just the communication between Dispatcher and Ambulances. The communication taking place between different units is harder to study as it would require that riding along in an ambulance that was taking contact with another unit, which is not that usual, and being able to listen to both sides at the conversation. By focusing at the communication between the dispatcher and the units there is a greater chance of being able to catch something of interest as the dispatcher is involved in all the different cases. An ambulance has, most of the time, nothing to do with what the other units are doing. Discussions arouse during a meeting with the supervisors for the thesis concerning how wide the focus was to be and if it was possible to include both these instances or if the thesis would benefit from single out one of them. It was decided to put the main focus at communication between the dispatcher and the units at the field but that the communication between different moving units would not be excluded. As much as possible this focus would be included in the reasoning but would not be allowed to shift the main focus from the dispatcher-unit view of the situation. The expectations for the project is to discuss positive and negative aspects with the different kinds of communications used today and to reason about what could be achieved by applying new ways of handling information that are available with today's technology and in a futuristic perspective.



Figur 4 - Ways of communication

2.4 PURPOSE AND GOAL

The goal of the project is to create a foundation for further studies concerning the ambulance dispatcher and the work he or she is performing and if possible propose an idea to improve the work routines used today. There are no intentions of delivering a system that could be implemented and used in cooperation with today's technology as the time for this project is too short to enable production of something that technically advanced. The thesis is intended as a platform for further studies, as for example someone beginning a doctor thesis cooperating with SOS Alarm, and to give detailed information about how the communication between the dispatcher and working units is working.

2.5 METHODS

As it was a limit to the time for the studies it was crucial that as much material as possible was collected to ensure that there was a foundation for building ideas and theories from. Pen and paper is a simple but efficient way of collecting material but not sufficient for this project. Adding a camera to document the activity is a simple way to ensure that there is the possibility to review the actions that were interesting for the project at a later stage. The material was collected by sitting next to the dispatcher using a pair of headphones without microphone to listen to the conversation that the dispatcher had with the caller. When calls came in that seemed interesting notes about the call were made in the notebook as the conversation was held and the times were marked down to simplify the search at the video tapes. All notes were cleaned up as fast as possible to ensure that all information that was not put on paper but remembered was added to the notes. There was also the option of making a transcription of the calls that were marked as interesting as everything is recorded and stored in a database for a certain time. All in all the methods used for collecting the material was rather simple but of the kind that I have much experience in and know how to handle. It is preferable not having to spend time figuring out how to use the tools brought for collecting the material.

Ethnography

To collect material for the thesis ethnography[14] has been the main approach used. Ethnography states that to ensure that the material that is collected is as correct as possible the studies should not be done in secluded and limited areas. Being involved and engaged in the context that is to be studied gives a better view of the reality and a more precise description. My hope is that by practicing ethnography it will give me as a practitioner a good foundation to use for discussions and in prolong, a base for the development of the design. The tools used to collect the material were pen and paper together with a video camera. While letting the camera tape the scene pen and paper was used to take notes of the actions that were showing indications of being interesting. The times were marked down in the margin to make it easier to match up the comments

[14] For more reading concerning ethnography: Hammersly M. & Atkinson P 1995

to the videotape when going through the material once back home again. When arriving back home the interesting parts were located at the videotapes and studied in reference to the notes taken to derive as much information as possible from what was caught on the tape.

Misconceptions and prejudices

When I arrived in Jönköping and SOS Alarm it became obvious that the ideas I had harbored concerning the communication and the way work was carried out, based on the information gathered during classes, was way wrong. The details of these misconceptions are not a contribution to the thesis and will not be specified but they concerned the way ambulances were directed in the field and how the problem over overflow at one SOS Alarm station was handled. A positive aspect that was achieved mainly because of these misconceptions was that the studies were performed without having any prejudices concerning the work, there just was no time to create a new set of such as the studies were already up and running. Having prejudices when beginning a study could result in important aspects and actions being missed as no attention is put in that direction. Not creating an idea in the head about how things are done at a workplace when before the studies are carried out is something that is very hard to do. That gives that the earlier the studies can be performed in a project the better it is as it will limit the time available to create such prejudices. It is also important to be aware that they exist and try to not let the affect the different decisions that are taken during the studies. To separate prejudices and knowledge obtained during the studies is crucial but could be troublesome as it is hard to remember exactly from where you got the knowledge in each specific detail. In other words, the main idea of something the person performing the studies has could be based on facts found during the studies but there might be small but important details that are just something that is believed without having been observed or controlled. To remember that the theory includes these small details is hard but none the less very important. That is why this project was lucky to get all the initial ideas labelled as wrong and therefore could initiate the studies knowing that everything had to be observed to be included.

Prejudices are not always a bad thing and could from time to time be a great asset as well. Performing studies at a place where the organisation is very big having prejudices that are somewhat correct that allows the person performing the studies to limit the area could be a positive aspect. The important part is that it is remembered that these are ideas based on prejudices and that they are allowed to be discarded as soon as there are indications to that they might not be correct, as the case was in this project. The discussion about prejudices could be long and interesting but this thesis will only point to the fact that there exists two views and it is up to each person to decide how the handle the facts that prejudices will be a part of the studies.

CHAPTER 3 ISSUES INCLUDED IN THE PROJECT

3.1 THE CO-OPERATION WITH OTHER INSTANCES

There are twenty different SOS-Alarm stations in Sweden and all of them do not work in the same way. In Jönköping the dispatchers and operators have a close collaboration with other instances, as for example the Police, something that is not standard procedure at the different stations. This results in situations where the police, for example, called SOS-Alarm and asked them if they could help them with finding a phone number to people responsible for a certain building company. Depending on the situation at hand the operator decided whether he or she had the time to help out with this or not. This co-operation is not standardized or supported in the software that is used today. Of course, there is an address book where the different numbers to different instances are listed and the dispatcher can call for a police car on the extra radio using the police frequency at any given time.

Is this collaboration something that should be encouraged or should it rather be quelled so to make all SOS Alarm stations in Sweden work in the same way? I believe that it would be a mistake to stop the personnel in Jönköping from working with the routines that they are using today. It opens up many possibilities for further collaborations and gives the dispatcher a better control over the situation at hand, which are not all the advantages that it provides. It also gives the dispatches the opportunity to follow up a case by asking the personnel that is contacting SOS to inform that they are done with the assignment given to them how everything turned out. By doing this the dispatcher gets feedback to how the decisions he or she made worked, if they were the right ones or if there was a mistake made. It is also relieving to get information that everything went well in a case that looked tough and where there were risks for the patients' life.

But the situation in Jönköping is such that the collaboration is extended beyond forwarding calls that are asking for police assistance and it would be preferable if the system were supportive of this need.

3.2 PROBLEMS INCLUDED IN THE COMMUNICATION

The communication between the SOS-Alarm dispatcher and other instances is not flawless. There are situations where the communication does not work for various reasons and this could, in turn, lead to more complications connected to the situation at hand. If, for example, there are problems when the dispatcher tries to contact a certain police unit that is to meet up with an ambulance to be able to arrive at a scene simultaneous this could be troublesome. It's not unusual that there is a time aspect in these situations which implies that the dispatcher have to solve problems fast to ensure that units arrive at their specified locations in reasonable time. Therefore not being able to ensure the collaboration between the ambulance and police could delay the arrival of

the units or lead to changes in the plan of letting them arrive simultaneous, both are effects that are undesired.

Is the way of communication used today inefficient?

Today most of the communication is done by radio or a device called MobiText. MobiText allows the dispatcher to send a sheet of paper to the ambulance where information about the case at hand is printed. This way it is possible for the personnel in the ambulance to consult this piece of paper several times so to make sure that they have a correct view of the case at hand without having to get in contact with the dispatcher. This way of communication is not practiced between two different units though. If two ambulances are to get in contact with each other they use the radio, which is a way of communication that follows the simplex standard, i.e. you ca not talk as you do on the phone or in face to face conversations. Each person has to finish the sentence and release the button that allows the second person to talk and the first one to listen. Is this a way to communicate that lives up to standards that are reasonable to set according to the advancement the technology has made? Is it not possible that there could be other ways and platforms that could be used to enhance the communication and in the prolong, the over all standard of the work performed by SOS Alarm?

CHAPTER 4 EMPIRICAL MATERIAL

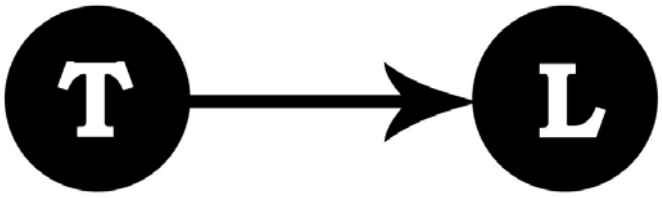
The empirical material that was collected during the project is the foundation for the ideas and theories that are presented in this thesis. The following sections will give a description of this material and what has been derived from it. The sources are the visits and studies done at SOS Alarm in Jönköping and at the Ambulance Centre in Karlskrona. The studies at the Ambulance centre have not been as detailed as at the SOS Alarm. Together with the information collected in Jönköping it has provided a good idea of how work is done in the ambulances, enough to be able to derive conclusions and propose different available solutions to enhancing the work.

4.1 DIFFERENT WAYS OF COMMUNICATION

There exist different ways of communication and they all have positive and negative features that are specific for that kind of communication. During the studies different ways of communication was observed which will be presented in the following text and by giving the specifics for each of them there is a good foundation to discuss the necessity of that particular way of communications role in the SOS Alarm organization. There will also be a few new ways of communication presented that are not implemented in the system at today's date[15]. These are looked upon in a futuristic view and assumptions are made of me concerning the technological evolution based on the latest year's progress in the area. This thesis works with the idea to find the essential parts of the ways of communication used today and to see if it is possible to reproduce these in other sets of communication which has other positive qualities as well.

Simplex Communication

Simpex communication is a communication that does only allow one way for the information to flow at the same time, "Used to describe a communications channel that can only ever carry a signal in one direction, like a one-way street. Television is an example of broadcast simplex communication."[16] This example result is that it is not possible to give response or feedback at the information given by the person receiving it, which would be marked as one of the negative attributes for this kind of communication. Simplex communication does not have to mean that it is not possible to give feedback and respond to the message received. If analyzed all it means is that two



Figur 6 - Simplex communication

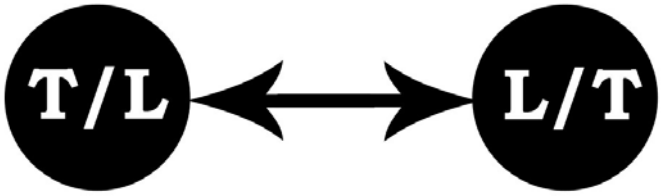
[15] Today's date being April 2004.
[16] http://www.hyperdictionary.com/dictionary/simplex

messages can not travel in opposed directions at the same time. In this thesis the expression will refer to communication where it is not possible to respond, as the television broadcast mentioned in the example. Another word for simplex is half duplex which means the same thing but simplex will be the word used in this thesis. A positive aspect is that it is a fast and efficient way of providing information. It requires no initial greetings and as the speaker knows that it is not possible for the listening part to ask questions it is crucial that he or she delivers all information that is important. It also allows for reaching multiple persons during a single session as the absence of answering possibilities allows for using, for example, an intercom system, as is the situation at the ambulance centrals. As illustrated in the image with T for Talker and L for Listener it is visualized that information only travels one way in simplex communication.

This is a way of communication that is used when the dispatcher contacts the ambulance central to send a car to an assignment. The dispatcher uses the intercom system in the central to call out the information throughout the whole central, reaching a lot of different persons doing that, and there is no way for the people located in the central to answer back to the dispatcher. This is a frequently used way of communication as it is almost always the way the initial contact is taken between dispatcher and ambulance personnel.

Duplex Communication

Duplex communications does allow the listener to become the talker and by that give response and feedback to the information initially given[17]. This allows for further investigation and questioning concerning the topic if there is an uncertainty about the information. Another name for this is full duplex but in this thesis the word duplex will be used. This allows for a more accurate communication as misunderstandings and question can be cleared up during the conversation. It is also a slower way of communication as questions is asked and answered. Using duplex communication is hindering the possibility to reach several persons in the same session as they all would have to be able to respond to the initial talkers' information in a way that does not become chaotic. In a situation of duplex communication the role of listener and talker is switched between the two participants, as illustrated in the image. In duplex communication it is also possible that two persons are talkers and listener at the same time, at least during short periods. When there is a hand-over of the role as "talker" it might happen that both participants speak at the same time and also tries to listen to what the other person says. This moment usually only lasts a short time as one of the speakers decides to let the other person take



Figur 7 – Duplex communication

[17] http://www.hyperdictionary.com/dictionary/duplex

the role as the talker and take the role as listener herself. This follows rules of social interaction and usually there are no problems with keeping such a conversation going without any incidents.

Duplex communication is often used as a second contact between the ambulance and the dispatcher in case there is something about the assignment that is not quite clear. It is also used frequently when there is something that has to be discussed between the instances, for example an assignment which is out of the ordinary. An example would be the case where there is a respirator that has to be brought along at a transportation and there are some issues concerning if there is any ambulance personnel on duty that are qualified to operate this machinery[18]. The dispatcher then calls an ambulance to have a conversation about whether there are a person with such a competence available, and of so, where he or she might be at the moment. This kind of communication would be troublesome to maintain in simplex mode and demands either duplex of PTT, which will be discussed next.

Push To Talk [PTT]

Push to talk is something of a hybrid between Simplex and Duplex. It allows for the initial listener to become the talker, but not at the same time as the other participant. Compared to duplex where both participants can talk at the same time even though it is not recommended following social rules of behavior. It could be considered as a switching simplex communication as in each moment there is one listener and one talker, but it is possible to switch position with each other. Walkie-talkies use this kind of communication, and the name, push to talk, indicates that you press a button to become the talking participant and let go to be able to listen. This kind of conversation often uses the phrase “over” to signal that you are done talking and enter “listening-mode”. This style of communication can be troublesome if you are not used to it as you will not hear what the other participant says as long as you button is pressed.

I have observed communications in other environments than SOS Alarm with walkie-talkies where it took several tries just to get the other person to understand how to behave. Not such an easy task as you can not be sure that what you just said got through to the other person, all depending on whether he or she were pressing their button, often to ask a question in the middle of your description, or not. We can therefore conclude that it is not possible to use the same rules for social interactions as in a duplex communication situation, another set of rules has to be applied here. The operators and the ambulance personnel have developed the routines for radio communication further. As they do a lot of communication via radio it is somewhat irritating to use the phrase “over” each time a sentence is finished and therefore this has been abolished according to the operators. The conversation is held in a fashion that is very similar to duplex communication with the exception that it still is not possible to be two talkers at the same time. Instead of using the phrase “over” the listener has to pay attention to when

[18] A scenario observed during the studies.

the other person quits talking, which indicates that it is time to switch roles. As long as the new rules are followed this way of communication is quite effective. An example of a new rule is that when you are done talking you keep quiet, you cannot take breaks and then expect to continue[19]. The other person has to be able to trust that when the talker turns silent, it's time to switch. Unless this is working it will be a chaotic and ineffective way of communicating.

Asynchronous Communication

Asynchronous communication is a way of communication that leaves a trace that it is possible to refer to at a later time. For instance, a recorded phone call or a letter is both members of the class asynchronous communication as they can be brought back for investigation and consultation at a later instance. This is useful when there is much information and a possibility that the receiver will not be able to remember it all after just hearing it once. By using asynchronous communication the receiver can go back and acquire the information as many times as is needed without having to contact the person who delivered the information initially. The negative part is, similar to the simplex communication, that it is not possible to give instantly feedback or ask questions concerning the information given. It is a concrete way of communication that is easy to understand as there is an obvious absence of another person to reply to which implies that there is no possibility for direct feedback. Asynchronous communication does also have another advantage which is that is does not require the presence of the receiver in the same way that simplex-, duplex- and PTT-communication does. As it is asynchronous it can be sent to where the receiver will be in the future and leave it there for her to claim at a time suitable.

During the studies there were plenty of examples where there was a call placed directly to the ambulance personnel when they were not in the ambulance and an assignment was handed out to them, as the following example shows. These situations almost always resulted in using the advantages of asynchronous communications by sending information to the ambulance for the personnel to collect when possible.

- *Yes it is 952 here.*
- *Hello this is Carl from the central; there is an assignment for you, a transportation to the hospital, with prio 2.*
- *Ok, we are having coffee right now, is it ok if we finish up or is there any rush.*
- *No problem at all, as long as you're on the road in 10min. The transportation is from Hallebro to Huddinge*[20].
- *No problems, we're just about done, do you send a slip to the ambulance as well?*
- *Already sent, enjoy your coffee.*
- *We will; bye.*

[19] This way of communication was observed during studies.
[20] These are not the correct names of the cities.

This log[21] gives a good example of how the advantages of asynchronous communication are used by placing the information needed in the ambulance where the dispatcher know that the personnel will be in the close future. And as the dispatcher has the knowledge of this there is no need to give more specific details of the case than from where to where and what kind of assignment it is. This is also a safety aspect if the conversation is held over the radio as that is very easy to listen in to for people outside the organization. Today it is very easy to do so as the radio uses the public bandwidth. That is why the information handled over the radio is non-descript and only gives the outlines of the assignment. More details are sent via the MobiText or over the phone. MobiText is a slip of paper that is printed in the ambulance where there is information about the patient, what has happened, where, special condition and so on. There are certain things that almost always are included but there is an field open for the operator to put in information specific for that case.

4.2 CASE FROM LOGS

Depending on the situation the dispatcher has different ways of communication to use with the unit in the field. If it is an emergency call, called prio-1, which requires that the ambulance leave immediately and get to the scene as fast as possible, the dispatcher uses the intercom system at the ambulance station and says what unit is to go at the assignment and where it is located. After doing that the dispatcher sends a MobiText to the car where there is more information about where they are to go and what kind of emergency it is. If there is something that is unclear the ambulance takes contact with the dispatcher and uses verbal communication to get further information. If everything is clear the dispatcher will probably not hear anything from them until they are done with the assignment. There are situations where a prio-1 is given to a specific unit that is close to the scene and then it is done by the radio channel in much the same way as when handing out an assignment that does not require an immediate response. In these cases much of the information is given via radio and the Mobi-Text is sent more as a source for later consultation that as an initial source of information about the case. Still, it plays an important role and is appreciated by the ambulance personnel[22]. The following is an example of how a prio-1 case is handled:

- *The Dispatcher [D] receives a call that turns out to be a prio-1.*
- *[D] surveys the map-computer to see which ambulance is to be sent.*
- *[D] decides that it is an ambulance from the central that is to be sent.*
- *[D] reads from a chart which ambulance that is on emergency duty.*
- *[D] Uses radio to call out through the speakers in the central, telling that it is a prio-1, the address they are to go to and which ambulance that is to go.*
- *[D] sends the Mobi-Text to the car that is going to the scene.*

[21] Extract from logs produced during the study in Jönköping.
[22] Information from interview with ambulance personnel 2004-03.04 in Karlskrona.

- *If possible [D] sends address information to the map computer in the ambulance which will help them find the scene by using the a screen that shows them a map and how to get to the position marked by [D]*
- *The Ambulance [A] contacts the [D] and asks for more information about the case.*
- *[D] & [A] discusses the case using radio but are careful not to give away details as anyone could be listening to the channel.*
- *[A] Is satisfied with the new information and ends the call.*

In this case[23] the dispatcher uses four different ways of handing information to the Ambulance personnel. First there is the simplex communication via the speakers at the central. This does not allow the staff to answer the dispatcher in any way so all they can do is to act on the information given to them. Secondly there is the information sent to the GPS[24] in the ambulance which gives the driver a way of finding the way by being shown a map of the area with the ambulance placed on it and told how to go to reach the destination. Third is the Mobi-Text sent to the ambulance, also a simplex communication but different compared to the first instant as it is possible to re-read the paper-slip and thus confirm the idea of the situation that the reader have in the head. Last there is the verbal communication which is a duplex communication and allows for instant questions and answers. These are all different ways of communication which gives them different uses in the context.

4.3 WHAT DOES THESE DIFFERENT WAYS OF COMMUNICATION PROVIDE

These four ways of communication that are presented above are all a part of how the dispatcher communicates with the ambulance personnel at a prio-1 situation. First contact, over the intercom at the ambulance station is a simplex communication. Second contact, sending a Mobi-Text, is simplex as well but also a way of asynchronous communication as it is a piece of paper printed in the ambulance. Third contact, sending the coordinates, is a simplex communication without any ways of giving feedback. Last is the contact the ambulance personnel take with the dispatcher in case something is unclear. This is a duplex communication and is initiated to get further information or if something is unclear. The question that arises then is if these are all necessary and what they provide for the communication.

As simplex communication is labeled the fastest way of getting information to the receiver that is the natural choice for the initial contact. By using intercom and simplex communication there is no need for the persons that are affected of the call to do anything else than get to the ambulance as fast as possible while they listen to the information sent in the speakers. This allow the personnel to focus on getting to the car and get on the road, which is the most important task at that moment.

[23] Taken from logs produced during the studies in Jönköping.
[24] Global Positioning System. See http://www.trimble.com/gps/ for more information.

Once in the car there is a Mobi-Texts message waiting for them and in the position marked at the GPS[25]. This allows them to read the specifics of the case and what they can expect once arriving. This note ensures that there does not have to be any timing between the dispatcher and the personnel arriving in the car. By printing the information it is there before they arrive and does not go away, one of the positive aspects of asynchronous communication. Also this phase is well adapted as it allows the ambulance personnel to collect the information at a time chosen by them without having to consult or operate together with the dispatcher. It also gives them the possibility to re-read the slip to make sure that they understood the information correctly.

If there is any trouble concerning the information at the Mobi-Text slip the personnel has the option of contacting the dispatcher and put up a duplex communication via radio or telephone. This is a slower way of communication but more accurate and is used for getting further information or solving issues concerning the Mobi-Text or GPS.

[25] If such a device is installed. But it is to be standard equipment at all cars in a close future according to interviews with ambulance personnel.

CHAPTER 5 DESIGN

This chapter will present the design ideas that have evolved through this project and based on the empirical material collected during the same. These ideas are not fully developed systems that are ready to be implemented but more of a theoretical idea of how technology added to the system could enhance the reliability and speed of information traveling from the caller and to the ambulance personnel. Two futuristic scenarios will be presented where an idea of how thing could work using the new technology is described, and discussed separately in two different chapters. These scenarios are based on the empirical information, the analysis of it, and the ideas I as a writer of this thesis have concerning the future in SOS Alarm.

5.1 PICTURES AND VIDEO

Using pictures for communication is not something new. It has been used for a long time in other areas, one example being Pictograms[26] which is a way of communication for people who are visually impaired. The advancement made in technology available for the market today has given us a situation where it is not unusual to be able not only to use your phone to contact others in every part of Sweden but also being able to take a picture with the same device and send to different instances. This could be a friends' phone, an e-mail address, a special number that makes a post-card out of it and sends it to the address you have specified with the message you wrote printed on the back. Therefore it is not hard to imagine that pictures could become useful when describing a scene of an accident. Today the phones can take pictures with up to 1Megapixels, which is a quite acceptable resolution but not good enough to be able to see details in a picture. Assuming that we have reached 3Megapixels in a couple of years, which is very likely, the usage of pictures for transferring information could be very effective.

What does pictures have that text does not as both of them have the attribute of Asynchronous communication and text already is used in the MobiText-slips? As the old saying goes; a picture says more than a thousand words and it is not something taken from thin air. Having a scene of accident described could only include a limited amount of information as there is a time constraint that could not be ignored. Being able to look upon a picture of the scene is a feature that allows the ambulance personnel to derive information from the scene by him or her-self without having to go through another instance, and at the same time, not getting second hand information that has already been interpreted by another instance. This mid-way interpretation is an action that could distort the information originally given by the caller. It is also a faster way of manufacturing an image of what could be expected when arriving at the scene compared to reading a text as there is no need to make up images based on information derived from the text at hand. The actual scene is presented for the interpreter who could then

[26] For more information of Pictograms see Lindén 99

focus at what parts that are important and cold supply the interpreter wit crucial information.

What, then, could be seen as information that is better mediated though an image than by verbal communication? Preferably information that contains a lot of details and where the person who is giving the information is not skilled in determining what is important and what is not. Which qualifies many of the calls that are made to SOS Alarm as it is not common that the caller has medical training herself. If it would be possible to send a picture of the scene of accident to SOS Alarm who would then forward them to the ambulance personnel much information would be transferred that might not have gotten though otherwise, as there are “filters” that has to be passed on the way. These “filters” are for example the callers interpretation of what it is that is important. This affects what information that is passed on to the operator at SOS. Another filter is the operator who decides what goes on the MobiText-slip that is sent to the ambulance. There is limited time and space to the operators’ disposal and decisions has to be made what is important enough to inform the ambulance personnel about. By passing on the picture straightly from the caller to the ambulance there are no filters that have to be passed and the information reaches its destination untainted and non-filtered. There has been discussions concerning pictures and one of the arguments has been that if it is to be done, it should be done in such a way that the operators at SOS Alarm do not have to look upon them. The ambulance personnel will be confronted with the scene anyhow though and using a picture could help them prepare mentally if it is a scenario that is could be hard to handle. The operators should be protected to ensure that they can keep calm and does not get exposed to too many details concerning the case at hand if it is not necessary.

Video is similar to pictures when we talk about advantages and disadvantages but it is not as common that there is someone with a video camera present at the scene of accident as a person with a camera or a cell phone with a camera. It is also troublesome to send such large quantities of data that a video needs that is just about useless in a situation where speed is an important factor. Video do also have a few negative aspects that are not present at the same way when using pictures. When taking a picture the photographer knows that it is crucial that all the information that she wants to mediate is included in the image. Using a camera it is quite possible that a lot of information that is not as important is included as well as the cameraman might be moving about to get different shots and these sequences are included as well when sent to the ambulance. This gives the person who is to interpret the material a lot more information that has to be worked with and organized to find the important aspects and scenes. This would not be a big problem if there were no limits to the time that could be spent doing this. When in an ambulance and on the way to the scene of the accident it is crucial that things are done quickly and without delays. That is why using video in this environment is not as effective or as fast as pictures.

5.2 USING DUPLEX WITH ROUTINES FOR REPLACING SIMPLEX

Comparing simplex and duplex communication we have discovered a couple of differences that allows them to be more or less functional for different tasks. One thing that is obvious is that a system developed for duplex communication could be used for simplex communication by adding rules to way the participants can behave. A phone call could be made as a simplex communication as long as both participants are aware of the fact that this is the way of communication that is to be used. By leaving the choice to the people using the technology it is ensured that there will be no unnecessary restraints put at the conversation. If they choose to use duplex instead of simplex it is possible and no other piece of technology has to be used to switch. This gives that by using routines for communication we can achieve a simplex communication situation with the possibility to switch to duplex when needed without having to change equipment is a possibility. The advantages with simplex communication can still be achieved as long as wanted.

5.3 ARE THESE THE OPTIMAL WAYS OF COMMUNICATING

Are these the optimal ways of communication? At a first glance it might seem like it is. By making sure that there are optional ways of communicating and by using the fastest of them for the initial contact and leaving the decision to the ambulance personnel about using the slower but more accurate duplex communications system it seems quite well designed. But just because something is well designed it does not mean it can not be improved.

There are other ways of handling communication available except for the three represented here. Whether these optional ways have been investigated and discarded or just not brought up for discussion when developing the system used today is not known and hard to get to know considering the time that has passed since the system was introduced. In any case the optional ways of communication will be brought up here to be reviewed with today's technology as a foundation of discussion. This gives another base of possibilities compared to what the technology available at the late 80's could, when the system was developed.

5.4 FUTURISTIC SCENARIO I

An accident happens at a highway where three cars are involved and there are people who are hurt and in need of fast medical attention. The first person arriving at the scene, Eva, just a couple of seconds later stops and gets out of her car and immediately calls 112, the number to SOS Alarm. She is very stressed so when the operator, Linda, answers and tries to get some useful information from her about what has happened, where and what the situation looks like Eva has a hard time delivering satisfactory answers due to high stress factor. Linda then asks her if she can take pictures with her phone, which she answers that she can. She then asks Eva to take three pictures of the scene of the accident, one to show the whole scene of the accident and two more to

show details of the status of the cars and the persons inside, if that is possible without endangering her own physical or psychological health. Linda receives the pictures immediately as they are sent to the number that the phone is connected to at the moment. The pictures are marked as icons at her screen and does not show what they portrait unless Linda herself, as an operator, chooses to bring this image up front to look at it.

Linda places the call to the ambulance central giving the assignment to car 549 giving them the address and that it is a prio1 assignment. This goes out through the intercom system in the central so to reach everyone in there at the same time. Just a few seconds after she has made the call-out there is an answer from the central. This is only done in case there is some trouble that has to be solved or if something is not going by the routines. The personnel all have a radio attached to the jacket which allows them to answer to the call made in the intercom as long as they are inside the premises of the central. The simplex communication is therefore switched to a duplex but through the same system as it was only simplex by choice. Linda is told that there was some trouble with that ambulance earlier and another unit, 550, is on the way instead. Then the ambulance leaves the station all three pictures are displayed on the screen in the car which allows the person not driving to get a good idea of the situation. He immediately sees that the accident has occurred at one of those places where there are wires separating the opposing lanes from each other. This calls for the use of one of those special pliers that are made for separating these wires from each other. This is not for getting to the accident itself as that is easily done by just lifting the wires but to allow the traffic to pass the scene at the other side of the road.

By viewing the pictures some more and zooming in and out at the screen it also looks like one of the persons are jammed in the car and tools are probably required to get her out. There is also a lot of blood which is an indication that there are severe damages and that operation is probably needed. It also looks like there is need for one more ambulance. When this information is collected, which takes under 20sek giving the possibility of just watching pictures of the scene and using the experience from similar cases a call is made to SOS Alarm requesting pliers to cut up the wires, a fire truck which has the special tools for opening up a car, that another ambulance is sent and that the closest hospital is prepared for an emergency operation. By doing this the fire truck and the second ambulance arrives at the scene only a few minutes after the ambulance and it has brought all the tools needed. The police are there as well and can take care of the re-direction of the traffic. The car is opened up and the patients are taken care of and as soon as the injuries are located this information is passed on to the hospital along with what type of blood that is needed. So when arriving at the hospital there are a team waiting for the patient and the doctor performing the surgery do have an idea about what damages that has to be fixed and can work from that.

Discussion I

The scenario presented above gives an idea of how the communication could be carried out if there where new ways of communication implemented. Several things differ from how it is carried out today and all of them are to the advantage of fast communication and reliable information. The following aspects and ideas are labeled by me as interesting and important. The discussion concerns those details that are marked down as related to what have been discovered while working with the empirical material.

First advantage is when the caller is confused and has trouble with giving the operator the information about what has happened, and what the situation looks like. This is information that could make the difference between life and death in some circumstances, as if someone is stuck and can not get loose by herself and needs to get medical attention quickly if she is to survive. If this is the case the caller can use the camera in the phone and take pictures of the scene and by doing that passes on the possibility to analyze the situation to someone else and in this case, to someone who has had much more experience in the area and is not stressed. Stress is something that can affect the judgment of a person in a negative way[27] and being able to analyze a situation without being under the influence of stress and with experience in the area is a great advantage. It is to be said that stress could also affect a person in a positive way and in those cases pictures might not be needed as an extra tool but that does not change the situation that in many cases they can be crucial.

Secondly there is the part when the ambulance that is assigned the mission is unable to go and another unit leaves instead. This is reported to the operator immediately by switching from simplex communication to duplex but still using the same devices and means of communication. This allows for fast response to something that earlier was not possible to replay to at all. This could for example be very important if one unit was sent not only because they were the ones that had the emergency duty at the moment but also because the persons in that team had special competence that were fit for that assignment[28]. If another ambulance is leaving with another crew without the operator being informed until later it could cause trouble. The same is true if a certain ambulance that was to go but did not start had special equipment that is needed at the scene it has to be brought along independent of which crew that goes to the assignment and in which ambulance. By being able to respond quickly to something that in normal circumstances would be a simplex communication is making sure that problems are solved faster than if contact had to be made through other channels and a new communication link had to be established.

The third instance is when the car is leaving the station and the person who is not driving has time over to study the pictures that are sent to the ambulance. These are shown on a screen instead of being printed to make it possible to zoom in and out to see

[27] Paton D. & Flin R. 1999
[28] Observed in the studies where an ambulance was chose because of its crew.

details of the picture. Having them printed would take the decision from the ambulance personnel to choose the interesting areas themselves. Having a printer in the car is a way to print those parts that are interesting if there is a need for a printed copy. Analyzing these pictures is something that is done quickly for someone who is used to watch a scene of accident and take fast decisions about what is important and has to be taken care of and what is not. Images are not a substitute to, for example plain text or verbal contact but is to be regarded as addition to possible ways to communicate and send information[29]. In this scenario there is information derived from the pictures that would not have been able to get until arriving at the scene if the pictures were not used and that information is that there are cables blocking the way that has to be opened. This was not mentioned by the caller and would not have reached the ambulance personnel not because of negligence but because the caller did not label this as important information. The lack of experience turns the caller into a bad choice of person to lay the responsibility of deciding what is important and what is not upon.

The last instance is when contact is taken with SOS Alarm from the ambulance to request special tools and units based on the information derived from the pictures that was not included in the text messages sent to the ambulance, the MobiText. This is a whole new instance compared to the routines used today as it is derived from pictures and is thus information that is not accessible for the ambulance personnel today.

5.5 FUTURISTIC SCENARIO II

Carl is faced with the situation of being the first at the scene of an accident and contacts SOS Alarm to ask for ambulances as he understands that there are people who are seriously hurt. During the conversation with the operator at SOS Alarm it is obvious that Carl is quite affected of the situation and has great problems with giving a good description about what has happened and what the situation looks like. The operator asks Carl to take three pictures and talks him though the process to ensure that the pictures captures important areas of the accident. As these pictures are sent over the operator contacts the Ambulance central and sends an ambulance to the scene and passes on the pictures for them to analyze. These pictures are not viewed by the operator to keep them from having to watch the scene of the accident. As the ambulance leaves the central the operator is soon contacted by the ambulance personnel who tells her that the quality of the images are so bad that it is close to impossible to derive information from them. The operator still has Carl on the other line which is lucky for now she has to begin the work of calming him down to a level where he can give her information of the accident that is significant. Because of the failed communication via images time has passed when the operator could have done worked with soothing Carl, now it has all been delayed for the same time that passed between the decision of using pictures and to the ambulance reported that the images were useless. After a while of talking Carl calms down to a level where the operator decides that he is calm enough to

[29] Brealy 2000

be able to deliver useful information. Now the ambulance is already on its way so the operator decides to make a hotlink between Carl and the ambulance. She informs Carl of what is to happen and tells the personnel in the ambulance that there is a hotlink coming in. Now Carl can give the information directly to the ambulance without having to pass though the operator. If the operator feel she need she can listen in to that conversation to collect information to put in the form for specifying the case that is possible. The ambulance personnel derives useful information from Carl and as they do not have to go through the operator there was enough time to prepare for what they are heading for and to prepare.

Discussion II

The first instance that is interesting is when it is discovered that Carl is not in shape to explain to the operator what has happened and she takes the decision to use pictures instead. This is a decision that could get consequences if it turns out that these images do not contain information that is useful. As the operator uses time to explain what kind of photos that are most effective and that Carl should try to take time that could be used to calm him down and collect information verbally is occupied. This gives that when the ambulance personnel gets the operator on the phone and explains that the images are useless the first minutes with Carl on the phone has been of no use. This is a situation that could become troublesome as much trust has been set to the images and they are used as a replacement for the verbal communication and since they does not pass any filters in SOS Alarm, i.e. the operator does not view the pictures herself and the information is passed on to the ambulance personnel regardless of its quality. The images are not meant as a replacement much because of this uncertainty of the quality and if they are to be used as such it could be required of the operator to review them before sending them forward to ensure that it is useful information that is sent away. This is what is done with the verbal information that is collected. The important parts are singled out and it is organized to ensure that it will be easy for the receiver to quickly understand the situation based on the text. The usage of images must be controlled so that it is not used as a substitute for the verbal communication unless there is an instance that is able to filter the information to avoid sending irrelevant or not usable pictures to the receiver.

The second instance is when the operator decides to connect Carl to the ambulance personnel directly, without passing through herself first. Because of the mistake with the images there is a shortage of time at the moment and the information has to get from Carl to the ambulance as fast as possible, and this is done by creating a direct link between these two instances. This is a new way for the information to pass, from the caller to the ambulance, and is intended for situations where the filtering of the operator is either unnecessary or the information has to reach its destination quickly and therefore has to bypass that instance.

CHAPTER 6 DISCUSSION AND CONCLUSION

Communication is developed in a continuing fashion, there is no final goal that is to be reached as the technology is advancing and offers new and different ways of handling contact with other persons. In this thesis two new ways of communication has been put into context in the scenarios presented. What is it then that can be gained by changing the ways of communication? Are there any negative aspects? What is it that is affected by these changes? These are questions that might have arisen during the reading and the following sections will discuss these and also reach a conclusion for the thesis.

6.1 DIFFERENCES BETWEEN NOW AND THE FUTURE IN COMMUNICATION

Today the communication has a pipeline in which it travels to reach its destination and there are no optional ways to choose from if it turns out that this pipeline is broken in some way. In other words, the communication is dependent upon everything working as planned and no surprises arise during the work. By expanding the system and giving the operator an opportunity to choose between different ways of communicating the system becomes more flexible and able to handle a wider range of situations without braking down in any instances. Flexibility is a positive aspect as it is not unusual that the operator has to go "outside" the system to solve situations that are somewhat different. The operators regularly used feature's in the system to perform tasks that is was not intent for[30]. The system in this aspect is referring to the system installed in the computers used and the limitation for procedures it contains. The futuristic communication does also rely on technology working as planned, as these options of choosing other means off communication also gives that there are more technology used. The more technology that is used in a system, the larger is the risk of a breakdown as there are more things that can go wrong. In a futuristic view though it is not only the level of advancement in technology that has evolved, most certainly the reliability has been improved as well. Therefore I believe that it is safe to say that even though the technology of tomorrow will be more advanced the reliability will be higher, or at the worst, in the same level as it is today.

Opening up a new channel for information

Using images for communication gives the person who is the receiver a chance of getting untainted information. Today the caller is the person who interprets the scene and passes on information to the operator who re-interprets it before sending it to the person who will make use of it. This gives that there is a new channel opened up that is a direct link between the caller and the ambulance personnel. The filtering that is done at the SOS Alarm station is not implemented at the pictures for the reason that the operators are to be protected from having to see the scenes of accident. It is also

[30] This was observed during the studies in Jönköping.

possible for the caller to be connected directly to the ambulance if such a need would arise, as in Futuristic Scenario II, to enhance the speed of information. This will also give the ambulance personnel to opportunity to give direct feedback to the information handed to them and to investigate further in the areas that they single out as important. Even though the operators do have medical training they can not compete with the ambulance personnel's education and experience in the field when it comes to analyzing a scene of accident. This pipeline for the information must be used sparsely though. One of the operators' tasks is to screen the calls that arrive and sort out the ones that are not in need of an ambulance, which is a quite high percentage of the calls. By connecting the ambulance with the caller the possibility off screening and sorting the information given by the caller is moved from the operator to the personnel in the ambulance. Therefore it is crucial that the calls that are let though this pipeline are calls where the caller is able to give correct information in a way that does not demand the ambulance personnel has to work for getting the information delivered. In other words, the operator should not let through persons who are stressed, angry, or in any other state of mind that hinders them from having a calm conversation with the ambulance. Just as the ambulance personnel are better fit for reading a scene of an accident the operators are more used to and better prepared for handling people who are not calm when placing the emergency call as they deal with that on a daily basis[31]. In either case, it should not be the caller who is responsible for deciding what is important and what is not, it should be either the operator or the personnel in the ambulance.

Is it possible to let the caller through to the ambulance even if they have passed though the operator initially to ensure that they are fit for carrying out a conversation concerning what has happened at the scene of the accident? This is a question that will not find an answer in this thesis, but I believe that it should be mentioned and addressed before something like this is to be implemented. It is possible to connect the caller to the ambulance today as well and it is mainly used for giving directions to the accident if it is troublesome to find the way. By making use of the new technology that is implemented in today's cellular phones and the technology that will be implemented in the upcoming five years we will have the opportunity to send high quality images and even video streams which will be available for the personnel in the ambulance. Regardless of which way the information it uses to get there, via SOS Alarm or by being directly connected to the ambulance itself the direct coupling will allow for duplex communication as well as video and images. This in turn will allow the personnel in the ambulance to direct the caller to the areas that are of interest.

On demand

On demand is the idea of getting things when they are needed, demanded, which gives the explanation to the expression. The aspect of on demand concerning the images includes the option for the operator to view the images herself if there is a need for it. Not always is the accident of such a kind that the images will be unfit for viewing but

[31] During the studies many examples of operators dealing with caller who were stressed were presented.

could be a help to the operator as well. It is possible to view the images if the need arises and it is each operators own choice when to do so and when not to. This ensures that the operator can choose to distance her from the accident or to take a bigger part and get involved in the scenario.

Digital advantages

The digital advantages of the pictures are an important aspect that should not be forgotten. While the picture is digital it is possible to work with it to find as much information as possible. Inverting an image (polarizing the colors) could for example be a way of finding details that the ambulance personnel are looking for[32], something that is not possible once the image is printed and the digital copy is lost. The colors and sharpness of a screen is often better than what a small printer can produce so there will probably be a loss in quality as well once it is printed. It is important to make use of the digital advantages that are available[33] to ensure that as much information as possible is derived from the image. The digital copy is also reproducible and it can be sent to more instances if there is need for it. An image portraying a wrecked car could be of more use sent to the fire fighters than the ambulance and this is possible to do as long as it is still in digital format.

6.2 CONCLUSION

The situation today is not non-functional but there is ways that the communication could be enhanced to ensure that the SOS Alarm could work more efficient and with greater accuracy. Using images and changing the pipelines for simplex communication to duplex communication are two ways that the communication could be enhanced but there is most certainly several more that could be found by studying the SOS Alarm and the ambulance centrals. It is very crucial though that much effort is put into ensuring that as many negative scenarios as possible are tried out before the system is installed, to ensure that there are no negative surprises once it is up and running.

By making sure that the new technology that has become available on the market is included in the studies there is a greater chance of discovering new and maybe more effective ways of communicating. It does not always have to be technology that was developed for communication, as images is an example of, it can still be used to enhance and improve the routines and ways the communication is making use of.

Neither does this has to be limited to ambulances and how they are to make use of this technology. SOS Alarm is in contact with more instances, as the police and fire fighters. There is a new system in the development process today called RAKEL[34] and this system will connect all these different instances in such a way that communication between different instances will be easier to perform. This is well connected to the idea

[32] Using inversion to find details is something I have used myself, it's not a standardized procedure.
[33] Hollan J & Tornetta S. 1992
[34] http://www.sou.gov.se/rakel/

that these new ways of handling communication should not be limited to ambulances alone. The police and fire fighters could be helped out by seeing pictures of the scene just as well as the ambulance personnel.

Images are not a final solution that will, by itself, turn the work at SOS Alarm into a flawless routine with solutions to every situation that could arise, but it is a step closer. Nothing is flawless though, which I hope this thesis has pointed out as well and once implemented there will probably arise problems with using images that were not discovered in the pre-study. In the end though I believe that the technology offers us great opportunities to enhance the communication of today and I think it is wise to grab that opportunity.

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