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Experience with the use of the COM computerized conferencing system

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Abstract:

The COM computerized conferencing system has been in regular use on the DECsystem-10 computer at the Stockholm University Computing Center since March 1979. This report summarizes the result of a number of studies of the effect of the system. The report also summarizes the result of some other studies of similar computerized conferencing systems.

The report gives information about how much KOM (the Swedish language version of COM) is used, what it is used for, which people use it, the user opinions about the advantages and disadvantages of the system, and it compares cost with other communication media. The result shows that part of the communication in COM replaces communication previously conveyed by telephone, letters or meetings. Much of the communication in COM is however new communication. COM has changed the communication patterns and increased the communication between people at large organizational distance, especially for people younger than 40 years of age and among people who are not managers.

For many of its users, COM has meant an increase of the circle of people with which they exchange experience and ideas on a daily basis, and has meant that information and viewpoints can be both disseminated to and collected from more people faster than was possible before.

The Swedish language version of this report (report no C 10166) also contains as appendices full reports of those studies not presented in separate reports. Most of these appendices are not included in this English translation of the report. The English version of the report has however been updated with much new information not present in the Swedish version.

Search key:

Electronic Office, Office Automation, Computer, Text Processing, Word Processing, Electronic Mail, Message Handling, Communication, Computerized Conferencing, Computer Networks.

When reprinting this report in 1993, some diagrams have been redrawn, but the text from the 1984 report is otherwise unchanged.

1 Table of contents

(Note: Only appendix G.2 and appendix L is included in this English-language translation of the report, but the full list of appendices available in the Swedish version is included below for information to English-language readers.)

2 What is computer conferencing?

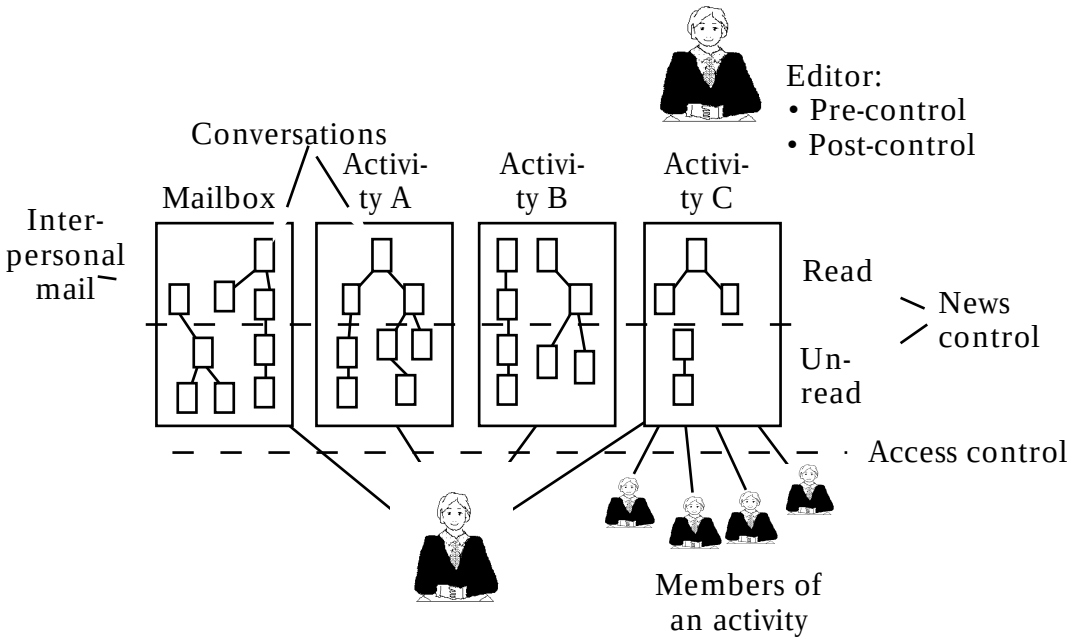
Computerized conferencing will probably start to play a major role in the eighties in saving energy costs by reducing the need for travel, and in furthering international cooperation.

A computerized teleconferencing system can be seen as something halfway between a conference and a very rapidly published newsletter. The system can be used by hundreds of people at diverse geographical locations. Each user must have access to a simple computer terminal; a typical user sits at this terminal once or twice a day.

The system has a data base, consisting of a large number of text messages. Each such text message can contain any text written in ordinary human language which the author wants to put there. There are two main kinds of *messages*: the first, called a *letter*, is a message from one user to one or a listed number of other users. The second type, called a *conference entry* is stored in one of several *computerized conferences*. A number of users are members of the computerized conference. Each member normally reads all that is written in the conference and also can freely write messages into the conference, which are then made available to all the other members of the conference.

The computer remembers which messages each user has already seen, and when users connect to the system, they will get all their new letters and all the new entries in the conferences they are members of. They can directly write their own messages, which will then immediately be stored in the database.

It is important to note that rarely do all members of a computerized conference sit at their terminal at the same time, conducting an ordinary meeting but with written instead of vocal communication. Instead, a typical user connects once or twice a day at times suitable to this user, gets all news and writes any comments or new messages into the system. Thus, the system is in some ways more similar to a very rapidly published newsletter than to a conference.



This figure shows the main principles of a computerized conferencing system. In the figure, users are members of activities, and the system knows for the members what they have seen and not seen in the activity.

2.1 Use of existing systems

There is already much experience with the use of this kind of computer system, most for contacts between research people. There are systems in existence today which have several hundred active users and many thousands of messages written each month. The experience shows that actual and often intense discussions can go on between the users. The interaction is of course not as immediate as in face-to-face meetings, but this is compensated by the fact that a computerized conference can go on for months or years with interaction every day.

2.2 Some claimed advantages with computer conferencing

- You can take part in many on-going conferences using much less time than for face-to-face meetings.
- You can read and write at times suitable to yourself, when you have free time, or something to say or to ask for.
- You can skip messages of less interest and use the computer to help you select or search for what you want to read.
- You can get a large group of people to look at a proposal or a question and get their comments within a day or two.
- Because you save the time and cost of travel, much more intense and close cooperation is possible across geographical distances.
- People with different mother tongues often find it easier to understand each other by written than by spoken language.

- Computerized conferencing seems to work well in groups of fifty or a hundred participants, while it is well known that face-to-face meetings can be cumbersome with more than about seven participants.

  Computerized conferencing should not be seen as a replacement for face-to-face meetings, since experience with existing systems shows that most of the communication is of a new kind which would not have taken place at all if this tool had not been available. There are of course certain tasks, for example those including complex negotiations, where the fast and immediate interaction of face-to-face meetings is essential.

2.3 Examples of computerized teleconferences:

- Exchange of experience between people with similar tasks but placed in different locations, for example exchange of experience between users of a common computer system or application including contacts with the developers and maintainers of the software.
- Collection of comments and ideas on suggestions and proposals from a geographically distributed group of people; for example, obtaining comments on a proposed change in the characteristics of a product from its users.
- Contacts in groups working toward a common goal but spread at different locations, for example, the members of a standards committee.
- Getting answers to questions by posing them to a group of people well-informed in the subject area of the question, for example, how to find a product with particular desired characteristics.

  The COM computerized teleconferencing system was developed by Torgny Tholerus and Jacob Palme at the Swedish National Defence Research Institute. Development of COM was moved to the Stockholm University Computer Centre (QZ) in July 1982.

2.4 Facilities of the COM teleconferencing system

Function	Implementation
Implementations	COM has been in production usage for several years at about 15 DECsystem-10 and DECsystem-20 installations. PORTACOM is under development or field-testing for Norsk Data Nord-100, Burroughs B 7800, CDC Cyber/NOS, Digital Vax-11/VMS, IBM 370/VS1, IBM 370/MVS-TSO, IBM/VM-CMS, Siemens 7.760/BS 2000 and Univac 1100 computers. PORTACOM will probably also be implemented on Vax-11/Unix systems.
User interface	Individually composed menus but in reality command driven, since any command can be given to any menu.
Help facility	"Help <command>" describes that command.
Text data base	The text data base consists of a text directory and a number of text items.
Links between texts	"Comment" links can be established between text items. Several comment links can refer to the same

	item creating recursive tree structures.
Conference data base	A conference consists of a list of members and a list of links to text items. The same text item can be referred to from several conferences. Links from a conference to a text item can be of type "Receiver" and "For information".
Conference types	Conferences can be of several types, the most important being: OPEN, where any user can join the conference, CLOSED where the organizer decides who can participate, RESTRICTED which are OPEN to some users and CLOSED to other users, WRITE-PROTECTED to which only the organizer can establish links from text items, PROTECTED where all information about the conference is hidden from non-members.
User data base	A user has a list of conferences, in which that user is a member. Every user has a "personal conference" storing letters to and from this user. One and the same text item can thus both be linked as a conference entry to one or more conferences and as a letter to one or more individual users.
Name data base	The name data base contains names of users and of conferences with links to the conference and user data bases.
News control	For every user who is a member of a conference, the system notes how far that user has read in the conference. This marker is updated whenever a new entry is read. A user can be automatically guided through all new letters and all new conference items, one conference at a time, but the user can choose a different path for scanning news and can modify the default path according to which conferences with news are presented. The same text item is not shown twice to a user, even if the user is a member of two conferences and the text item was sent to both conferences.
Text item retrieval	By conference, writer, receiver, item number, item range and (in PORTACOM) content. Comment chains can be traversed. Browse facility available. Items of interest can be marked by an individual who wants to see them again later.

Function	Implementation
Name data base	Names of users and conferences can be matched retrieval from abbreviated search words. In COM version 6, general text search is also available on the name data base.
File system interface	Text items can be saved on files, files can be submitted as entries or as command files.
Text editing	Simple text editor built into the system. COM version 6 also provides a facility for calling an arbitrary external text editor.

Terminal type modes	The system can be adjusted to different terminal types.
User modes	Some user interface facilities can be adjusted according to individual user preferences.
Tables and statistics	Commands to print out lists of users and conferences, lists of members of a conference and usage statistics.
Disk purging	Automatic facilities for removing old text items when space is needed for new text items. (In COM version 5: By running a disk purging program. In COM version 6: Also old conferences and users are automatically removed when space is needed for new users or conferences.)
Text interchange	GILT and RFC (Arpanet, CSNET, MAILNET etc.) MAIL with other CBMS-es protocols available for COM, and will be developed for PortaCOM.
Special program interface	A "special program interface" is available which allows computer programs to act as "users" in reference to the system.

3 The COM system, history and legal problems

The first computerized conference system in the world was probably the EMISARI system, which was developed by Murray Turoff in 1970 for the American "Office of Emergency Preparedness". Turoff visited Sweden several times in the middle of the 1970's, told us of his experience and got a number of people in Sweden interested in the idea.

To get more experience, the Swedish Board for Technical Development (STU) got a copy of the American computerized conference system FORUM (also known under the name PLANET) and installed it at the Stockholm University Computing Centre (QZ) in 1976.

FORUM was used for a series of trials by STU and was also tested by the regular users of the QZ computing centre. The experience was positive, and at the same time the Swedish National Defense Research Institute (FOA) needed new communication tools because of a government decision to spread FOA geographically to five different Swedish cities. FOA made a number of tests with the FORUM system in 1977 and decided in November 1977 to develop a new such system.

3.1 The Swedish Data Act

Immediately after this decision FOA contacted the Swedish Data Inspection Board. FOA visited the Data Inspection Board several times and discussed the system under development and asked for comments. The Data Inspection Board did not then have any objections, and so, in May 1978, FOA made a formal application to the Data Inspection Board for permission to use the system.

The reason why such an application is necessary is that the Swedish Data Act requires a permission from the Data Inspection Board for

all computerized Data Bases containing information on individual persons which can be identified directly or indirectly. This Act is intended to protect against invasion of privacy by misuse of such data bases, especially by combining information from several data bases.

FOA at the same time found it important to get an evaluation of the advantages and disadvantages of the system and its effect on the work environment. FOA asked Gothenburg University to make such an evaluation. Gothenburg University was chosen to get an impartial evaluation by an organization not involved with the development or use of the system. This evaluation started in July 1978 with literature studies and pre-interviews with a trial group which was to begin using the COM system. The same group was interviewed one year later to make possible a comparsion of their expectations before using the system with their experience after having tried it. A large inquiry was sent out in 1980 to all who had used COM more than 10 times, and to a random sample of FOA employees who had never used COM. The result of the Gothenburg Evaluation was published in Adriansson 1980A and Adriansson 1980B (in the Swedish language), a short summary of some of the results has been included in chapter 17 of this report.

The Swedish Data Inspection Board sent the FOA application for permission to use the system to the central trade union organizations in Sweden, LO (for blue collar workers), TCO (for clerical workers) and SACO (for academic graduate workers). These, especially LO and TCO, wrote in their replies that they were afraid of certain problems which might be caused by computerized conference systems. They feared that such a system might lead to less equality by making it more difficult for employees not accustomed to written communication and they were also afraid that the computer could be used for improper control of and spying on the employees.

The Data Inspection Board decided in November 1978 to refuse the application from FOA for permission to use the system. Even if the fears of the trade unions had some influence on this decision, it was mostly based on a formal interpretation of the Swedish Data Act. This Act was clearly written for a conventional data base containing records with certain defined fields within each record. The Act requires that an application shall indicate clearly what kind of information is to be stored in the personal records, and the Data Inspection Board must, when it grants an application, issue directions specifying what kind of information is permitted in the personal records of the data base.

The Swedish Data Act is however written in such a way that it can be interpreted to mean that also the mention of information about a human person in an ordinary text stored in the computer is personal information of the kind which requires permission by the Data Inspection Board. Thus, every mention of information about a human person in the text of a message in a computerized conference system would require permission by the Data Inspection Board. But since it is impossible to issue directions specifying what kind of information is permitted in ordinary textual messages, the Data Inspection Board concluded that such a system could not at all be

permitted.

The Data Inspection Board did however grant a new application from FOA in March 1979 to use the system for a trial period of two years. In this application, FOA tried to comply with the Data Act by specifying a list of certain kinds of personal information which were to be forbidden in the messages stored in the system. Such a negative list of what is not permitted is easier to write than a positive list specifying all that is permitted in the messages. The list included for example that messages in the system were not permitted to include information about the political or religious beliefs of individuals or about their health. This was put into the list because the Swedish Data Act specifically says that the Data Inspection Board should be restrictive in permitting personal data bases containing that kind of information. The new FOA application which was granted by the Data Inspection Board also restricted the search facilities in the system and included principles for erasing old messages.

At the same time, a member of the Swedish Parliament introduced a Bill in Parliament requiring a change in the interpretation of the Data Act. The bill said that the rights of individuals to communicate with each other on religious and political matters was protected by the Swedish constitution. Because of this, it was not reasonable to apply the Data Act in such a way that this right was impeded in a computerized system for communication, especially since the Data Act was never intended to be applied in this manner.

The Data Inspection Board when granting the application for a two-year period of trial required FOA to report the results of the trial period when applying for use of the system after this period. Such a report was expected to include investigations of the fears expressed by the trade unions, and the evaluation made by Gothenburg University investigates in detail these fears. The goal of the evaluations made by Gothenburgh University (reported separately) and by FOA (reported here) was however also to investigate the value and usefulness of the system.

Towards the end of the two year trial period, FOA sent in a new application to the Data Inspection Board for permission to use the system after the end of the trial period. This new application contained many hundreds of pages of documentation on effects of the system concluding that the risks with this kind of system were not large enough to make them unacceptable under the Data Act. In this new application, FOA again (as in the first, unaccepted application to the Data Inspection Board) claimed that personal information about individuals in the text of messages were not the kind of personal information which is covered by the Data Act. This time, the Data Inspection Board accepted this view, and the new application was thus granted without any need for directions concerning what kind of information is permitted in the text of the messages.

The Data Inspection Board did however of course issue directions concerning the contents of the more formalized files within the system, such as membership lists for conferences.

3.2 The Swedish "Sunshine Act"

Another Swedish law which influences the use of computerized conferencing systems is the so-called "Sunshine Act". This law, which is part of the Swedish constitution, says that documents available to government offices are public. By public is meant than any citizen is entitled to look at them, unless there is a specific paragraph in the Official Secrets Act forbidding public access to the document.

The Sunshine Act applies to all documents within government offices except internal discussion papers during the preparation of a decision. If, however, these internal discussion papers contain new pertinent facts, they also become public.

The application of the Sunshine Act to computerized conferencing systems has been tested in a decision which partly was taken in the highest Swedish administrative court. According to this decision, what is written in a computerized conference system is to be regarded as documents. Thus, any citizen is allowed to look at conferences with the exception of (i) certain internal discussion conferences within one government agency (ii) information which is secret according to the Official Secrets Act.

Computerized conferencing might very much increase the amount of material which is publicly available according to the Sunshine Act. This can be seen from two viewpoints:

(a) Increasing use of computerized conferencing may make more information available to interested citizens who want to check on what is done in government offices. This is a positive effect in accordance with the intentions of the Sunshine Act.

(b) The knowledge that what is written may become publicly available may make people afraid of using computer conferencing. They may prefer to use face-to-face meetings or telephone conversations just because they do not like everything they say to become publicly available.

Our experience, however, is that neither of these effects seem to be very important. Effect (a) does not seem to be very important since no one has ever used the Sunshine Act to get out information from the COM system. (A group of people once asked for information, but they never took out the information when it was made available to them. Perhaps their main interest was in testing the law, not in actually getting information out of the COM data base).

Effect (b) also does not seem to be very important since the official publication of the legal decision that the Sunshine Act does apply to COM did not at all reduce the usage of COM.

4 Some statistics on the usage of COM

When this is written (August 1981) the COM system has been installed on five computers in Sweden (plus some computers outside Sweden):

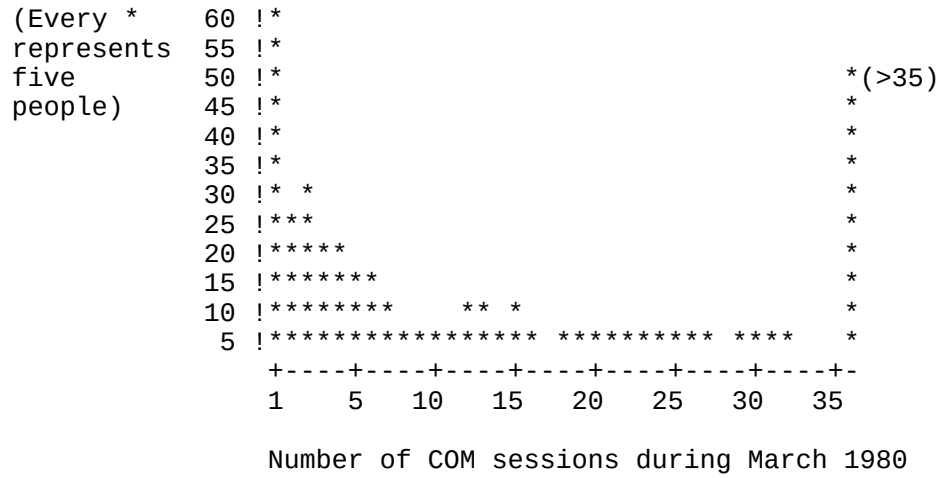
- The ODEN computer at the QZ center in Stockholm, used by FOA, by QZ and by researchers in the Stockholm area.
- The NADJA computer at the Royal Institute of Technology in Stockholm.
- The AURORA computer at the University of Stockholm.
- The FILIP computer at department 3 of FOA in Linköping.
- The LIDAC computer at the Linköping University.

The COM usage at the ODEN computer is however much larger than at the other computers. The statistical information in this report is mostly only on the COM usage at the ODEN computer. On the ODEN computer, there are two COM systems with separate data bases, one for Swedish-language messages and one for English-language messages. The Swedish language data base is presently much larger, and the statistics in this report only apply to that data base.

All the COM systems except that at LIDAC are connected through a network allowing the transmission of messages between the systems. Messages transmitted to the ODEN computer from the other computers will sometimes influence the statistics in this report.

During the period from March 1979 to October 1980, about 90 000 text messages were written in or transmitted to the COM system at the ODEN computer.

Number of users: The question "how many people are using the COM system at the ODEN computer" is not easy to answer. This is because the distribution of users across activity is very slanted:



Number of COM sessions during March 1980

The diagram shows that a large percentage of the users used COM only once a month. The number of users depends very much on whether these low-frequency users are included or not. The problem is not solved by including them, since this only poses a new question for a rather large volume of users with even lower frequency of usage.

Definition of the concept "user" Number of users during 1980

Person who has used the COM system at any time.	About 1000-2000 people
Person who used COM at least once a month.	About 400 people
Person who used COM at least once every two weeks and not including people who are just testing the COM system and not coming back.	About 225 people

In the rest of this report, the last of the three definitions above will be used. These users will be called *regular users*. This will in many ways influence the statistics presented. If all the low-frequency users are included, this will of course give lower means on how often a user accesses the system etc.

During september 1980, all the COM users together used COM for a total time of 1909 hours or about 8 hours for each regular user. During the same month, 7740 messages were entered into the COM data base.

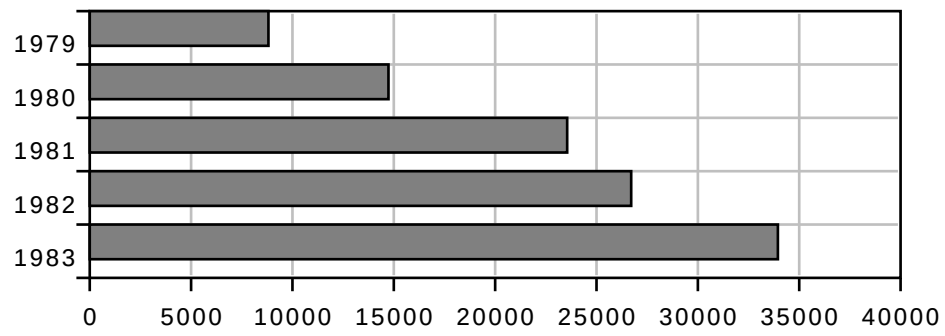
Time per user: Regular users connect to the system in the mean twice every working day or ten times a week. Each session lasts for about 10 minutes, which means that COM is in the mean used 20 minutes/ working day or about 4 % of a full working day.

Read- and write-activity. If you look at those 20 conferences, in which most entries were made during the period 1980-01-01--1980-08-03, then for an average meeting, 62 people had read anything from this meeting at any time during the time period and 47 people had written anything to the meeting during the same time period.

COM usage at QZ

QZ has when this is written (August 1984) about 1400 COM users all over Sweden, in most Western European Countries and in North America, writing more than 150 000 COM entries per year and reading more than two million COM entries per year. The COM usage has grown sharply ever since COM was first installed in 1979.

The diagram below shows the total number of hours of COM usage/year at QZ:



5 Number of readers/written text

A text item in COM can be sent to any number of people and conferences. The same text item can thus be both a letter and a conference entry. When an item is sent to a conference, it can be read by many people who take part in that conference.

Below, text items written between 1982-03-01 and 1982-06-30 are split into three categories, pure letters, where all the receivers are people, pure conference entries, where all the receivers are conferences, and mixed items, which were sent to at least one person and at least one conference. Of a total of 31780 text items written during this period, 4198 were erased and not available when the statistics below was calculated.

	Pure letters	Pure conference entries	Items sent to both conferences and individuals	Total
Number of people receiving this entry as a letter	19667	-	1829	21496
Number of conferences receiving this entry as a conference entry	-	10653	1531	12184
Number of sent text items	16512	9713	1357	27582
Mean number of people as letter receivers	1.19	-	1.35	1.20
Mean number of conferences as receivers	-	1.09	1.12	1.10

During the statistics period, 31780 text items were written and 584167 items were read, so the mean number of readers/text item was 18.4. From this follows that the mean number of readers of a conference entry by conference members was 43.9 and the mean number of readers of a letter by individual letter receivers was 1.20.

Note that since some letters were also conference entries, the mean number of readers of all entries which had at least one letter receiver, including conference members of conferences to which some letters was sent, will be 4.5 assuming that such conference entries are read by as many people as ordinary conference entries.

6 What is COM used for?

Number of conferences: On October 1, 1980, t,T>/were 219 conferences in the system. The conferences were of the following types:

93 Open conferences	In which any COM user can make themselves a member

11	FOA conferences	In which all FOA employees can make themselves members
7	Write protected conferences	Open conferences where only some people have write privileges
3	Archive conferences	For selection of important entries originating in other conferences
100	Closed conferences	In which the organizer decides who is allowed to participate
5	Protected conferences	As closed, but no information about the conference is available except to its participants

Messages in COM are *conference entries* (available to all participants of a conference) or *letters* (sent to one or more named persons).

During a statistics collection period in April 1980, the distribution of messages between *letters* and *conference entries* was:

	Letters	Conf. entries	All messages
Mean no. of readers	1.9	32.9	14.1
Percentage of no. of written messages	61 %	39 %	100 %
Percentage of no. of read messages	8 %	92 %	100 %

Note the large difference between letters and conference entries. Although 61 % of all messages *written* in COM are letters, the letters represent only 8 % of all messages *read* in COM. Letters are however often more important to their receivers than conference entries, so the importance of letters is probably somewhere in between these two values.

From the information in Appendix G, the time to read and write a message can be estimated:

	Conf. entries	Letters	All messages
Time to write a message	296 sec	255 sec	267 sec
Time to read a message	27 sec	49 sec	28 sec

By combining this with the information above about what percentage of messages are letters and conference entries, the time spent in COM in various activities can be computed:

	Conf. entries	Letters	Total
Time spent writing messages	17 %	23 %	40 %
Time spent reading messages	51 %	8 %	60 %
Total	69 %	32 %	100 %

This shows that although only 8 % of all messages read are letters,

still 32 % of the time spent using COM was spent for letter communication.

(Note: The figures above do not exactly agree with those given in chapter 14.2. This is because the figures above are partly based on statistics from another period (April 1980), and that the time spent on "other" activities have been added as an overhead to writing and reading in the table above. The figures in chapter 14.2 were entirely based on statistics from September 1980. The mean number of readers/message was 36 % higher in September than in April.)

Appendix A (chapter A.6) reports an investigation made on a random sample of entries from COM in May 1980. The population was for open conferences all open conferences, for closed conferences only those conferences in which I (Jacob Palme) was a participant. (Since the rules for COM forbids me to read entries in closed conferences of which I am not a participant.) This will, for closed conferences, introduce a bias towards conferences about the COM system itself, of which I, was a member because of my work, to a larger extent than other COM users.

Open conf.	Closed conf.	Subject-classification
52 %	18 %	Computers, computer programming
20 %	56 %	How the COM system works, suggestions for improvements, planning of future computer conferencing systems
10 %	12 %	Private (road traffic rules, classified advertising, spring feelings, protection against insects etc.)
10 %	4 %	Miscellaneous official business (economic planning, weapons technology etc.)
4 %	5 %	Administrative matters (references, naming, address information, planning of a business trip, planning of work.)
3 %	2 %	Subjects on the borderline between official and private business (Certain discussions on social and language matters.)
1 %	5 %	Working conditions etc.
100 %	100 %	Total

Appendix F contains a list of all open and closed conferences in COM in which more than 10 entries were written during January-July 1980.

For some of these conferences, it is possible to classify the subject of the entries in the conference from the title of the conference. The table below is a subject classification of the conferences in this list:

Group	Number of Conferences	Number of entries	Percentage of conferences	entries
Computer usage etc.	60	6873	42.3 %	39.7 %
Computerized conferencing	18	4274	12.7 %	24.8 %
Not known	26	3375	18.3 %	19.6 %
Trade union internal usage	11	634	7.7 %	3.7 %
Other official business	11	528	7.7 %	3.1 %
Not official business	7	509	4.9 %	3.0 %
Administration etc.	6	436	4.2 %	2.5 %
Maybe official business?	1	346	0.7 %	2.0 %
Work environment etc.	2	275	1.4 %	1.6 %
Total	142	17250	100.0 %	100.0 %

The table shows that computer usage dominates, especially in the open conferences. The Gothenburg inquiry (see Adriansson 1980) shows that 83 % of experienced COM users, 62 % of less experienced COM users and 50 % of unexperienced COM users often used the computer for other things than COM - that is, they were computer users in other respects than as COM users. The reason for this is probably:

- The initial difficulties in beginning to use COM is lower if you already know how to handle a computer terminal.
- FOA has not to any large extent bought special computer terminals for COM usage, COM is thus mostly used from terminals which already exist and these terminals are placed where people work with computers.
- Those who work in the computer area are a group of people who have a common interest of the kind for which a communication system like COM is useful.

Note however (see Adriansson 1980) that only 3 % of the COM users said that "difficulties in learning to use COM" were a factor against using the system.

7 Why people use or do not use COM

Adriansson 1980 shows that the most important reasons for not using COM is "I do not have time", "the discussions in COM do not interest me", "it is difficult to get hold of a terminal" and "I prefer oral communication". This result agrees well with investigations in other countries, which also indicate that the main factor determining whether a person selects to use and to continue to use a computer conferencing system or not is if they provide communication in areas of practical value to the user, and if this value is sufficiently large to overcome the difficulty of regularly connecting to the system, and if there are no other alternative better communication channels available.

The real value for a person in a system of this kind will of course depend on whether the person can communicate through COM with a sufficiently large number of other persons with whom the person has a need to communicate. How large this group is depends on how large the need to communicate is in the group. If this need is large, and if alternative satisfactory communication means are not available, then COM may work even for a person who only communicates in a small group of e.g. 5-10 people, but for persons who use COM mainly for exchange of experience, communication with at least 30 other people seem to be necessary before they feel that the value of using COM is larger than the trouble.

Note also that other communication channels are more difficult to use for communication in groups larger than a few persons. Meetings with more than 8 participants are difficult to arrange sufficiently often and also such meetings often are not very efficient for psychological reasons. Sending out a circular to many people is difficult and time consuming. Computerized conferencing on the other hand works efficiently even for fast interactions in groups of sizes from 20 to 100 persons.

The conclusion is that for computerized conferencing to succeed, a sufficiently large group of people must be found. This group should be people who have a genuine personally felt need to communicate and for which other suitable communication media are not satisfactory. Such a group has been easiest to collect among the computer users, and this is probably one main reason why so much of the COM usage is in the area of computer usage.

The most successful meetings *not* in the computer usage area are according to appendix F, "Using the Swedish Language", "Equality at work", "The AF Trade Union board", "Strange phenomena and their explanation" and "Risk estimation and evaluation".

This fact agrees well with the theory above. Four of these five meetings have very general subject areas of potential interest to many people. The exception is "The AF Trade Union board". This is the board of one of the trade unions at FOA. In this case, the need for contact in this trade union in an organization spread out in four different cities was obviously large enough for it to work efficiently even though the group size was only 19 persons.

8 Time delays measurements

8.1 Time before a letter is read

This table shows how long time it takes from the entering of a letter into COM until it is read by a letter receiver, based on statistics from 1982-02-01--1982-06-01. If a letter has more than one letter receiver, then the letter is counted once in the table for each letter receivers. Receivers who never read their mail is not included in the statistics.

Time from sending to receipt of a letter	Number of receivers in this time interval	Percentage of receivers in this time interval	Cumulative percentage of recei-vers
- 9 min	3109	14.0 %	14.0 %
10-19 min	1002	4.5 %	18.5 %
20-29 min	763	3.4 %	21.9 %
30-39 min	594	2.7 %	24.6 %
40-49 min	511	2.3 %	26.9 %
50-59 min	424	1.9 %	28.8 %
1h-2h	1879	8.5 %	37.3 %
2h-3h	1117	5.0 %	42.3 %
3h-4h	851	3.8 %	46.1 %
4h-5h	611	2.7 %	48.9 %
5h-6h	468	2.1 %	51.0 %
6h-7h	420	1.9 %	52.8 %
7h-8h	384	1.7 %	54.6 %
8h-9h	348	1.6 %	56.1 %
9h-10h	304	1.4 %	57.5 %
10h-11h	281	1.3 %	58.8 %
11h-12h	300	1.3 %	60.1 %
12h-15h	977	4.4 %	64.5 %
15h-24h	2862	12.9 %	77.4 %
24h-48h (1-2 days)	1764	7.9 %	85.3 %
48h-72h (2-3 days)	1006	4.5 %	89.9 %
72h-168h (3 days - 1 week)	1609	7.2 %	97.1 %
168h- (> 1 week)	647	2.9 %	100.0 %
Total	22231	100.0 %	

Median: 5.5 h. Lower quartile: 41.5 min. Upper quartile: 21.5 h.

8.2 Size and duration of comment chains

The statistics in this chapter is based on all comment chains whose first entry was written between 1982-02-01 and 1982-06-01.

An entry in COM often gets a reply or comment, and then there is a comment on the comment and so on causing a chain, or actually a tree structure of comments. The mean size and the mean time between the first and the last entry in such a tree is shown in this table. Note that also entries without comments, that is comment trees including only one entry, were included when computing this table.

Number of people who read the entries	Number of such trees	Mean tree size	Mean time from first to last entry in the tree
1	6219	2.1 entries	2.0 days
2	702	2.6 entries	2.1 days
3	128	2.7 entries	1.5 days
4	46	4.1 entries	2.7 days
5	20	5.9 entries	4.4 days

Partly conference entry	215	5.6 entries	13.6 days
Conference entry	3308	3.9 entries	4.5 days

This table shows the number of comment trees of different sizes for letters (column 2-4) and conference entries (column 5-7).

Number of texts in the comment tree	Comment trees with letters of this size			Comment trees with conference entries of this size		
	absolute	percent	cumulative	absolute	percent	cumulative
1	3079	43.3 %	43.3 %	1436	43.4 %	43.4 %
2	2206	31.0 %	74.3 %	633	19.1 %	62.5 %
3-4	1253	17.6 %	91.9 %	611	18.5 %	81.0 %
5-7	438	6.2 %	98.0 %	316	9.6 %	90.6 %
8-10	94	1.3 %	99.4 %	121	3.7 %	94.2 %
11-13	25	0.4 %	99.7 %	53	1.6 %	95.8 %
14-16	5	0.1 %	99.8 %	34	1.0 %	96.9 %
17-20	12	0.2 %	100.0 %	34	1.0 %	97.9 %
21-25	3	0.0 %	100.0 %	14	0.4 %	98.3 %
26-30	0	0.0 %	100.0 %	14	0.4 %	98.7 %
31-50	0	0.0 %	100.0 %	26	0.8 %	99.5 %
51-	0	0.0 %	100.0 %	16	0.5 %	100.0 %
Total	7115	100.0 %		3308	100.0 %	

	For letters	For conference entries
Median number of text items in a comment tree	2	2
Lower quartile	1	1
Upper quartile	3	4

Excluding entries without any comment on them (only including trees with more than one entry in them):

Median number of text items in a comment tree	2	3
Lower quartile	2	2
Upper quartile	3	5

Note: When comparing the cost efficiency of (a) ordinary telephone calls (b) computer mail and conference messages, the amount of interaction is important. A telephone call may be more efficient if many interactions are needed, but computer messaging may be more efficient if fewer interactions are needed. According to one estimate, when only two people are involved in a communication process, telephone calls will be more efficient than COM if more than four interactions are needed. It is therefore interesting to note that only 8.1 percent of the comment trees for letters in COM include more than four interactions. Some of these comment trees may include letters with more than one recipient, in which case COM

is more efficient than telephone calls even for much more than four interactions. The impression is thus that COM users intuitively tends to use COM for such communication where COM is the most efficient medium.

Note 2: The distinction between "letter" and "conference entry" is not sharp in COM, since the same entry can be sent to both a conference and a person. When the statistics in the table above were compiled, comment chains in which some entries were sent as mail, some as conference entries were not included. Trees where all or most entries were sent to a conference were counted as conference trees even if there was one or more people who also got the entries in the tree as letters.

The table below is similar to the previous table, but instead of showing the number of comment trees of different sizes, it shows the number of entries which are part of comment trees of different sizes.

Number of texts in the comment tree	Entries in trees with letters of this size: absolute	percent	cumulative	Entries in trees with conference entries of this size: absolute	percent	cumulative
1	3079	19.7 %	19.7 %	1436	11.2 %	11.2 %
2	4412	28.2 %	47.9 %	1266	9.9 %	21.0 %
3-4	4202	26.9 %	74.8 %	2068	16.1 %	37.2 %
5-7	2465	15.8 %	90.6 %	1839	14.3 %	51.5 %
8-10	824	5.3 %	95.8 %	1072	8.4 %	59.8 %
11-13	292	1.9 %	97.7 %	624	4.9 %	64.7 %
14-16	73	0.5 %	98.2 %	501	3.9 %	68.6 %
17-20	217	1.4 %	99.5 %	628	4.9 %	73.5 %
21-25	71	0.5 %	100.0 %	324	2.5 %	76.0 %
26-30	0	0.0 %	100.0 %	389	3.0 %	79.0 %
31-50	0	0.0 %	100.0 %	963	7.5 %	86.5 %
51-	0	0.0 %	100.0 %	1728	13.5 %	100.0 %
Total	15635	100.0 %		12838	100.0 %	

	For letters	For conference entries
Median size of the tree to which an entry belongs	3	7
Lower quartile	2	2
Upper quartile	5	22

Excluding entries without any comment on them (only including trees with more than one entry in them):

Median size of the tree

to which an entry belongs	3	9
Lower quartile	2	3
Upper quartile	6	28

The statistics below is based only on comment trees with at least two entries. For comment trees with one entry, the time difference between the first and the last entry would of course always be zero.

This table shows the time difference between the entering of the first and the last entry in a comment tree, letters in column 2-4 and conference entries in column 5-7.

Time from first to last entry in tree	Entries in trees with letters in interval			Entries in trees with conference entries in this interval		
	absolute	percent	cumulative	absolute	percent	cumulative
0-9 min	317	7.9 %	7.9 %	55	2.9 %	2.9 %
10-19 min	176	4.4 %	12.2 %	52	2.8 %	5.7 %
20-29 min	126	3.1 %	15.3 %	40	2.1 %	7.9 %
30-39 min	101	2.5 %	17.8 %	34	1.8 %	9.7 %
40-49 min	79	2.0 %	19.8 %	25	1.3 %	11.0 %
50-59 min	69	1.7 %	21.5 %	21	1.1 %	12.1 %
1-2 h	312	7.7 %	29.2 %	110	5.9 %	18.0 %
2-3 h	204	5.1 %	34.3 %	72	3.8 %	21.8 %
3-4 h	161	4.0 %	38.3 %	59	3.2 %	25.0 %
4-5 h	106	2.6 %	40.9 %	50	2.7 %	27.7 %
5-6 h	92	2.3 %	43.2 %	40	2.1 %	29.8 %
6-12 h	235	5.8 %	49.0 %	109	5.8 %	35.6 %
12-24 h	702	17.4 %	66.4 %	287	15.3 %	51.0 %
1-2 days	429	10.6 %	77.0 %	229	12.2 %	63.2 %
2-3 days	246	6.1 %	83.1 %	135	7.2 %	70.4 %
3-4 days	168	4.2 %	87.3 %	102	5.4 %	75.9 %
4-5 days	96	2.4 %	89.7 %	74	4.0 %	79.8 %
5-6 days	94	2.3 %	92.0 %	53	2.8 %	82.6 %
6-7 days	60	1.5 %	93.5 %	43	2.3 %	84.9 %
1-2 weeks	160	4.0 %	97.4 %	132	7.1 %	92.0 %
2-3 weeks	34	0.8 %	98.3 %	44	2.4 %	94.3 %
3-4 weeks	20	0.5 %	98.8 %	20	1.1 %	95.4 %
> 4 weeks	49	1.2 %	100.0 %	86	4.6 %	100.0 %
Total	4036	100.0 %		1872	100.0 %	

	For letters	For conference entries
Median	13 hours	23 hours
Lower quartile	1.5 hours	4 hours
Upper quartile	2 days	4 days

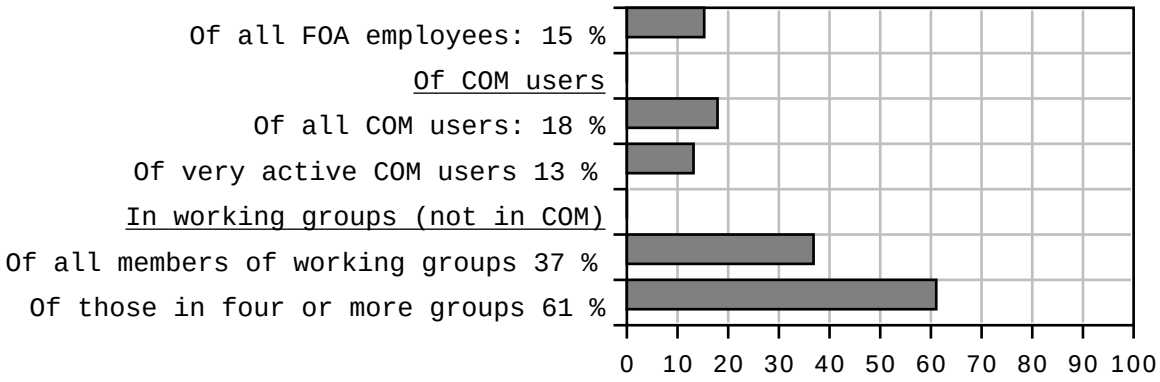
9 Which people use COM?

About 70 % of all COM users on the ODEN computer were, in the year 1980 FOA employees. The rest are mainly employees at universities, public research institutes or the Swedish defense.

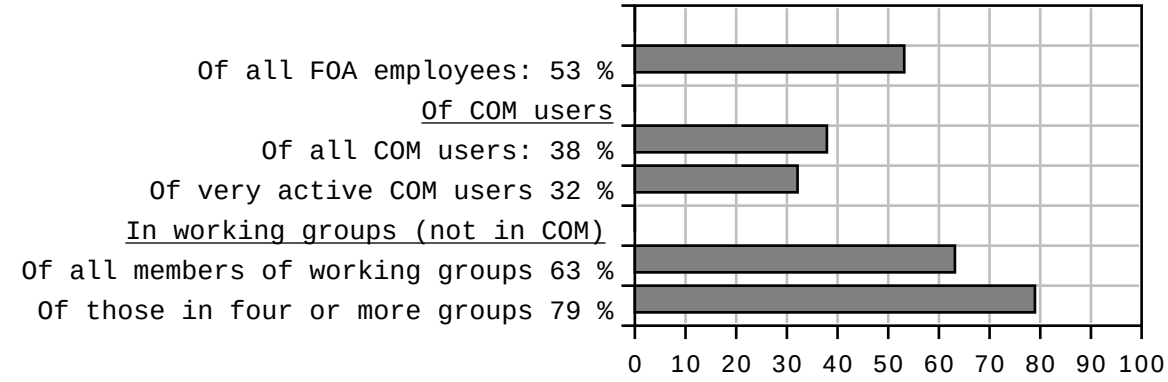
The diagrams below are based only on FOA employees. COM usage statistics are based on those who have used COM more than 20 times between August 1979 and July 1980. Comparison is made with members of working groups within FOA, because these groups are a main form for communication across organizational borders which can be compared with the COM usage.

See further appendix B.

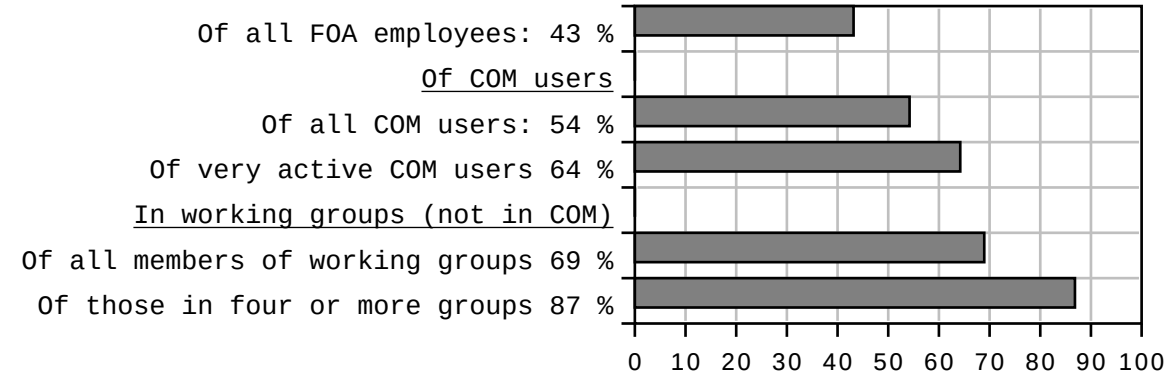
Percentage of persons who are managers in different groups



Percentage of people above 40 years of age in different groups



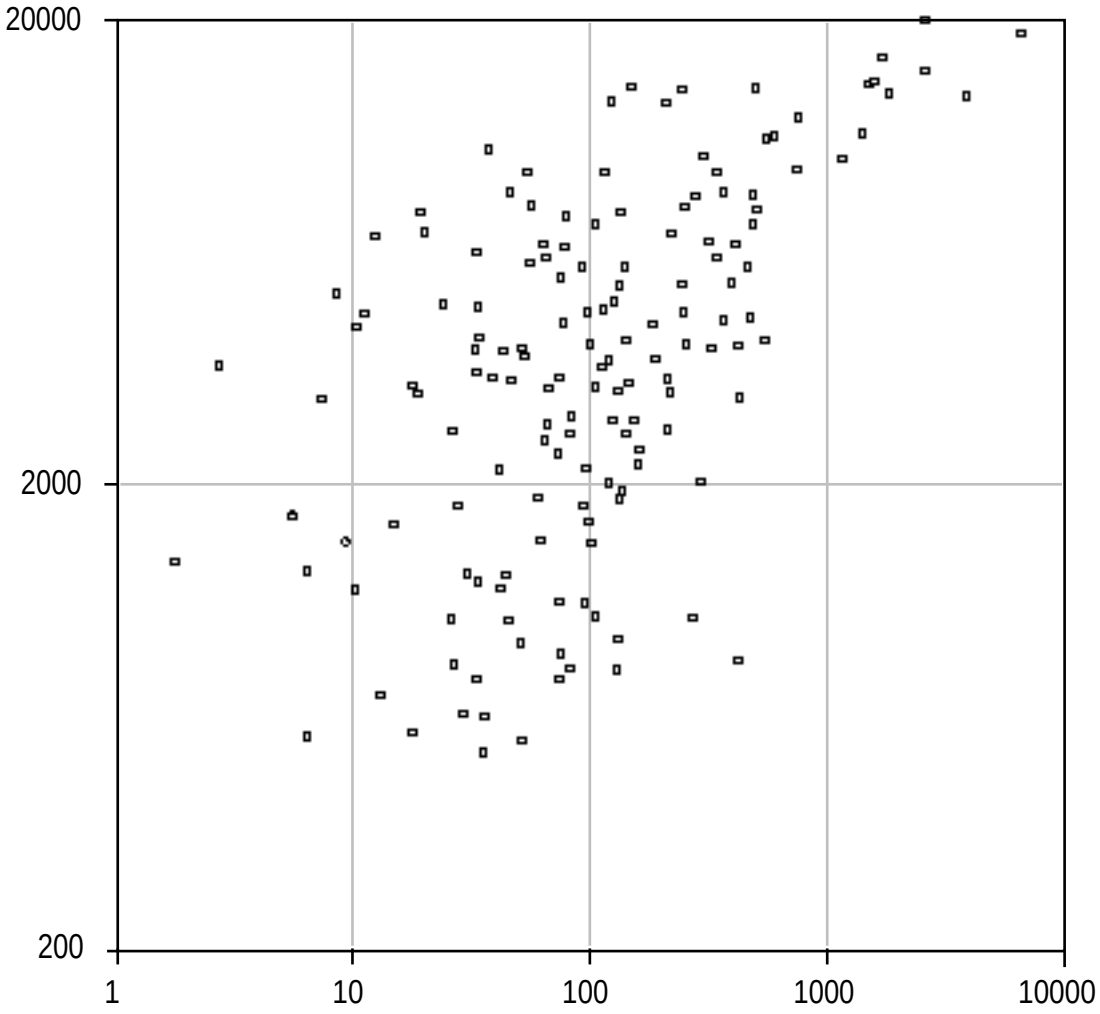
Percentage of people with university education in different groups



If you compare with the situation before COM was introduced (when the working groups were the principal form of group communication across department borders within FOA) then COM has increased the possibility to communicate for young people who are not managers and for people without university education.

FOA has only to a very limited extent acquired special terminals

for COM usage. COM is therefore mostly used by those employees, who for other reasons have access to a terminal. This is one reason why university graduates, who use computers as research tools, are overrepresented among the COM users.



Every mark in the picture above represents one person who has read more than 500 messages in COM from August 1979 to May 1980. Even if the write and the read activity varies much among the COM users, the results do not indicate that the COM users can be partitioned into an active writing part and a passive reading part.

The activity varies much between different COM users. The 50 % most active COM users represent 78 % of all sessions with COM. Also the proportion between written and read messages varies, so that some people write more in proportion to what they read than others. There are however few "pure readers" in COM, the percentage who

write messages in less than 5 % of all sessions with COM, is 6 % for those who have used COM 20-99 times, and 1.5 % for those who have used COM a hundred times or more.

Is everything in COM written by a few active participants?

To investigate whether this statement is true or not, an investigation was made on all messages (both letters and conference entries) written in COM in the period 80-11-01 to 81-04-11 by persons who were in the COM data base at the end of the period.

The statistics do not include messages transferred automatically from other computers.

Number of People	Percentage of written messages	Number of People	Percentage of written messages
10	39.6	130	88.8
20	54.1	140	89.9
30	61.6	150	91.0
40	67.5	160	92.0
50	71.9	170	92.9
60	75.5	180	93.6
70	78.0	190	94.3
80	80.6	200	94.9
90	82.7	210	95.4
100	84.4	220	95.9
110	86.0	230	96.3
120	87.5	240	96.7

In total, 660 persons had used COM some time and were still kept in the COM data base. Of these 660 persons, 480 persons had written at least one message. Note however, that many of the 660 persons were people who had tried COM once or twice in a demonstration. The number of regular users who come back every week or so was only about 250.

The above statistics show that certainly some people write a lot. The result could be summarized to say that (defining an active COM user as a person who uses the system at least twice a month):

Percentage of active COM users	Have written this percentage of messages
8 %	50 %
25 %	75 %
63 %	90 %

10 At what time is COM used?

The object of this study is to investigate at what time of day, that the COM system is used. The COM data base does not contain the times when users enter the system. The COM data base does however contain the date and time when:

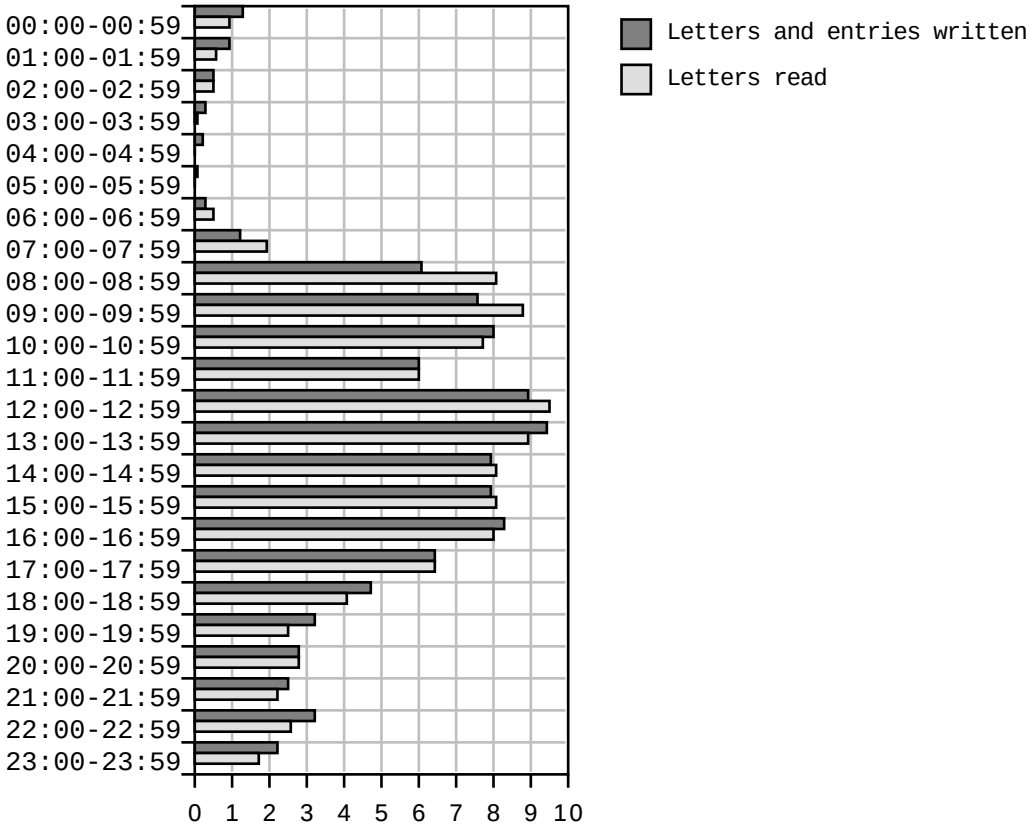
a) A letter or a conference entry is written
b) A letter is read (but not when a conference entry is read)

These dates and times will here be used as approximations of the time when COM is used. The result is based on everything written in COM during the four-month period 1982-03-01--1982-06-30. Texts which were written into COM by transfer programs which automatically transfer texts from other computer conference systems are not included in the statistics on writing times, since the COM data base notes the time when such texts are entered into the COM data base, not the time when they were actually originally written. Texts written by computer programs and not by humans are also not included - such texts are too a large extent written during the night, since the computer is used more by terminal users during the night and more by batch programs during the night. And some batch programs report their results by writing COM entries. Thus, the number of entries written during the night would be higher if texts written by computer programs were included.

COM has both a Swedish-language and an English-language data base. Only the Swedish-language data base was used for the statistics reported here, which means that there will be little interference from people using COM from other time zones. In the English-language COM system, some entries are written in the middle of the night, Western European time, by people in America.

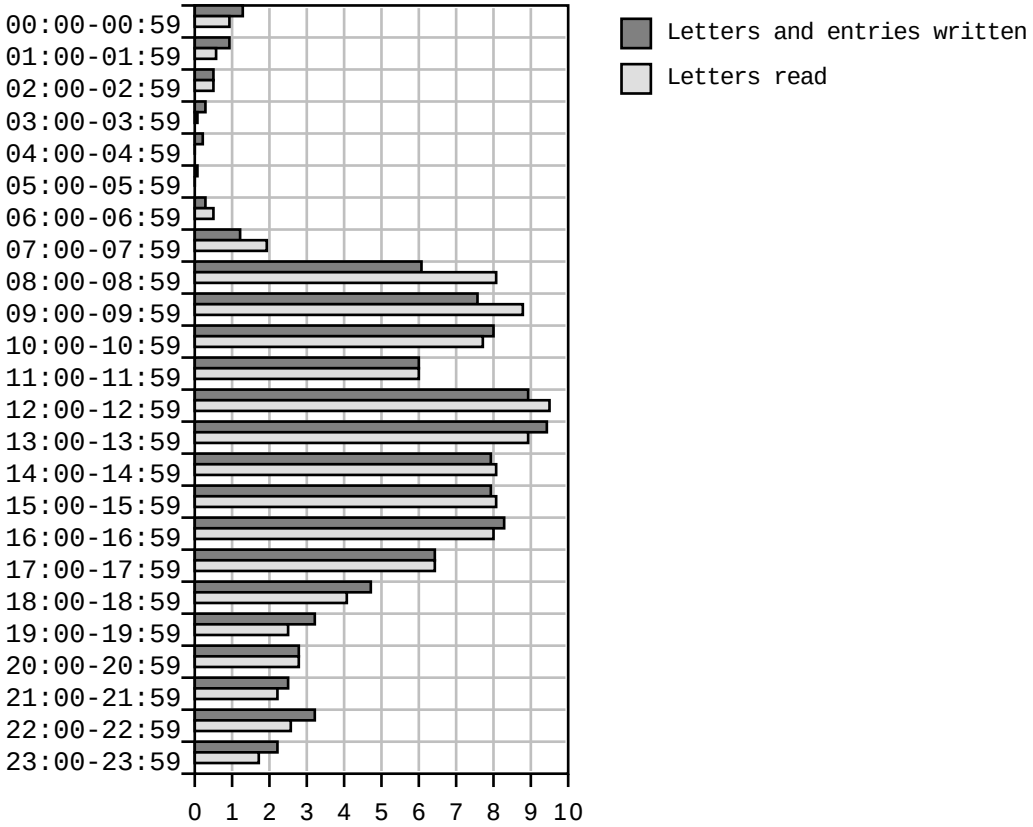
Note: In 1983, QZ opened COM up for usage by hobby computer users for a special low price after 20:00 hours in the evenings and on Saturdays and Sundays. This has probably meant an increase in COM usage at those periods of time. The statistics in this chapter was however collected before this special price was introduced.

COM usage on work days:



Note: By work day is meant monday to friday except holidays.
The diagram is based on statistics from 25118 written texts
and 20249 read letters.

COM usage on weekends and holidays:



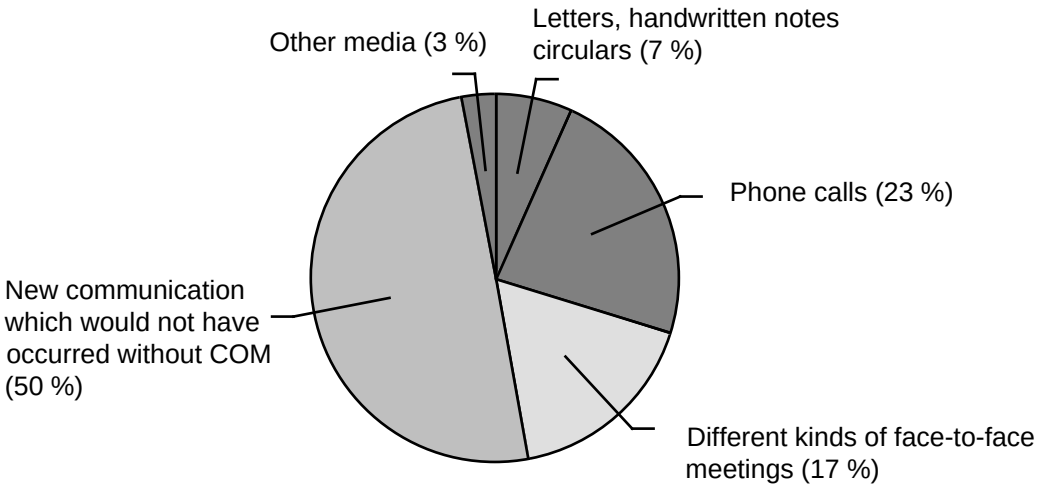
The diagram is based on 3338 written texts and 1904 read letters.

Summary in main categories:	Written texts	Letter readings
Work days during office hours between 08:00 and 16:59	17614 = 61.9 %	14814 = 66.9 %
Work days outside office hours	7504 = 26.4 %	5435 = 24.5 %
Weekends and holidays	3338 = 11.7 %	1904 = 8.6 %
Total	28456 100.0 %	22153 100.0 %

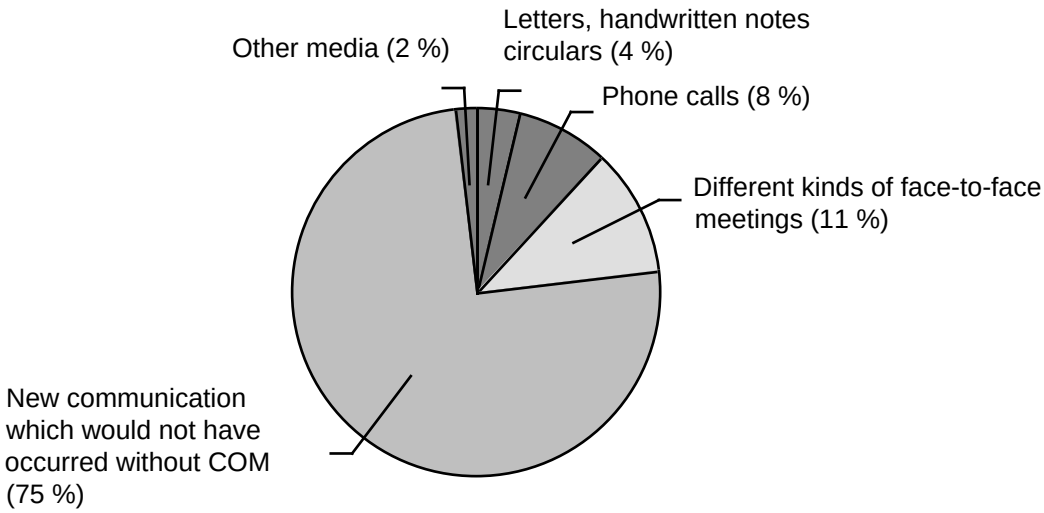
The reason why letters are more often read during office hours is that COM users normally read letters as soon as the letters arrive, and most letters arrive during office hours. Writing of text is not so much controlled by the information you get. Probably the reading of conference entries, which we do not have statistics for, would be a little more common outside office hours than the reading of letters.

11 Does COM replace other media?

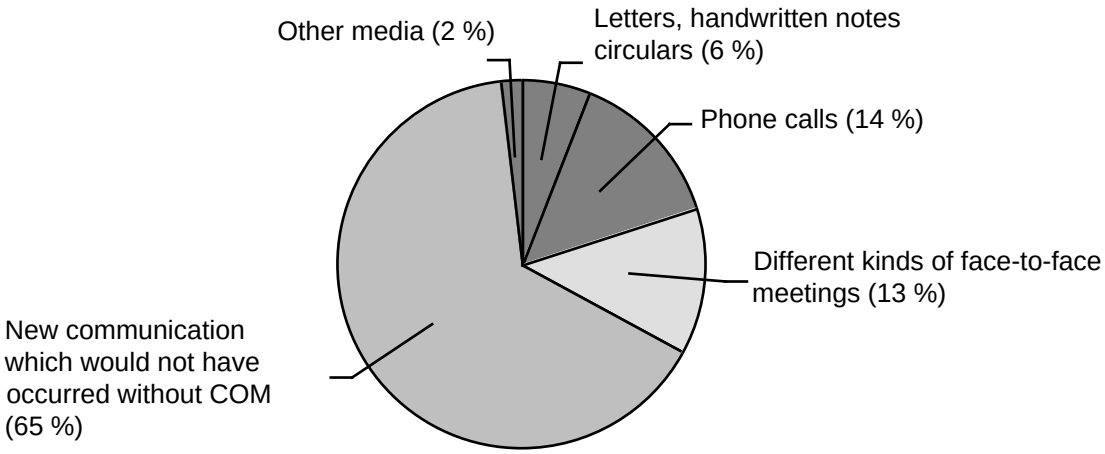
According to an inquiry made to the writers of a random sample of messages in COM in May-June 1980, COM replaces other media according to the following table. Note that the question here was which other medium would have been used instead of COM to perform the communication done in COM.



The figure above shows the percentage of written messages which replaced and did not replace other media.



The figure above shows the perecentage of read messages which replaced and did not replace other media.



The figure above shows the percentage of the time spent using COM which replaced and did not replace other media.

Comment: Important to note is that COM to a large extent does not replace other communication media. Instead, COM represents new communication which would not have been feasible without COM. COM has thus not only or mainly meant the transfer of communication to a new medium. COM has also meant a change in whom people communicate with, probably also in what they communicate with these people about.

Some understanding of what the new kind of communication is can be gained from the following chapters.

Another investigation with a similar question asked instead what people believed they had done previously on the time now spent in COM. Thus, this question studies how people spend their time before and after COM, not, as the previous question, what medium they would have used for communication if they could not use COM.

(Methodology described in appendix L.)

Here is a table of which activities COM users claim that COM usage replaces:

23.2 % Telephoning	2.1 % Leisure
12.1 % Letters, circulars, messages	2.0 % Newspapers
7.5 % Dead time	1.4 % Eating
6.2 % Computer programming	1.4 % "Don't know"
5.4 % "Other work" (not specified)	1.4 % Planning
5.4 % Committee, conference	1.1 % Breaks
4.7 % Nothing	0.7 % Small talk
4.3 % Television	0.5 % Technical development
4.2 % Research	0.5 % Radio listening
3.7 % Face-to-face talks	0.5 % Physical exercise
3.3 % Journals	0.4 % Travel
2.7 % Books	0.2 % Friends
2.5 % Hobbies	0.2 % Family
2.4 % Sleeping	100.0 Total

Here is the same result grouped into fewer larger categories:

23.2 %	Telephoning
12.1 %	Letters, circulars, messages
10.9 %	Computer programming, research, technical development
9.3 %	Leisure, sleep, eating, hobbies, family, friends, exercise
8.0 %	Books, papers and journals
7.5 %	Dead time
5.4 %	"Other work" (not specified)
5.4 %	Committee and conference meetings
4.8 %	Television and radio
4.7 %	Nothing
3.7 %	Face-to-face talks
1.8 %	Breaks, small talk
1.4 %	"Don't know"
1.4 %	Planning
0.4 %	Travel
100.0 %	Total

Comment: Interesting to note is that although this kind of system is usually called "Computer conference system" or "Electronic mail system" only 5 % replaces conferences and 12 % replaces mail. Instead, COM also replaces a number of other activities. Notable is telephone with 23 %, mass media 13 % and non-work 9 %.

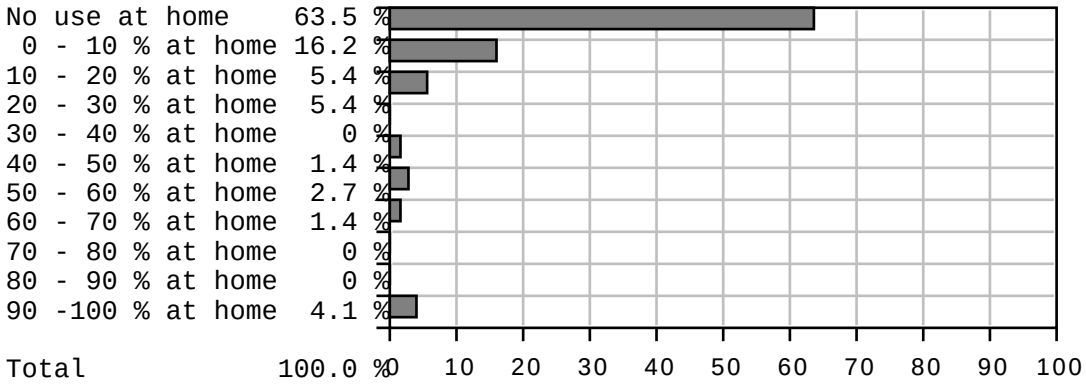
To what extent does COM replace face-to-face meetings? 10.2 % of the time replaces activities which clearly are face-to-face meetings in the list above. Another 4.6 % replaces activities which may or may not contain face-to-face meetings, like "breaks" or "eating". We can thus from this investigation only say that between 10 and 15 % of the time in COM replaces face-to-face meetings.

12 Is COM used from home terminals

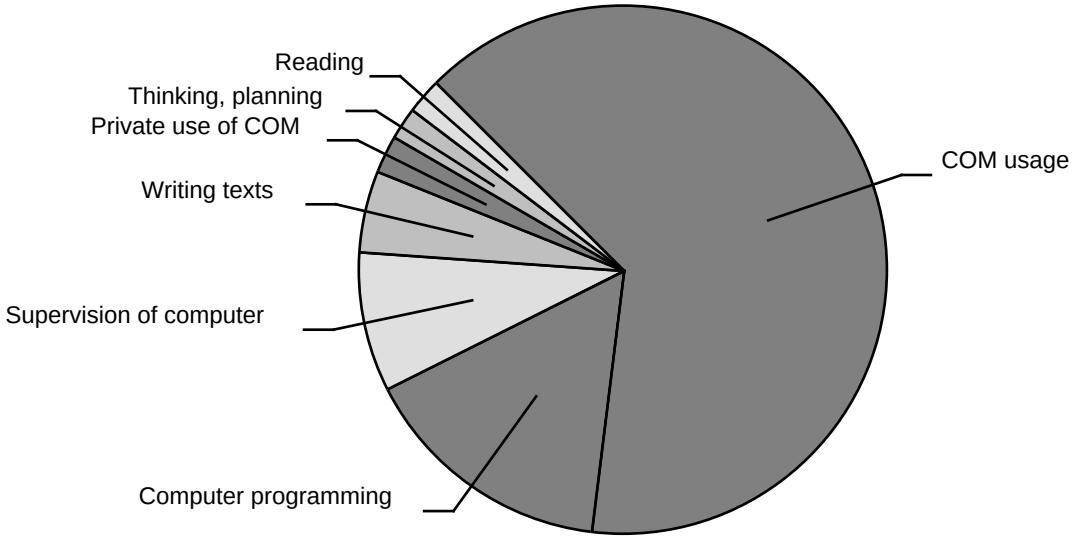
The results below are from an investigation made in May 1982 (see also Appendix L).

31 of 85 persons, or 36 %, had used COM at home some time. Many of them had however only used COM at home very little, e.g. taking a terminal to home once or twice to show the system to friends or something similar. Only 20 % of the respondents did more than 10 % of their COM usage at home. Of those who had used COM at all at home, 24 % of their COM usage was at home and 76 % at work. Of all COM usage, only 9 % is done from the home, and 91 % is done at work.

The distribution of COM usage at home and work is shown below:



The question about what kind of work was done at home was answered by 24 of the 36 persons who had used COM at home. The distribution of work tasks at home for these 24 persons were:

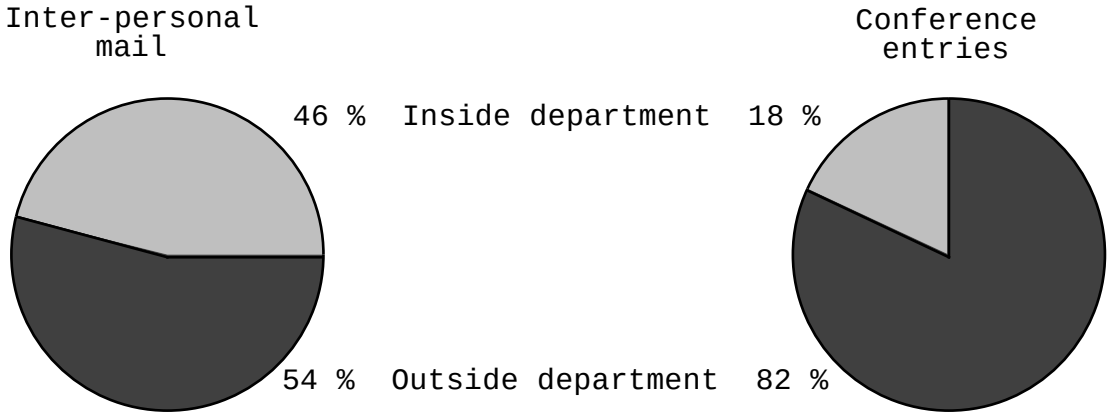


13 Organizational distance between users

FOA is organized into five main departments plus an administrative office. Every main department is organized into a number of institutions, and every institution is organized into sections. To investigate the organizational distance, we studied how large a percentage of the contacts through COM goes between people in the same main department, between people in different main departments and between people inside and outside FOA in April 1980. The result is shown in the following table (more information in Appendix D):

	Letters	Conf. entries	All messages
Within one FOA main department	46 %	18 %	21 %
Between FOA main departments	14 %	29 %	28 %

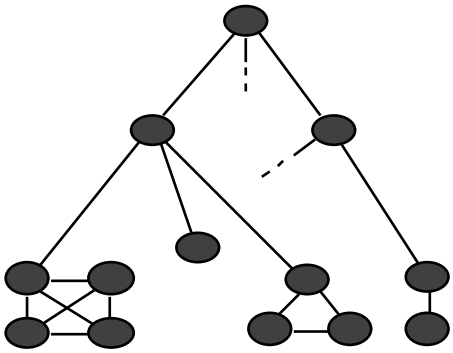
Between people in and outside FOA	31 %	40 %	39 %
Both reader and writer outside FOA	9 %	13 %	13 %
Total	100 %	100 %	100 %



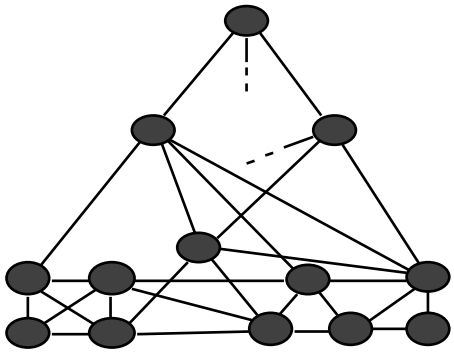
Note the large difference between letters and conference entries. Letters go to a much larger extent between people at a low organizational distance, while conference entries to a much larger extent go between main departments or between FOA employees and the external world.

The difference between a letter and a conference entry is that when you write a letter, you tell the computer explicitly the names of the people to which the letter is to be sent. For conference entries you choose receivers for your entry by indicating a subject (= the title of the conference) and the message will then be sent to all people who have indicated interest in this subject (by becoming members in the conference). It is then easy to understand that conference entries to a larger extent reach people who do not know the writer personally.

You can thus say that a communication system based on letters to receivers named by the writer of the letter will get much communication within small groups of people who know each other well, while computerized conference systems of the COM type will cause more contacts between people at a larger organizational distance.



CLOSED GROUPS



OPEN CONTACT PATTERN

The figure above shows the type of contacts which occur, to the left inside small closed groups and to the right also at larger organizational distance within the organization.

A common observation among COM users is that they have become less isolated, less dependent on small, closed groups. Organizational sociologists claim that organizations where most of the contacts are in small, closed groups tend to be more conservative and find it more difficult to develop and accept changes than organizations with good contacts at larger distances. Allen 1977 finds for example that consultants with more external contacts produce more successful results. COM has had this effect of increasing the amount of contacts at larger organizational distances.

14 Cost of using COM

14.1 Cost per user hour

When comparing the cost with other media, it is easiest first to compute the cost per hour that one person sits in front of one terminal connected to the COM system. The costs below include all costs except wages for the person sitting in front of the terminal using COM. The costs are the costs to FOA, because of the tariff structure of the computing centre the costs are higher for external users. Costs are given in Swedish Kronor at the 1980 price level. To convert to U.S. dollars, divide by 5, to convert to U.K. pounds, divide by 10.

	Basic cost (a)	Marginal cost (b)
Computer time for interactive COM usage	32.70 kr	27.79 kr
Computer time for printouts etc.	0.83 kr	0.70 kr
Disk area with the COM data base	1.95 kr	1.65 kr
Terminal, connection,		

computer terminal port	5.49 kr	5.49 kr
Printing terminal	1.11 kr	0.60 kr
Computer network costs	7.70 kr	0.00 kr
Computer time for program development	2.69 kr	1.40 kr
Personnel time for program development	14.20 kr	14.20 kr
User education	2.80 kr	1.40 kr
Total cost	about 70 kr	about 53 kr

(a) This "basic cost" only includes the additional costs to FOA because of using the COM system. However, half the cost of a computer network between FOA departments in different cities is also included, even though this network would probably be kept for other applications even if COM was not available.

(b) This "marginal cost" is the additional cost if FOA increases the usage of COM beyond the present level.

14.2 Time for using COM

Since the wages of the people communicating is often the largest cost, cost/effectiveness estimates will very much depend on the time for a communication process using different media. Unfortunately, this time is difficult to measure, especially if you want to measure not only the time per word but the time for producing a certain result.

To measure the time for using COM we modified the COM system so that it stored the times for performing different commands in a file during a five day period in the beginning of September 1980 (Appendix G).

We found that the COM user time at the terminal is distributed in the following ways on different activities:

Activity	Percent	Group of activity
Reading new entries	53 %	
Reviewing previously seen entries	6 %	61 % reading
Administration of reading	2 %	
Writing of entries	27 %	27 % writing
Table printouts	5 %	
Miscellaneous	8 %	
Total	100 %	100 % total

When using these results, the following simplifying assumptions are made:

- We do not subtract the time when a COM user is sitting in front of

a terminal connected to COM, but is actually doing something else, like talking over the telephone. This approximation means that we overestimate the time for using COM by not more than about 15 %.

- We do not consider that actions like taking out table printouts from COM, reviewing old messages etc, have any value of their own. All the time spent on such activities is thus added as an overhead on the time for writing and reading messages. This approximation means that we overestimate the time for using COM by not more than about 18 %.

- We do not include in the time for COM usage the time when a person reads COM messages printed on paper without being connected to the computer. This approximation means that we underestimate the time for using COM by not more than half a percent.

- We do not include the time when a COM user uses a separate text editor to edit messages which are later entered into COM. This approximation means that we underestimate the time for using COM by not more than half a percent.

With these simplifying assumptions we find that a mean message in COM (with a mean length of 292 characters or 50 words), takes 266.9 seconds to write and 28.4 seconds to read (for each reader).

The time per communicated word through COM is thus 5.38 seconds for writing the word and 0.57 seconds to read it (for each reader).

Note that this is the time per new word communicated from the author to the reader (not the time per word communicated between the computer and the computer user, the latter time is much smaller).

14.3 Cost comparisons with other media

If you use the cost of 70 kr/user hour (see chapter 14.1 above) for the COM system and 85 kr/user hour for the salary of the COM user (this was the mean salary in 1980 for a FOA employee including social costs.) you get the following results (divide by five to get costs in U.S. dollars, by ten to get costs in U.K. pounds):

	COM, terminal, network, computer	Salary of the COM user at his terminal
Cost for one person using COM for one hour at a terminal	about 70 kr	about 85 kr
Cost to read a COM message (mean time = 28.4 seconds)	about 0.55 kr	about 0.67 kr
Cost to write a COM message (mean time = 266.9 seconds)	about 5.20 kr	about 6.30 kr
Total cost for a mean COM message for all 19.18 readers.	about 16 kr	about 19 kr
Total cost per reader for such a mean message	about 0.82 kr	about 0.99 kr

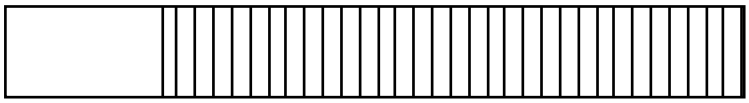
Cost for a message with only one reader, including time for both the writer and the reader (mean writing time = 255 seconds, mean read time about 52 seconds)	about 6 kr	about 7 kr

As is shown in the investigation in chapter 11 above, more than half of the COM usage is new communication, which would not have taken place if COM had not existed. Part of the COM usage is however a replacement for letters, telephone calls and face-to-face meetings. Even that COM usage which is not a replacement for other communication can of course be compared with the cost which would have occurred if this communication had taken place using other media. See also appendix J.

Cost comparison with face-to-face meetings

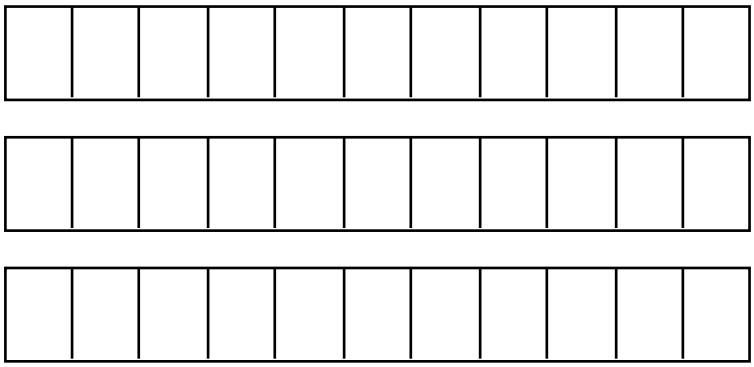
Group size 33 participants (= average COM conference):

Conference system: Long writing time but short reading time:



Writing Reading
3.6 min. 32 times 0.47 = 15.0 min.

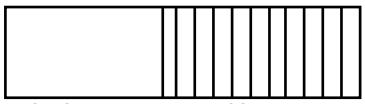
Face-to-face meeting: Shorter speaking time but longer listening time:



Speaking and listening: 33 times 1.7 = 56 minutes

Group size 12 participants (= large face-to-face meeting):

Conference system: Longer writing time but shorter reading time



Writing Reading Total time
3.6 min. 11 times 0.47 = 5.2 minutes. 3.6 + 5.2 = 8.8 minutes.

Ordinary meeting: You talk faster than you write, but you listen slower than you read:

Total time for talking and listening: 12 times 1.7 = 20.4 minutes.

Travel costs and computer costs are not included in the comparison shown in the figures above.

Comparing with *face-to-face meetings* (and with the reservation that COM is not always suitable as a replacement for face-to-face meetings), it seems as if the result of the cost/effectiveness estimate will depend on the number of participants in the meeting, on how many of these have travel times and travel costs and on how

large the need for communication is within a single group.

Since the time to write a word in COM is about 10 times as long as the time to read a word, while at an ordinary meeting, the time to talk and to listen to a word is the same, the effectiveness of COM as compared to face-to-face meetings will increase with more people participating in the meeting (See Hiltz/Turoff 1978 page 410ff). An exact estimate is difficult to make since more words are used to convey the same amount of information in vocal as in written communication (two to three times more words according to Hiltz 1980).

The reason why the reading time is shorter in the conference system is not only because people read faster than they listen, but also because a conference system allows every participant to decide how much time to spend on each message. You can read carefully items of importance and skip items with information you already know or which is of no interest to you.

This difference is not only an efficiency factor. It is also important psychologically. With twelve participants, as in the example above, every person uses about a third of his/her time giving information and about two thirds of the time receiving information, in the computer conference system. In an ordinary face-to-face meeting, they would on average talk 8 % of the time and listen 92 % of the time. Communication works psychologically better with computer conferencing, because you are not forced to be a passive listener as much as in face-to-face meetings. This also means that computer conferences can work well even in group sizes of 30-100 people which would be very difficult to manage in face-to-face meetings.

This fact is also one reason why people who regularly use computer conferencing systems feel that a whole new vista of contacts and communication has been opened for them. Group communication in large groups was simply not psychologically possible for them before, at least not so much in so little time as with computer conferencing.

The marginal cost of letting one person more take part in the communication is much lower with computer conferencing than with face-to-face meetings. This makes it economically possible to have larger group sizes, which means that more people can contribute with ideas and thus improves the quality of the result.

It does however seem as if *COM is more effective than face-to-face meetings* if *at least one* of the following three conditions are fulfilled:

a) The number of people who participate in and benefit from the communication is larger than 15. (The mean number of readers of a mean conference entry in COM is about 32).

b) At least two of the participants had to travel from another city, or a conference telephone connecting more than three different cities was used.

c) The group had a need for sporadic contacts, not really enough

to require regular face-to-face meetings, and most of the group participants take part in several different COM meetings.

With the same reservation, it does seem as if *face-to-face meetings are more cost effective than COM* if *all* the following three conditions are fulfilled:

a) The number of participants is less than 5.

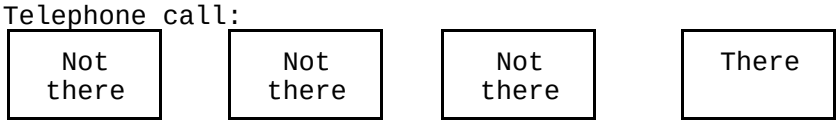
b) No participant had to travel from another city.

c) The meeting had productive matters to discuss for two hours or more.

Between the above conditions for COM to be more cost effective than face-to-face meetings, and for face-to-face meetings to be more cost effective than COM, there is a wide area where we do not know for sure which medium is most cost effective.

Cost comparison with a telephone call

Telephone call:



2.6 + 1.0 min. | 2.6 + 1.0 min. | 2.6 + 1.0 min. | 5.5 + 1.0 + 4.5 min.

Total: 22 minutes.

Conference system:

Writing 4.2 min. Reading 0.5 min.

Total: 4.7 minutes.

Notes:

(a) Several messages in a conference system are often necessary to replace one telephone call.

(b) If more than two people are involved in the communication, the time cost for telephone increases much more than the time cost for the conference system.

If you compare with *telephone calls* (data from appendix H), then the cost for such a call (including several unsuccessful calls, according to Uhlig 1979, only 28 % of all call-ups get you into contact with the person you are seeking), including the working time for the person involved, the cost for telephone exchange operators and for the telephone call itself, a mean telephone call lasting 4.5 minutes costs about 30 kr for a local call and about 35 kr for an interurban call in Sweden.

The cost of a mean message in COM with only one receiver, measured in the same way (Cost for computer, terminal, COM usage etc. plus working time for involved people) is about 13 kr. When comparing these figures, note that one telephone call can often accomplish a communication corresponding to several COM messages. What is most effective will thus depend on whether the communication can be accomplished with three or less COM messages. Thus, short simple messages are more effective in COM while more complex interaction requiring direct contact between the two people will be more effective using the telephone. Note that this cost comparison is for communication between just two people. If three people are involved, requiring two successive telephone calls, then the telephone cost will double while the COM cost will only increase marginally (from about 13 to about 14 kr). A three-people simultaneous telephone connection is even more costly and also even more costly in time to arrange.

If you compare COM with *letters, messages written on paper and circulars*, then COM is cheaper, especially for rather short messages and when there is more than one receiver of the message. A letter in COM with one receiver (including the wage cost for both writer and reader) costs about 13 kr, while a typical ordinary letter according to Uhlig 1979 takes about 53 minutes to produce, which represents a cost of about 75 kr.

The fact that it is so simple and cheap to send information copies of letters in COM to other people than the main receiver of the message means that this facility is used very much. The mean number of readers of a letter in COM is not 1 but 1.9 people.

A circular with 16 receivers will probably cost more than a hundred kronor in working time for production, copying, mailing etc. while the corresponding cost in COM is about 21 kr (including wages for the sender but not wages for the reader of the message). However, several COM messages are probably often used to convey information which would have been combined in one longer circular.

The least saving occurs when comparing COM with short handwritten messages, but even in that case, COM does not seem to be more expensive than mail. COM is however several times faster, and this will of course also represent a value.

14.4 Cost estimate of a COM conference

This comparison can be seen as a practical example to illustrate in more detail the cost comparisons in the previous chapter and in appendix J.

To study the cost of COM as compared to face-to-face meetings, one conference in COM was randomly selected. This comparison is somewhat artificial, since the same kind of communication would surely not at all have occured without COM. The costs are in the 1982 price level and in Swedish Kronor (SEK). One SEK was approximately 0.17 US dollars when this was written (august 1982).

The members of the selected conference were geographically distri-

buted according to the following table:

Place	Number of members
Stockholm	21
Linköping	6
Uppsala	5
Oslo	1
Lund	1

This includes all members of the conference except 4 people who were members but had more than 10 unread notices, and three apprentices. Note: The entries in this conference were also transferred automatically to another computer, but the people participating remotely through the COM system at that computer are not included in the evaluation below.

In this conference 268 entries were written from 1982-02-08 to 1982-06-30, a period of 142 days. The mean number of entries per day is thus 1.89. The time to say in a face-to-face meeting the same things which are written in an average COM entry is very approximately 1.7 minutes. One face-to-face meeting every second month lasting 103 minutes each time might thus provide the same communication as this COM conference. However, to be able to communicate only once every second month is not comparable to the many times faster communication in COM. A fair comparison would be to compare COM with a face-to-face meeting once a week or more often, but then the length of this face-to-face meeting would only be 12 minutes, and it is not reasonable for so many people to gather at one place for a 12-minute face-to-face meeting!

The cost of COM usage is also not easy to calculate, because this depends so much on the existing technical infra structure in the organization using COM. If COM can share an existing technical

infra structure with other computer applications, the COM cost will be much lower than if COM is introduced in an organization without any such technical infra structure. Thus, the COM cost for the Swedish National Defense Research Institute has been estimated to 80 SEK/hour of COM usage, while the cost for an organization without all technical infra structure may be twice as much or even more if the organization will use COM very little.

	Cost of COM conference		Cost of face-to-face meetings	
	When COM can share costs with other applications	If COM cannot share such costs	Meeting once a month	Meeting once every second month
COM cost/hour for one user (including computer time, terminal, network cost etc.)	80 SEK	160 SEK		

Travel cost/ meeting, ticket and per diem			2841 SEK	2841 SEK
Total technical costs/month	2720 SEK	5440 SEK	2841 SEK	1421 SEK
	User time for COM usage one person one month in this conference:		User time per month for one member in face-to-face meetings.	
	Writing entries 6.08 min Reading entries 26.57 min Total time 32.65 min		During meeting: 51.5 min	51.5 min
			Travel time: 245.3 min	122.6 min
Total for all 34 participants	18.5 hours		168.2 h	98.7 h
Cost of this time assuming a per-sonell cost of 100 SEK/hour (1)	1850 SEK	1850 SEK	16820 SEK	9870 SEK
Total of perso-nell and techni-cal cost (sum of underlined items above)	4570 SEK	7290 SEK	19661 SEK	11291 SEK

(1) Note: According to Swedish government rules, a much lower pay of only 22 SEK/hour was assumed for travel time when travelling outside normal office hours.

15 Personal information in the COM system

The Swedish Data Act, which controls the storage of information about individual persons in computers, has created interest in the existence of such information in COM (see chapter 3 above). Such personal information could be misused, e.g. by making improper collections of personal information, even though such improper collections are easier to make from a systematic data base than from personal information which spuriously occurs in ordinary text.

An investigation of the occurrence of such individual personal information in COM in May 1980 is reported here. The results are presented in more detail in Appendix A.

The study was based on a random sample of COM conference entries. 157 entries from open conferences were randomly sampled. Another 57 entries from closed conferences were randomly sampled but only from those conferences where I was a member (since I am not entitled to read in other closed conferences). The total sample is thus 214 COM conference entries.

131 of these 214 entries, or 61 %, contained some personal information. The total number of personal information items was 174, since some entries contained more than one such item. The concept "personal information item" was interpreted in a wide sense. Not only "My opinion is ..." but also "It would be better if ..." was interpreted as personal information (about the opinions of the writer). The borderline is still not sharp. If someone writes "I have modified X", then this was counted as personal information, while the line "X has been modified" was not interpreted as personal information, even though the reader in most cases would understand who had made this modification.

About whom is information given?

Percentage	Category
63 %	Information about the writer of the message him/herself
17 %	Information about someone else who is a member of the same COM conference or will in some other way read the information him/herself in COM
1 %	Information about another COM user, who is however not a member of this COM conference and will thus not read the entry.
16 %	Information in minutes from face-to-face meetings about a person who does not use COM, but who will get the minutes sent to him/her and thus read the information
3 %	Other information about people not using COM
100 %	Total

Thus only 4 % of all personal information items in COM would not be read by the person, about whom the information was given.

Role classification

Percentage	Role
34 %	Work tasks (Example: "N.N. was present at the meeting", "I have been using encryption", "I read in the news-paper about", "I can call and ask them for the cost of the transports".)
16 %	Wishes, demands (Example: "How can I split a line into two using VIDED", "I do not believe any more bugs will occur, but please report immediately if there are any", "Mr. Grange inquired about security in the system").
2 %	Nominations (Example: "Bengt Olsen was appointed chairman").
21 %	Opinions (Example: "Mr. Kalin suggested that the word 'operator' should be reserved", "Marianne Janning suggested the use of MIC", "The Chief of the Army was present and had no objections").
17 %	Knowledge (Example: "I do not believe that the change will cause any problems").
3 %	Quotes (usually in minutes from face-to-face meetings published in COM).
1 %	Politeness (thanks, excuses, praise).
2 %	COM presentations (all COM users are asked by the system to input a short personal presentation, to be made avai-lable to other COM users).
3 %	Miscellaneous (Example: "Protection against insects").

16 An American group dynamic comparison between face to-face meetings and computer conferencing

Here is a short summary of Hiltz 1980 plus some remarks made by Hiltz and Turoff during the conference "International Symposium On Office Automation - Emerging Office Systems: Why Some Work and Others Fail." at Stanford University in March 1980.

Computer conferencing will influence the way in which an organization works (not only provide a new medium for the same communication in the same organization as without computerized conferencing).

Whether the introduction of computer conferencing into a community of people will succeed or not depends on many factors. The most important of these factors is whether the attitude towards coworkers in an organization is "we want to help each other" or "other people want to steal my ideas". In the latter kind of community, computer conferencing has less probability of succeeding.

In one experiment in using computerized conferencing in a standards group with representatives of several companies, each participant had the goal of getting a standard in agreement with the products of that company, but without revealing their own plans to their competitors. Use of computerized conferencing in this competitive group did not work well. After modifying the computer system to add

a special form of interaction based on anonymous entries, the conference system worked much better in this group.

Hiltz 1980 describes a series of experiments with computerized conference systems. 80 test persons were split into 16 groups of 5 people in each group. Two problems to solve where selected. One of the problems was of a more technical nature (what should be included in an arctic distress kit) and the other a more socially oriented problem (how to handle a human-relations conflict at work). Every group solved one of the two problems with the aid of computerized conferencing and the other problem in a face-to-face meeting of equal length. Every other group began with one or the other of the two problems, and with one or the other of the two media, according to a statistical test plan to reduce the bias introduced by the order in which the two media and the two problems were tested.

The quality of the results produced by the groups were evaluated by experts in the subject area of the problem. These found that the mean goodness of the solutions arrived at in a given time was equally high whether the groups had arrived at the result through a face-to-face meeting or a computerized conference meeting.

In the human-relations problem, groups could arrive at solutions which were more punishment-oriented or more positive and generous. The experts evaluating the solutions agreed that the punishing solutions were less good. The computerized conference groups arrived at positive solutions a little more often, and at punishing solutions a little less often. And when a group using computerized conferencing could not agree, this was more often because a minority disagreed with a punishment-oriented solution arrived at by the majority of the group.

The probability that the decision arrived at by the group is shared by all participants is much larger after a face-to-face meeting than after a computerized conference. The probability that the whole group gets caught in a risky or extreme solution is larger in face-to-face meetings. This could be because of the psycho-social climate in a face-to-face meeting, or it could be because those persons who easily dominate in a face-to-face meeting (by stating their views eagerly) also are those people who most often favor more extreme and risky solutions.

The probability for a dominating leader to emerge in the group and succeed in getting everyone to agree with him/her is higher in a face-to-face meeting. The equality between participants in getting to say their views is larger with the computerized system. This was so even though some of the participants had difficulties learning to master the new technique of using the computer.

The probability that the women in the groups change their views to agree with the opinion of the men in the group was higher in a face-to-face meeting than when using the computer system.

The frequency of different statements was also counted:

- The number of statements expressing agreements with some other

participant was larger in face-to-face meetings.

- The total number of ideas and solution suggestions was larger when using the computer system.
- Group participants asked other participants to explain what they meant more often in face-to-face meetings.
- Questions to the group members about their opinions were more common with the computer system.
- The total number of words used was two or three times as many in the face-to-face meetings as with the computerized system. Note however that the quality of the result was the same even though fewer words were used with the computer system. Repetitions and reiterations are probably more common in spoken communication - with written communication, the reader can re-read the same message several times even though the writer does not write it more than once.

When asking the participants afterwards what they thought about the different media, they said that both were equally nice, but many of them observed that it was more difficult to reach consensus with the computerized system.

When evaluating the results from the Hiltz experiments, one caution is that the participants had no previous experience with computerized conferencing and only got a short introduction before the experiment started. The result with experienced computerized conference system users might be different.

17 Opinions about COM among users and non-users

17.1 Introduction

The institute of psychology at the Gothenburg University have studied the effects of the system through both interviews and written inquiries.

The results of these investigations have been reported separately (in Swedish) in Adriansson 1980A and Adriansson 1980B.

Here is a summary of some of the results in these reports.

17.2 Summary of the interviews

A group of researchers who had at that time little or no COM experience were interviewed in 1979. They were asked about what kind of effects, positive and negative, that they expected that the COM system would have on them and their work situation.

The interviewer found that the interviewees in general had positive expectations. They expected that the system would give a larger contact surface and give better cooperation within the geographically distributed department. Some time gains were also expected, mostly by a reduction in the need for travel. The most important disadvantages expected were the lack of immediate feedback, the risk of a too large information flow and that the system would be

dominated by computer experts communicating with each other.

Following a decision by the Swedish Data Inspection Board, the system had to be closed down in November 1979. (It was opened again in March 1980.) An interview was then done with the same group. Now they were asked in what way the closing down of the system influenced their work situation. Some questions were also put about risks of infringement on personal integrity from the COM system. Most of the interviewees experienced a lack of information when the system was not any more available. The risk of infringement on personal integrity was thought to exist - as in other media - but to be rather small. The interviewees thought that COM could further the efforts to create a more democratic work organization. Half of the interviewees thought that there was a risk that those employees who had less experience with the use of computer terminals and with written communication would be put at a disadvantage, while the other half of the interviewees did not expect that any group would be experience such disadvantage.

One year later, those members of the group who were now COM users were interviewed to evaluate their practical experience with COM against their expectations in the previous interview. The general opinion was that the positive expectations had been fulfilled or were beginning to be fulfilled, while the negative expectations were mostly unfounded. That is, the contact surface had widened, the cooperation within the department had increased (all did not agree on this) and time gains had been made. Some disappointment was expressed that so few of the employees had begun to use the computer system. In some cases, they thought the cause of this was technical problems.

One interesting result was that in the initial interview, before beginning to use COM, several interviewees said that they thought that the lack of "body language" communication would be a disadvantage with COM. However, after experience with the system, the interviewees did not any more express this particular misgiving about it.

In connection with the initial interview, a written inquiry was sent to administrative personnel at FOA. Questions were posed about how the COM system could influence equality between different groups, how the work of the trade unions would be influenced, how the work environment would be influenced and about personal integrity aspects. The results showed that these questions were perhaps put too early, since many of the people had not very much experience with COM. In spite of this the investigation can be valuable in showing expectations of would-be COM users. The general result was the same as that expressed by the interview group. People thought that COM would give the employees more influence on their work situation by making it easier for them to get information and state their views. The risk for infringement on personal integrity was thought to be small. As in the interview group, opinions were split on whether COM would favor or restrain various groups of people.

17.3 Summary of the large written inquiry

The large written inquiry was sent to all people who had entered COM more than 10 times in the period 1979-08-01--1980-03-31. The inquiry was also sent to a random sample of FOA employees who had not used COM at all in the indicated period. The population was divided into the following five groups:

Group A: *Experienced users*, who had entered COM more than 99 times.

Group B: *Less experienced users*, who had entered COM 34-99 times.

Group C: *Inexperienced users*, who had entered COM 10-33 times.

Group D: *Never used COM*, a random sample of non-users.

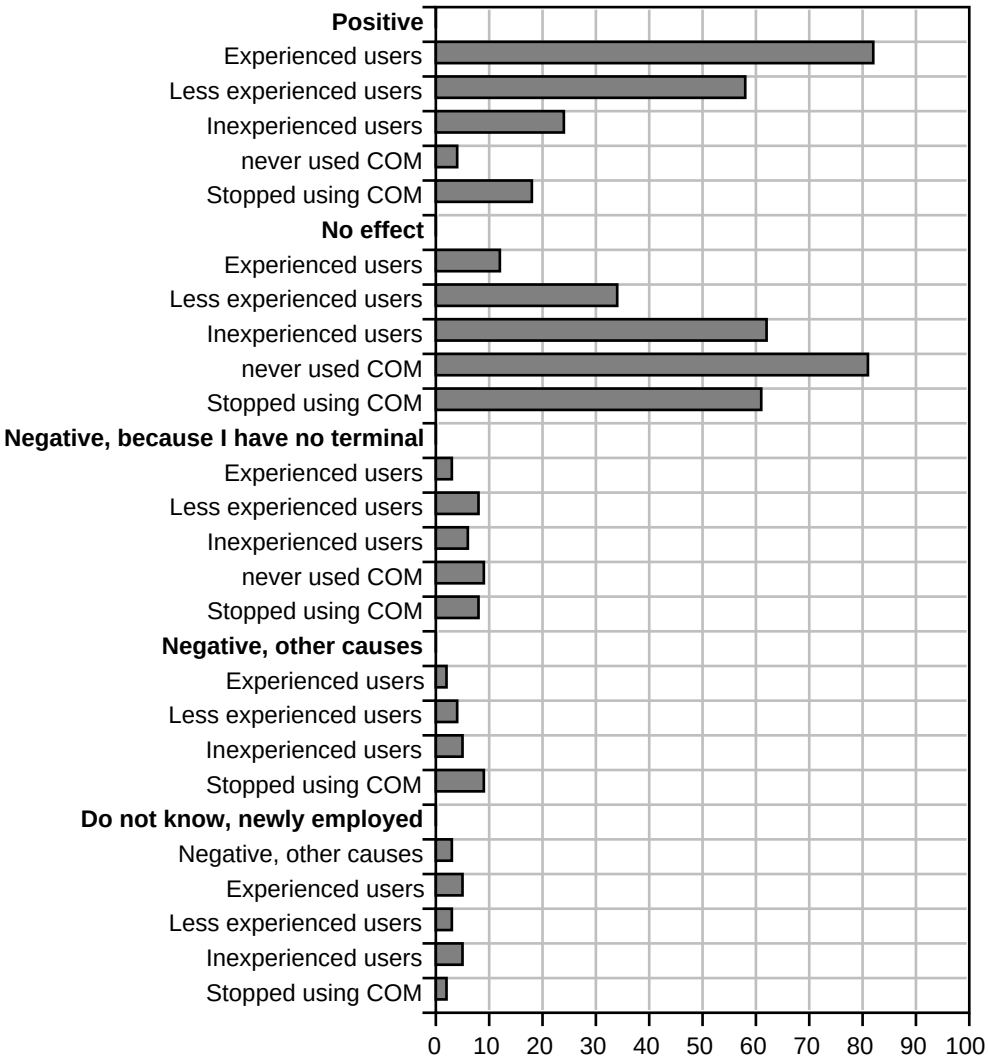
Group E: *Stopped using COM*, who had used COM 10 times or more but not used COM during the last two months.

Group A and B got the full inquiry, the other groups got simplified inquiries, since detailed questions about COM qualities were not thought meaningful to people with little or no COM experience.

Group E was very small, only 16 people. The other groups each had a size of about 70 people.

Most of the people who had not used COM gave as a reason a lack of time and of interest in the subjects discussed in COM, and a preference for written communication. The same reasons were given by those who had only used COM a little as reasons why they were not using COM, and also by a small group of people who had been using COM but had stopped using it.

Effect of COM on the work environment

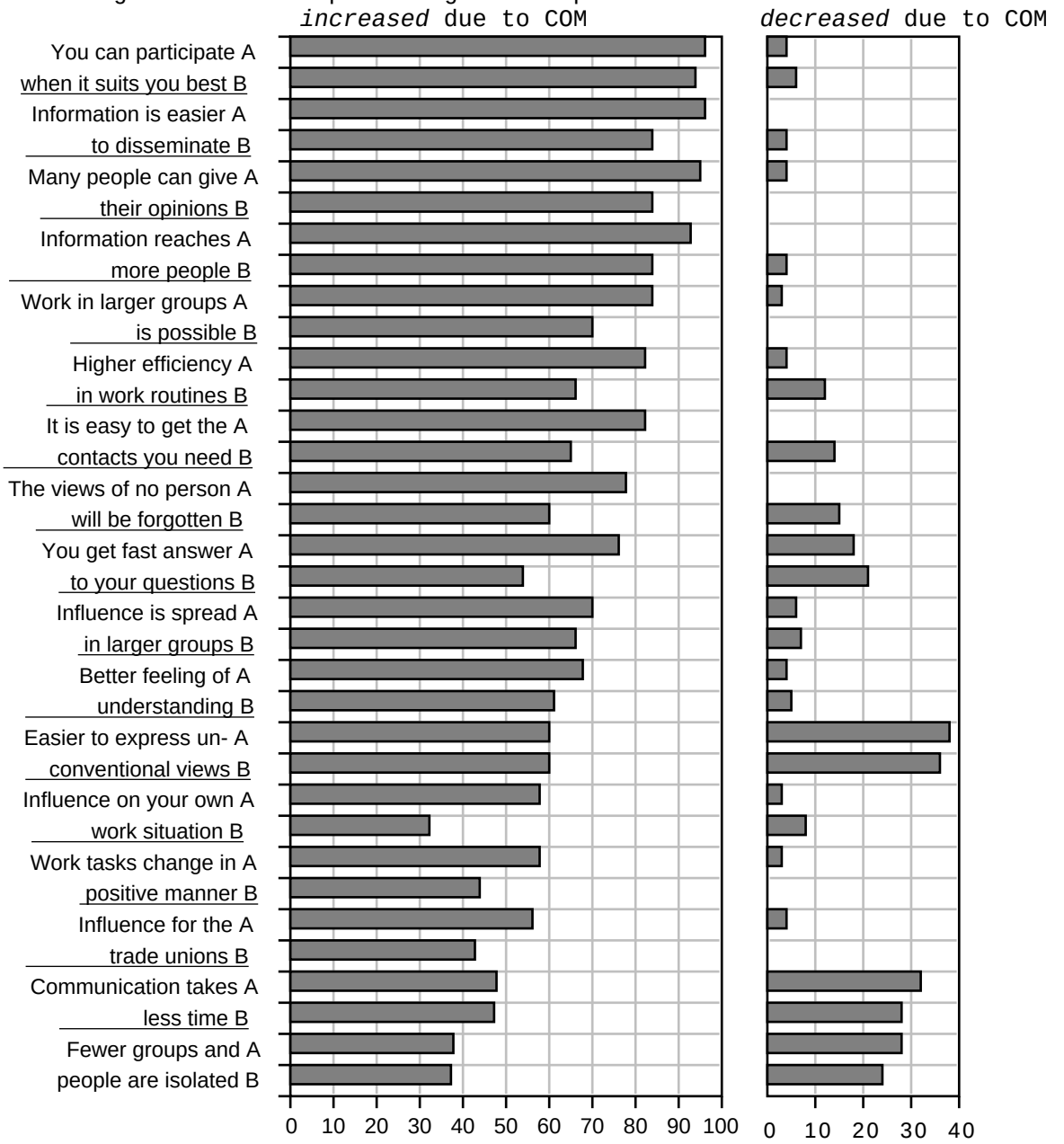


Most of those who used COM were of the opinion that the system had caused a positive change in their work situation, while those who were not using COM did not think that the existence of COM had influenced their work situation neither positively or negatively.

The need to be able to use a typewriter and the requirement for written communication was not thought to be any important impediment for using COM either by users or non-users.

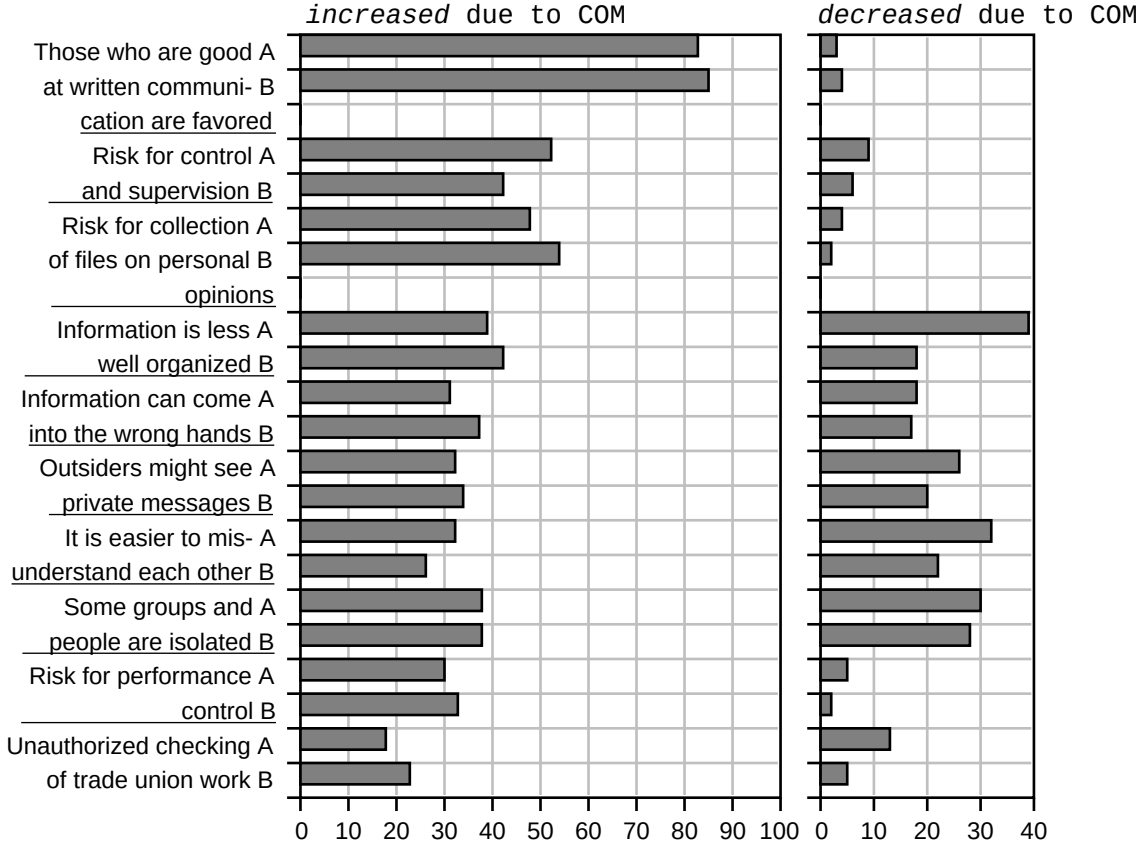
Positive effects from COM (A= experienced, B = less experienced users)

This diagram shows the percentage of respondents who said that this effect



Negative effects from COM (A = experienced, B = less experienced users)

This diagram shows the percentage of respondents who said that this effect



18 Conference size

One aspect which should be studied more is the optimal conference size. Our experience is that a computer conference seems to work best in group sizes between 10 and 80 participants in COM. Note that in face-to-face meetings where every participant has equal right to speak, the optimal size is known to be 3-7 participants, while psychological problems occur with larger group sizes.

Here is an hypothesis of the cause of this effect; In a face-to-face meeting, the problems with larger group size occur because:

Many participants think that too much time is spent giving information they already have got or discussing subjects on which they have already made up their mind. In a face-to-face meeting, they have to sit and listen to this, while in a computer conference system they can easily skip entries of less interest to them.

Many speakers in face-to-face meetings hesitate to say things because they are afraid that other participants are not interested, are in a hurry to get somewhere else. Because it is so easy for a reader in a computer conference to skip reading entries, the social pressure on participants against writing messages is also lower.

A computer conference participant can spend more time formulating his/her entry so as to be concise and easy-to-understand. This increases the time spent by the writer, but lowers the time spent by the reader in getting the message, and will thus increase the efficiency with larger reader groups.

In a face-to-face meeting with 5 participants, each participant will on average speak 1/5 or 20 % of the time. As is shown in chapter 6 above, the mean time to write a conference entry is 11 times longer than the mean time to read the entry. Thus, a computer conference has to have a size of 56 participants before the average time spent writing gets as low as 20 %. Humans will probably for psychological reasons be more efficient if a reasonable part of their time is spent giving information, while they are disatisfied and inefficient if they have to spend too much time passively receiving information. And a computer conference system can have larger group sizes without getting to low average time spent giving information.

19 Conclusions

19.1 General

People who hear about computerized conference systems, but have no experience of their own with such systems, have a tendency to see the systems mainly as a *replacement* of other communication - telephone calls, letters, face-to-face meetings or newspapers. This reaction is natural - you try to understand something new by relating to something you already know.

One important result from the investigations is that most of the COM usage is *not* a replacement of existing communication but rather *new communication* which would not have occurred without COM.

The results of the investigations show that experienced COM users see COM as a new medium providing certain new communication possibilities, but also a medium which (like all other media) is not suitable for all kinds of communication needs, and is therefore best used where it is suitable.

Probably COM has caused a small increase in the total time spent in communication activities. COM is however not a dominating communication media for most of its users - the mean COM user is connected to COM for 20 minutes each working day, and will in that time read 22 messages and write 1 message.

The investigations show that COM has meant more information exchange between people at large organizational distances. This is most marked for non-managers and for people aged less than 40 years.

COM is mostly used for:

Exchange of experience between researchers within different fields of research. COM has here meant that researchers with the same interests but at different geographical locations have gotten better possibilities to exchange experience and test their results

and ideas on other researchers.

- Exchange of letter messages, especially for small and simple messages which can be distributed quickly in this way.

- Information copies; messages which without COM would have been sent to one or very few people are in COM often stored in such a way that more people are reached.

- Contacts and discussions in working groups. These groups usually also have face-to-face meetings, and COM is used between these meetings.

- Contacts within trade unions inside the FOA research institute. COM is used both for general meetings for all trade union members and for closed meetings for the board or other smaller groups within the trade union.

There is less dominance of a few people on the communication process when COM is used. According to the views of the COM users, the system gives more people better possibilities of saying their views, reduces the risk that the ideas of someone are forgotten and gives increased influence to the trade unions.

A person who uses COM will get more contacts with other people, and this means that new ideas will spread more easily and the organi-zation will easier grow and adjust to a changing environment.

Ordinary face-to-face meetings work less well if there are more than eight participants, all having equal rights to talk. In COM however, it seems as if a meeting with 50 or more participants will work, even though more than half the participants in such large meetings will at one time or another write something in the meeting.

For decision processes, the main impact of COM has been more thorough discussions and collections of ideas and arguments before the decision. The final formal decision is almost never taken directly using the COM system.

Most COM users do not think that COM means an increased risk of control, performance control and unauthorized snooping, but there is a minority who believe in such risks.

The cost of using COM is about 70 Swedish kronor per hour or about 0.80 kronor per read message. COM is thereby cheaper than telephone calls for small and simple messages, cheaper than ordinary letters, and cheaper than face-to-face meetings if the group size is 15 or more people or if some of the participants had to travel to get to the meeting.

19.2 Authoritarian or democratic attitudes

When designing communication processes in an organization, this can be done with an authoritarian or a democratic attitude towards human relations. This table shows some of the differences:

Authoritarian attitude	Democratic attitude
People are lazy and undependable and must be watched and controlled.	People are dependable, can be motivated and control themselves.
The main goal with the information system is to give better support for the managers.	All employees shall get support from the information system.
Efficiency in the performance of work elements must be increased.	The functionality and possibilities for growth of the organization shall be aided.
Work tasks should be split into many small elements, where each employee only gets the information necessary to perform his /her element.	Work tasks are organized so that changes and new needs are easier to handle, by promoting high competence and flexible contact and organizational patterns.

Traditional administrative computer systems often cause a division of work into small elements for different employees, and they are often designed to give every person only exactly the information needed to perform a certain task. The systems are often difficult to modify for new kinds of information or for new kinds of treatment of the information. Thus, the design of traditional computer systems is more in accordance with the authoritarian attitude.

Computerized conference systems give much freedom for each user to choose what information they store in the computer, where the information is sent and what information they take out. They can easily start using the system for a new kind of task, e.g. by opening a new conference in the system for the new tasks or writing about it in a letter message. Thus, computerized conference system are more in accordance with the democratic attitude.

19.3 Conclusions for the future

Most likely, computer-mediaded message systems of different kinds will be one very important communication medium in the future. They will not out-compete all other media, but will be an additional alternative in the spectrum of different media available to modern man. People will in each case choose the medium best suited to each communication need.

The increased use of computer communication media will cause many changes in the social communication patterns. Groups of people who cooperate on an intimate daily basis will often be distributed geographically at large distances within a country or in different countries or even different continents.

Computer media will also change the pattern of control of communication. More communication direct between low-level people in an organization will decrease the importance and function of managers. A computer-based message system in fact will in some ways perform automatically the functions today handled by managers of collecting and distributing information within an organization.

The ease of establishing communication groups electronically between people in different organizations will also decrease the importance of an organization (government agency or commercial company) in organizing human activities. Ad-hoc groups with participants from different organizations will occur and solve problems in ways perhaps not envisaged by their managers. We already have much experience of this kind of work distribution among the COM users.

All this may be frightening to people who have never used computer conferencing systems. But our experience is that people will easily adapt to the new environment. And all these cross-country and cross-organization contacts will make an organization more efficient by increasing its ability to find the best new ideas and methods. Thus, those organizations which succeed in using this new medium well will have a great advantage compared to those who do not in surviving in a rapidly changing world.

20 Who did what?

Torgny Tholerus programmed most of the COM system and most of the programs for the collection of statistics on COM usage.

Chapter 17 reports on research done by Lillemor Adriansson and part of the text is translation of text written by her.

Stefan Cederholm and Martin Nilsson have written some statistics programs. Section G.2 in appendix G is a transcript made by the program Martin Nilsson wrote.

Chapter 16 reports research performed by Roxanne Hiltz, Murray Turoff and their co-workers.

Mats Wallin, who programmed part of the COM system, has also written appendix B and made the investigation reported there.

The figure in chapter 9 was drawn by a computer program written by Mats Ohlin.

Tommy Nilsson has written appendix J and Anders Sandberg appendix K.

The rest of the report was written by Jacob Palme.

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(More complete bibliographies can be found in Palme 1978 and Adriansson 1980A.)

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APPENDIX G.2: Times and frequencies for COM commands

The statistics below are based on a random sample of all COM commands given (in the Swedish language version of COM, KOM) during a five-day period in september 1980.

Commands which took more than 30 minutes to complete are not included in the statistics.

Since people may do other things while sitting logged in to COM, the statistics may exaggerate the time to perform some commands.

Note that because of the way COM works, users are guided into using those commands which come first in a menu. Those commands are marked with an * below.

All times in the table are given in seconds.

Total number of characters to the computer: 414873
Total number of characters from the computer: 15107171
Total number of commands: 26982

Logical grouping of commands:

Percent	Total time	Mean time	Median time		(Group)command
1.54	14800	35.7	16.0		(Administration of reading)
0.64	6517	37.9	15.5	*	Only (read last)
0.27	3475	47.6	25.0		(Read) file
0.24	1091	16.5	9.0		Skip (all comments)
0.24	2225	34.2	17.0		Save (entry)
0.06	537	31.6	23.0		Archive (entry)
0.05	821	63.2	53.0		Read messages
0.03	134	14.9	11.0		Scan (news)

Percent	Total time	Mean time	Median time		(Group)command
66.74	415262	23.1	13.0		(Reading new entries)
30.63	156787	19.0	12.0	*	(Read) next comment
21.03	131006	23.1	13.0	*	(Read) next entry
12.66	93406	27.4	15.0	*	(Join) next meeting
2.35	24087	38.1	22.0	*	(Read) next letter
0.09	9976	433.7	235.0		(Read all) news

Percent	Total time	Mean time	Median time		(Group)command
6.77	50702	27.8	12.0		(Reviewing)
5.49	44536	30.1	14.0		Review (entry)
1.28	6166	17.8	8.0	*	(Read) next marked (notice)

Percent	Total time	Mean time	Median time		(Group)command
0.59	2929	18.4	7.0		(Administration of writing)
0.22	769	12.8	5.0		Information (copy to)
0.12	724	21.9	8.0		Add receivers
0.08	259	11.8	5.0		Move entries
0.07	776	40.8	7.0		Subtract receiver
0.07	176	9.8	8.5		Delete (entry)
0.02	187	31.2	20.5		Internal mail (FOA)
0.00	38	38.0	38.0		Write messages
0.00	0	0.0	0.0		(Set) expiration (time)

Percent	Total time	Mean time	Median time		(Group)command
7.42	209370	104.6	38.0		(Writing entries and letters)
1.73	64849	138.9	71.0		Comment (on entry)
1.16	38389	122.6	56.0		(Send a) letter (to)
0.85	35148	152.8	89.0		Answer (privately)
0.59	11479	71.7	30.0		(Re-)type (the entry)
0.45	7971	65.9	6.0		(Remove last) line
0.41	842	7.7	3.0		Cancel (it)
0.79	4992	24.0	5.0		Enter (it)
0.36	24577	250.8	141.5		(Type new) entry
0.35	8010	84.3	27.0		(Remove last) word
0.33	8310	94.4	44.0		(Re-) type (the letter)
0.16	1815	43.2	7.0		Submit (file)
0.13	811	23.2	5.0	*	Continue (writing)
0.03	1612	179.1	67.0		Change subject
0.03	219	24.3	13.0		(Submit) file
0.01	20	5.0	5.0		Finish (entry)
0.01	1105	368.3	137.0		Change presentation (of)
0.01	180	60.0	18.0		Continue
0.01	15	7.5	7.5		Message (to letter writers)
0.00	26	26.0	26.0		(Make) inquiry
0.00	0	0.0	0.0		Insert (entry)

Percent	Total time	Mean time	Median time		(Group)command
3.95	35677	33.4	15.0		(Table printouts)
1.76	17064	35.8	19.0		(Get) status (of)
0.94	5033	19.9	11.0		Present
0.79	4577	21.5	9.0		List (all) news
0.30	3563	44.0	28.0	*	List active (meetings)
0.09	3644	158.4	80.0		List (public) meetings
0.02	680	113.3	125.0		List private (meetings)
0.02	356	59.3	57.0		(Get) system information
0.01	295	73.8	79.5		List commands
0.01	270	67.5	62.0		List information
0.00	195	195.0	195.0		List (all) persons
0.00	0	0.0	0.0		Inactive activities
0.00	0	0.0	0.0		Active activities

Percent	Total time	Mean time	Median time		(Group)command

12.99	62273	17.8	2.0		(Miscellaneous)
4.65	938	0.7	0.0		Quit
2.14	8589	14.9	6.0		Join (meeting)
1.11	32435	108.5	6.0	*	Wait (for news)
0.50	30	0.2	0.0		Begin (with new) name
0.39	1065	10.2	2.0		Mark (the notice)
0.30	1672	20.9	16.0		(Become) member (of)
0.29	1038	13.1	11.0		(Something) else
0.23	1767	28.0	3.0		Unmark (the notice)
0.19	850	16.3	11.0		Erase (activity)
0.17	825	17.6	12.0		Withdraw (permanently from)
0.14	58	1.5	1.0		Change page size
0.10	539	20.7	6.5		(Get) daytime
0.09	204	8.2	1.0		Change expert (level to)
0.08	62	2.8	1.5		(Set) terminal (type) display
0.07	3	0.2	0.0		Call English COM
0.07	744	41.3	27.5		Something else
0.07	155	8.6	7.0		Reassign output (to file)
0.05	344	26.5	13.0		Leave COM
0.04	474	47.4	33.0		Add participant
0.03	694	86.8	53.5		Create (new meeting)
0.03	2	0.3	0.0		Call mini COM
0.02	233	38.8	35.0		(Get) help
0.02	2	0.4	0.0		Call new COM
0.01	220	73.3	44.0		Change name (of)
0.01	92	30.7	27.0		Change password (of)
0.01	463	231.5	231.5		Organize meetings
0.01	110	55.0	55.0		Change parameters
0.01	21	10.5	10.5		Organize meetings
0.01	0	0.0	0.0		Call travel compensation
0.00	39	39.0	39.0		Change membership
0.00	12	12.0	12.0		Change organizer (of)
0.00	4	4.0	4.0		Compute
0.00	0	0.0	0.0		Begin (from new) number
0.00	0	0.0	0.0		Call type writing course
0.00	0	0.0	0.0		Call 3rip
0.00	0	0.0	0.0		Change type (of meeting)
0.00	0	0.0	0.0		(Set) terminal (type) no display
0.00	0	0.0	0.0		Set terminal (type)
0.00	0	0.0	0.0		(Define) group
0.00	0	0.0	0.0		Exclude participant
0.00	0	0.0	0.0		Call old COM
0.00	0	0.0	0.0		Call program

All commands sorted by frequency:

Percent	Total time	Mean time	Median time		Command
30.63	156787	19.0	12.0	*	(Read) next comment
21.03	131006	23.1	13.0	*	(Read) next entry
12.66	93406	27.4	15.0	*	(Join) next meeting
5.49	44536	30.1	14.0		Review (entry)
4.65	938	0.7	0.0		Quit
2.35	24087	38.1	22.0	*	(Read) next letter
2.14	8589	14.9	6.0		Join (meeting)
1.76	17064	35.8	19.0		(Get) status (of)

1.73	64849	138.9	71.0		Comment (on entry)
1.28	6166	17.8	8.0	*	(Read) next marked (notice)
1.16	38389	122.6	56.0		(Send a) letter (to)
1.11	32435	108.5	6.0	*	Wait (for news)
0.94	5033	19.9	11.0		Present
0.85	35148	152.8	89.0		Answer (privately)
0.79	4992	24.0	5.0		Enter (it)
0.79	4577	21.5	9.0		List (all) news
0.64	6517	37.9	15.5	*	Only (read last)
0.59	11479	71.7	30.0		(Re-)type (the entry)
0.50	30	0.2	0.0		Begin (with new) name
0.45	7971	65.9	6.0		(Remove last) line
0.41	842	7.7	3.0		Cancel (it)
0.39	1065	10.2	2.0		Mark (the notice)
0.36	24577	250.8	141.5		(Type new) entry
0.35	8010	84.3	27.0		(Remove last) word
0.33	8310	94.4	44.0		(Re-) type (the letter)
0.30	3563	44.0	28.0	*	List active (meetings)
0.30	1672	20.9	16.0		(Become) member (of)
0.29	1038	13.1	11.0		(Something) else
0.27	3475	47.6	25.0		(Read) file
0.24	1091	16.5	9.0		Skip (all comments)
0.24	2225	34.2	17.0		Save (entry)
0.23	1767	28.0	3.0		Unmark (the notice)
0.22	769	12.8	5.0		Information (copy to)
0.19	850	16.3	11.0		Erase (activity)
0.17	825	17.6	12.0		Withdraw (permanently from)
0.16	1815	43.2	7.0		Submit (file)
0.14	58	1.5	1.0		Change page size
0.13	811	23.2	5.0	*	Continue (writing)
0.12	724	21.9	8.0		Add receivers
0.10	539	20.7	6.5		(Get) daytime
0.09	9976	433.7	235.0		(Read all) news
0.09	3644	158.4	80.0		List (public) meetings
0.09	204	8.2	1.0		Change expert (level to)
0.08	259	11.8	5.0		Move entries
0.08	62	2.8	1.5		(Set) terminal (type) display
0.07	776	40.8	7.0		Subtract receiver
0.07	176	9.8	8.5		Delete (entry)
0.07	3	0.2	0.0		Call English COM
0.07	744	41.3	27.5		Something else
0.07	155	8.6	7.0		Reassign output (to file)
0.06	537	31.6	23.0		Archive (entry)
0.05	821	63.2	53.0		Read messages
0.05	344	26.5	13.0		Leave COM
0.04	474	47.4	33.0		Add participant
0.03	134	14.9	11.0		Scan (news)
0.03	1612	179.1	67.0		Change subject
0.03	219	24.3	13.0		(Submit) file
0.03	694	86.8	53.5		Create (new meeting)
0.03	2	0.3	0.0		Call mini COM
0.02	187	31.2	20.5		Internal mail (FOA)
0.02	680	113.3	125.0		List private (meetings)
0.02	356	59.3	57.0		(Get) system information
0.02	233	38.8	35.0		(Get) help
0.02	2	0.4	0.0		Call new COM
0.01	20	5.0	5.0		Finish (entry)

0.01	1105	368.3	137.0	Change presentation (of)
0.01	180	60.0	18.0	Continue
0.01	15	7.5	7.5	Message (to letter writers)
0.01	295	73.8	79.5	List commands
0.01	270	67.5	62.0	List information
0.01	220	73.3	44.0	Change name (of)
0.01	92	30.7	27.0	Change password (of)
0.01	463	231.5	231.5	Organize meetings
0.01	110	55.0	55.0	Change parameters
0.01	21	10.5	10.5	Organize meetings
0.01	0	0.0	0.0	Call travel compensation
0.00	38	38.0	38.0	Write messages
0.00	0	0.0	0.0	(Set) expiration (time)
0.00	26	26.0	26.0	(Make) inquiry
0.00	0	0.0	0.0	Insert (entry)
0.00	195	195.0	195.0	List (all) persons
0.00	0	0.0	0.0	Inactive activities
0.00	0	0.0	0.0	Active activities
0.00	39	39.0	39.0	Change membership
0.00	12	12.0	12.0	Change organizer (of)
0.00	4	4.0	4.0	Compute
0.00	0	0.0	0.0	Begin (from new) number
0.00	0	0.0	0.0	Call type writing course
0.00	0	0.0	0.0	Call 3rip
0.00	0	0.0	0.0	Change type (of meeting)
0.00	0	0.0	0.0	(Set) terminal (type) no display
0.00	0	0.0	0.0	Set terminal (type)
0.00	0	0.0	0.0	(Define) group
0.00	0	0.0	0.0	Exclude participant
0.00	0	0.0	0.0	Call old COM
0.00	0	0.0	0.0	Call program

APPENDIX L: Change in life and work because of COM

1. QUESTION TEXTS

The following two questions were put to a sample of COM users:

Question texts translated to English:

(480550) 82-05-23 19:21 Jacob Palme FOA1
Receiver: COM enquiry group
[rende: Enquiry for Norwegian Telecom

The Norwegian Telecommunications has asked me to make an enquiry about COM usage. The replies will only be published as statistics, where you cannot see who answered what. The questions will be put to all who are members of this COM group conference, which was started for this enquiry.

Please do not withdraw from the group. More questions will come during the forthcoming weeks.

(480552) 82-05-23 19:22 Jacob Palme FOA1
Receiver: COM enquiry group
Enquiry with answers to Replies on COM enquiry
Subject: Question A: Use of COM at home

1) Have you used COM from a terminal at home?

Only answer question 2 and 3 if you answered YES to question 1.

2) How large percentage of your COM usage during the last year has been from home?

3) Which work tasks do you perform at home? Is it the same tasks as at work, or different tasks?

(482768) 82-05-26 18:55 Jacob Palme FOA1
Receiver: COM Enquiry group
Enquiry with answers to Replies on COM enquiry
Subject: What has decreased when COM has increased

Here is the second enquiry question.

A day has only 24 hours. So the time you use for running COM must mean a decrease in some other activity. Perhaps you telephone less, because you can use COM for communication instead. But you might also reduce something quite different, like sleeping less or watch TV less.

Here are some examples of activities, which might have decreased to get time for COM:

Telephoning, writing and reading letters, other writing, face to face meeting with other people (committee meetings, meetings with friends, with family, in societies), reading newspapers and journals, reading books, other reading, listening to radio, looking at TV, exercising, eating, sleeping, hobbies, research, computer programming etc.

Which activities do you believe has decreased with the time you now use for running COM?

Question texts in original Swedish version:

(480550) 82-05-23 19:21 Jacob Palme FOA1

Mottagare: Enkätgrupp om KOM
Ärende: Enkäter för Norska Televerket

Norska televerket har bett mig göra en enkät om KOM-s användning. Svaren kommer enbart att publieras i statistik-form, där det inte framgår vad en viss enskild person svarat. Frågorna kommer att ställas till alla som är medlemmar i den här KOM-gruppen, som skapats enbart för detta ändamål.

Jag är tacksam om du inte utträder ur gruppen. Det kommer några fler frågor under de närmaste veckorna.
(480550)

(480552) 82-05-23 19:22 Jacob Palme FOA1
Mottagare: Enkätgrupp om KOM
För kännedom: -Jacob Palme. Mottaget: 82-06-02 15:19
Rundfråga med svar till Svar på enkäter om KOM:
ärende: Fråga A: KOM-användning hemma

1) Har du använt KOM från en terminal i hemmet?

Svara bara på fråga 2 och 3 om du svarat JA på fråga 1.

2) Hur många procent av din KOM-användning har du det senaste året gjort hemifrån?

3) Vilka slags arbetsuppgifter är det du utför hemma? Är det vissa arbetsuppgifter som du utför hemma, och andra på jobbet, i så fall hur skiljer de sig?

(482768) 82-05-26 18:55 Jacob Palme FOA1
Mottagare: Enkätgrupp om KOM
Rundfråga med svar till Svar på enkäter om KOM:
Ärende: Vad har minskat när KOM har ökat

Här kommer andra enkätfrågan.

Dygnet har ju bara 24 timmar. Så den tid du använder åt att köra KOM, måste innebära minskning av något annat. Kanske telefonerar du t.ex. mindre, därför att du kan kommunicera via KOM istället. Men det kan också vara så att du minskar på något helt annat, t.ex. sover mindre eller ser mindre på TV.

Här är några exempel på aktiviteter, som du kan ha minskat på för att få tid till KOM:

Telefonera, skriva och läsa brev, skriva annat, umgås direkt med andra människor (sammanträde, vänner, familj, föreningsliv), läsa tidningar och tidskrifter, läsa böcker, läsa annat, höra på radio, se på TV, motionera, äta, sova, hobbyverksamhet, forska, programmera datorer o.s.v.

Vilka aktiviteter tror du har minskat med den tid du ägnar åt KOM?

2. SAMPLE AND RESPONSE

A random sample of 112 persons where chosen among those who had (a) used COM for more than 100 sessions (b) used COM during the last two months before the enquiry. The sample was intentionally chosen to contain only rather regular COM users, since we are interested in the effect of COM on the life and work of those who use COM so much that it can have any real impact on them.

Of the people in the sample, 10 never got the enquiry question, because they did not use COM during the enquiry period. Thus, the question was put to 102 persons. Of these, 85 answered the first question fully or partly, and 71 answered the second question.

The results are reported above in chapter 12.