

Matching Media

Information need and new media choice

Lidwien van de Wijngaert



Telematica
Instituut

Enschede, The Netherlands, 1999

Telematica Instituut Fundamental Research Series, No. 004 (TI/FRS/004)

Cover Design: Studio Oude Vrielink, Losser and Jos Hendrix, Groningen

Book Design: Lidwien van de Wijngaert and Henri ter Hofte

Printing: Universal Press, Veenendaal, The Netherlands

Cover Photo: Antonov AN2, Courtesy of Aviodome, Schiphol, The Netherlands

Telematica Instituut Fundamental Research Series

001 G. Henri ter Hofte, *Working apart together : Foundations for component groupware*

002 Peter J.H. Hinssen, *What difference does it make? The use of groupware in small groups*

003 Daan D. Velthausz, *Cost-effective network-based multimedia information retrieval*

ISSN 1388-1795; No. 004

ISBN 90-393-1760-7

Copyright © 1999, Telematica Instituut, The Netherlands

All rights reserved. Subject to exceptions provided for by law, no part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the copyright owner. No part of this publication may be adapted in whole or in part without the prior written permission of the author.

Telematica Instituut, P.O. Box 589, 7500 AN Enschede, The Netherlands

E-mail: info@telin.nl; Internet: <http://www.telin.nl>

Telephone: +31 (0)53-4850485; Fax: +31 (0)53-4850400

MATCHING MEDIA
INFORMATION NEED AND NEW MEDIA CHOICE

MATCHING MEDIA
INFORMATIEBEHOEFTE EN DE KEUZE VOOR NIEUWE MEDIA

met een samenvatting in het Nederlands

PROEFSCHRIFT

ter verkrijging van de graad van doctor
aan de Universiteit Utrecht
op gezag van Rector Magnificus, Prof. H.O. Voorma
ingevolge het besluit van het College voor Promoties
in het openbaar te verdedigen
op 21 januari 1999 des middags te 14.30 uur

door

Lidwien Anne-Marie Laurentia van de Wijngaert
geboren op 17 januari 1970 te Best

Promotor: prof. dr. J. Groebel, Faculteit Sociale Wetenschappen,
Media en Communicatie, Universiteit Utrecht

Co-promotor: dr. D. de Wit, Telematica Instituut, Enschede

Preface

My interest in research emerged when I studied Communication at the University of Amsterdam. When I finished, I wanted only one thing: more research. The *Telematica Instituut* offered the opportunity to do research on the use of new media. Writing a thesis turned out to be very different from studying. Both the research itself and working in a small but fast growing organisation at times turned out to be frustrating but more importantly challenging and rewarding. This dissertation is the result of five years of work. During these years a number of people have contributed to this work, for which I would like to thank them.

First of all, I want to thank several people for their advice and comments. I want to thank my promotor, Jo Groebel, for his dense and to the point comments on my work. Dirk de Wit I want to thank for both his comments and moral support. Other discussants I want to mention here are Hermen van der Lugt, Wouter Teeuw, Maurice Houtsma, Peter Neijens and Elisabeth Davenport.

Likewise, I want to thank Arjen for writing the Q-method data gathering tool. Furthermore, I would like to thank Peter van der Heijden and Cora Maas for their help with statistics.

I want to thank my colleagues at the Telematica Instituut. A special thank you goes to the members of both TAO en OTV. You have offered a platform that allowed open discussion.

My parents and siblings I want to thank for their help, advice and great moral support. Finally, I want to thank Harry, Larix and Leentje for being at home as such a stable factor, for information, communication and transaction but most of all: for being unique.

*Lidwien van de Wijngaert
Utrecht, The Netherlands, January 1999*

Contents

CHAPTER 1	Introduction - The user perspective	1
	1.1 The information need	1
	1.2 The process of communication	2
	1.3 Motivation, aim and research question	4
	1.4 Research approach	6
CHAPTER 2	Research area - Delineation and description of new media	9
	2.1 Media characteristics	9
	2.2 Media that provide electronic information	15
	2.3 Conclusion	33
CHAPTER 3	Preliminary research - Technology, task and (user) context	35
	3.1 Introduction	35
	3.2 Theoretical background	36
	3.3 Research design	39
	3.4 Results	45
	3.5 Conclusions	62
CHAPTER 4	Theoretical background - Information need and media choice	65
	4.1 Introduction	65
	4.2 Uses and gratifications	66
	4.3 Criticism on the uses and gratifications approach	70
	4.4 Gender issues	81
	4.5 The model used in this research	82
CHAPTER 5	Empirical research - Policy capturing	85
	5.1 Introduction	85
	5.2 Research Design	87
	5.3 Results	95
	5.4 Conclusion	115

CHAPTER 6	Conclusions - Matching media	121
	6.1 Technology versus the user	121
	6.2 Summary of results	123
	6.3 Limitations of the research and further research	131
	6.4 Discussion: Matching Media	133
	6.5 In conclusion	136
	Bibliography	139
SAMENVATTING	Matching Media	145
APPENDIX A	Q-methodology	157
	A.1 Overview of items	158
	A.2 Data gathering	159
	A.3 Statistical analysis	162
	A.4 Factor Analysis	167
	A.5 Comparison of media	174
APPENDIX B	Policy capturing	177
	B.1 Statistical analysis	178
	B.2 Research design	185
	B.3 Descriptive statistics	190
	B.4 Logistic regression	201

Introduction - The user perspective

With the development of new information and communication technology many new possibilities to obtain information have emerged. However, not all possibilities are used. This work tries to explain why some media are used and others are not. In order to do this, the user perspective is maintained. A process model of communication is used as a starting point. In this chapter, the research goals and questions are the central issues.

1.1 The information need

What time does the train from Amsterdam to Enschede leave today? If you want to know when the train departs, you can find the answer in a number of ways:

- look it up in the time table booklet;
- call 0800-9292 (Public Transport Information);
- look in an electronic time table on a PC;
- find the information on the Internet;
- walk down to the station and ask the ticket clerk, or
- ask a friend.

There are many alternative sources of information to find an answer to this question. Some alternatives are old and some are new. All the options have advantages and disadvantages. Some are quick, others take a lot of time to get the answer; some cost money, others are free of charge; some are easy to use, others are cumbersome; some provide a simple answer, others provide additional information.

The medium that is eventually used, depends on many different factors: the context in which the question is asked, the characteristics of the person

asking the question, and the media to which the person has access. Moreover, what happens if the circumstances change slightly? What happens, for instance, when the inquirer hears that a train accident took place?

It will become more and more important to take the specific functions and situations of the media users into account when further developing media. The medium itself is no longer the starting point. The personal factors, situations, and the functions of the media are of prime importance for users and must be taken into account (Groebel, 1997).

In the past decades many new media that provide electronic information have emerged from technological developments, for example Telephone Service Numbers, Teletext, CD-ROM and CD-i, Videotex, and Internet. Most of these media were introduced because new technology allowed new possibilities and not because a great need was felt from the public. Some of these media are successful, others are not. In other words, the mere existence of media does not explain why they are used or not used. In order to explain the actual use of new media, it is important to start with the user and his or her (information) need and not with the technology as such. This is the user perspective in this work.

This research attempts to determine who uses which medium for what purpose. More specifically, the research aims at finding out what factors influence people's use of media in general and new and electronic media in particular. The goal of obtaining this insight is to be able to introduce new media in a situation that media will actually be used. Using this approach the work may contribute to the successful introduction of new media.

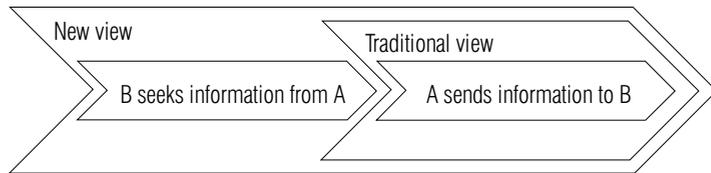
1.2 The process of communication

A research paradigm that has been used over a long period of time is that of a sender sending information via some means to a receiver. An old and often used definition of communication is: *Who Says What In Which Channel To Whom With What Effect?* (Lasswell, 1948).

Other, (more refined) notions of the communication process have been developed over the years. The concept of noise (Shannon and Weaver, 1949) and meaning (Osgood, 1954) for example were added. Also, the possibility of turning the process around (the receiver gets the role of sender) was added (Schramm, 1954). Despite these changes, basically little changed: the sender remained the starting point of the communication process. However, the media did change and the sender perspective was not able to describe the process of communication for new media such as Internet. None of the effect models allowed description of the active role of the receiver, or the user. In this research this role will be elaborated.

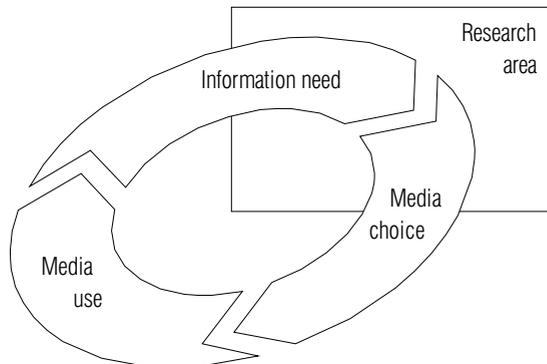
With the emergence of new media it is more appropriate to look at the process of communication from the perspective of a user's need for information and the consequences of that, rather than solely the role of sender, channel and receiver. In Figure 1-1 the difference between the traditional and current view is shown. As can be seen from the figure, this new view should not be seen as a replacement of the old view, but as an extension of the old view (Do, 1994).

Figure 1-1 New and traditional view of communication



This new view can be translated to a model that describes the process of communication for media from which electronic information can be obtained. The first step is B's seeking of information from A. This is the consequence of the emergence of a need for information of B. At some stage in a task or activity a gap in knowledge that is available and that which is needed emerges. The degree of B's motivation determines whether or not B will actually search for information. Then a phase of media choice follows. Alternative sources of information are examined and a choice is made. This choice is, for example, based on characteristics of the information need, on the context or on user skills. Once a media choice is made, B tries to find the information that will fill the knowledge gap by interacting with the medium. As a result the information need is solved, changed or unchanged.

Figure 1-2 The communication process in electronic information services



Summarising, three phases can be distinguished:

- *Need for information* consists of the process of perceiving a difference between an ideal state of knowledge and the actual state of knowledge.

- *Media choice* is the process of evaluation of alternative sources of information and the choice of one.
- *Media use* is the process of using a medium plus evaluation of the results of interacting with a medium.

A recursive process model, as is depicted in Figure 1-2, can be derived when the three phases are related to each other. This model is used as a starting point. In this research the emphasis lies on the relation between information need and media choice.

1.3 Motivation, aim and research question

1.3.1 Motivation of the research

This research aims at contributing to the successful introduction of new information and communication technology. The execution of this research can be motivated from several viewpoints. Both from a governmental and from an industrial point of view this research has relevance.

Government policy

In 1996 the following slogan was introduced: The Netherlands should grow from main port to brain port (Booij, Van Bruggen and Baidenmann, 1996). The slogan aims at the transformation of the Netherlands from a country in which distribution of goods is an important economic activity to a country in which the distribution of information takes a central place. A brain port should be developed both in terms of knowledge distribution as well as in terms of the distribution of bits and bytes.

In order to create such a brain port, a solid basis of media from which electronic information can be retrieved, should be built. Several initiatives have been started to obtain this goal. For example.

- In 1994 the Dutch government initiated the National Action Program Electronic Highway (1994). This program aims at making the Netherlands a European leader in the development of the information superhighway. A number of benchmark-studies show that the Netherlands is making good progress but also that further investments are necessary to realise the intended ambitions (Internet 1, 1998).
- Public Locator 2000 (Overheidsloket 2000) has been specified by the Dutch government as a nation-wide network of desks, to be consulted by citizens, trade and industry for information and public products and services (Internet 2, 1998).

Industrial motivation

Not only the Dutch government realises the importance of information and communication technology. Industry also sees new business opportunities. However, many of the initiatives that have been taken, eventually failed on the consumer market.

When a new product or a new service is introduced the question of its likely success is raised. Before this question can be answered, the following has to be taken into account. New products or services often emerge from:

- new technological developments or
- an idea of a producer who seeks buyers for his products.

The question about the chances for success is almost always answered from the same technological or supply-side perspective: the same perspective that was used to develop the product or service. This technology or supply side perspective is appropriate to develop new products but it is not suited to determine the chances for success. Some illustrative examples.

- *Videotex*: this medium offered the possibility to consult many on-line information services. However, the menu driven interface turned out to be too complicated for the public. Consequently Videotex was only accessible for the true dabbler.
- *CD-i*: a wonderful product: beautiful technology and easy to use. A complete encyclopaedia on a single CD! A technical miracle! But how often does one look in an encyclopaedia? Which need does the CD-i fulfil?

Both media failed to be a success in the consumer market. One of the reasons for this failure is that the chances of success were determined from a technological and a supplier perspective. Consequently, the weaknesses of these media did not become apparent. However, the failure of these products can be explained from a user perspective. If the success of CD-i and Videotex had been predicted from the user perspective it might have been possible to see that these products could not be successful on the consumer market. Summarising, it is not the user perspective in itself that makes a medium successful or not. However, the user perspective can help to identify the strengths and weaknesses of a (new) medium.

1.3.2 Research goal and central questions

The goal of this research is:

*to obtain insight into the process of communication,
for media that provide electronic information,
from a user perspective.*

More specifically, this research aims at identifying what media are used for what purpose in which situation. Based on this insight it should be possible to improve the match between supply and demand of information. A better match between supply and demand can contribute to a more successful introduction of a new medium. In order to reach this goal several research questions should be answered.

- How can media that provide electronic information be distinguished from other media and which (new) media are available in the Netherlands?
- Which (clusters of) factors influence the process of communication in general?
- How do these (clusters of) factors influence the relation between information need and media choice?

The answer to these questions provides insight into the process of communication from a user perspective. This insight is of value for several target groups. First, people on the supply side can learn how to match their services to consumer needs and thus create a better chance of a successful service. The results are not only interesting for service providers but also for content providers.

Second, also for researchers this work contains interesting results as it contributes to the body of research on new media use. Researchers from social sciences are the primary target group. But the work is also of interest for technological scientists who would like to base their research on actual consumer needs rather than develop technology out of personal interest or intuition.

Thirdly, this work contains relevant results for methodologists. The research methods that were chosen are relatively uncommon. The preliminary research is based on meta-analysis and Q-methodology and the main research uses the policy capturing method.

1.4 Research approach

The goal of this research is to obtain insight into the process of communication. In order to obtain this insight the research has a strong empirical basis. In both the preliminary and the main research the real world was chosen as the source of information. The research basically is divided in three parts:

- a sketch of the field of media in general and more specifically media from which electronic information can be retrieved;
- the preliminary research focuses on the factors that influence the process of communication that was sketched in section 1.2 and
- the main research focuses on the way in which these factors influence the relation between information need and media choice.
- The theoretical background in this research is based on three notions.
- The supply of electronic information is mainly explained by the concept of convergence. New media develop from the convergence of networks and or services (see Chapter 2).

- For the process of communication the information need is taken as a starting point. By investigating user needs, the user perspective was filled in. The roots of this research method can be found in the uses and gratifications approach (Chapter 4).
- The relation between information need and media choice is described in terms of contingency: media choice is explained in terms of a match between information need, user, and media characteristics (see also Chapter 4).

Structure of the text

Chapter 2 starts with a framework that outlines the field of media that provide electronic information. Based on this delineation five media are described in detail: Telephone Service Numbers, Teletext, CD-i and CD-ROM, Videotex, and Internet. These media are described in terms of past developments, configuration, services, supply of information, current use, and future developments. The result is an overview of media that provide electronic information in the Netherlands.

Chapter 3 provides an exploration of the process model of communication that was developed in this chapter. The central issue in Chapter 3 is to find those factors that influence the process of communication. Q-methodology is used to determine these factors. The results of this chapter show the importance of factors like context, topicality, uniqueness, and interaction. Also several user related factors are identified.

Chapter 4 provides an overview of several theories that relate to the process of communication. This overview, together with the result of Chapter 3, results in a conceptual model that will be tested in Chapter 5.

The goal of Chapter 5 is to determine in what way a certain need for information is related to media choice, while taking differences between users into account. A policy capturing study is performed in order to obtain this goal. In this approach several hypothetical information needs (cases) are presented to the respondents. Respondents are asked to choose a medium with which this information need can be solved. Results show that particularly differences in information needs influence media choice.

The last chapter of this work (Chapter 6) contains the conclusions for the whole research. A summary of results will be presented and the research questions will be answered. Attention will be paid to practical implications of the research and opportunities for further research.

Research area - Delineation and description of new media

Before it is possible to look at media use it is necessary to gain an overview of the media from which electronic information can be obtained. Here the media are available to users are described. The first section provides a characterisation of media in general and media that are central in this research. The second section provides a description of five media from which electronic information can be obtained. Telephone service numbers, Teletext, Off-line media (CD-i and CD-ROM), Videotex and Internet are described in terms of past developments, configuration, services, supply of information, current use and future developments.

2.1 Media characteristics

The first section provides a characterisation of media in general and media that are central in this research. Several viewpoints are used to distinguish media in general from media from which electronic information can be obtained. First, a timeline indicates when several media were introduced. This demonstrates the difference between old and new media. Also the issue of convergence will be addressed here. Secondly, a layer model sketches the elements of which a medium is built. Thirdly, the model of Bordewijk and Van Kaam distinguishes media in general from media that allow the user to search for information.

The outset of this section is a definition of media. Fiske (1990) defines media as '*those technical and physical means of converting the message into a signal capable of being transmitted along a channel*'. In this broad definition telephone is a medium, e-mail is a medium as is face-to-face communication. The

technological or physical properties of a medium are determined by the nature of the channel or channels available for its use. This concerns not only the transport of information but also the peripheral equipment and hard- and software that is used. Thus, in this definition the medium tells something about the form in which the information is conveyed from sender to receiver. For example, for e-mail it is written word and for telephone it is spoken word. Face-to-face communication offers spoken word and in addition facial expressions.

With this definition three ways to look at media will now be presented. Together these viewpoints will provide a delineation of the research area.

2.1.1 New media

The first way to distinguish media in general from the media that are the object of research is the distinction between old and new media.

In many textbooks the term 'new media' is used. However, the difference between old and new is not very clear-cut. In the seventies, for example videophone was introduced as a new medium. Now, some twenty years later, again videoconference, now in a digital form, is introduced as a new medium.

Here, the definition of new media of Williams, Rice and Rogers (1988) is used. They define new media as 'those media technologies, mostly electronic and digital, that are undergoing expansion in our times. The key technologies underlying the new media include microelectronics, computers, and telecommunications networks'.

Information technology can be found in three area's: broadcast, telecommunications, and computing. Broadcast originates from radio and television. New developments relate to the use of Teletext. CD-i can also be placed in the broadcast area because it strongly relates to the use of television. In the area of telecommunications telephony can be found, as well as fax and Service Numbers (0800/0900). In the area of computing for example the personal computer and CD-ROM can be found.

The developments in new media are mainly the consequence of the convergence between the worlds of broadcast and video, computers and information technology and telecommunication (Arnbak, van Cuilenburg and Dommering, 1990). New media emerged because several technologies were combined.

Figure 2-2 illustrates the consequences of the trend of convergence over the past decades. From left to right the figure shows a timeline on which the introduction of several new media is marked. Besides that, the three areas of broadcast, telecommunication and computing are presented. The overlap between the areas indicates where convergence can be found. The figure is not exhaustive, other examples can be placed in this figure.

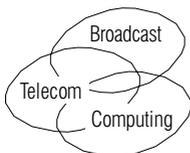


Figure 2-1 Convergence

Figure 2-2
Developments in
Telecommunications
(based on Ungerer,
1988)

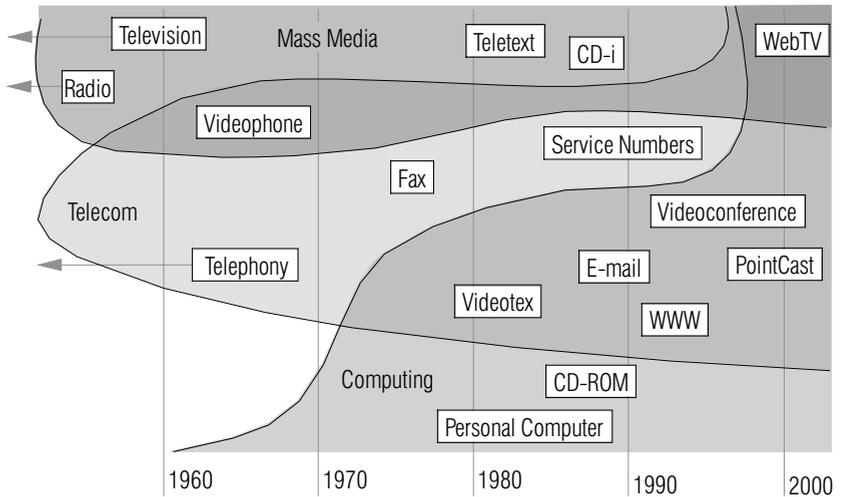


Figure 2-2 shows that the convergence between computers and telecommunication is a particularly fruitful combination. New media such as Videotex, WWW, E-mail, and Videoconference have emerged from this trend. One of the newest possibilities includes all three areas. WebTV allows a user to search for information on the Internet using a television as presentation medium and a telephone line as communication medium (see also section 2.2.3).

2.1.2 Electronic media

A second distinction between media in general and the media that are the object of research is a distinction between electronic and non-electronic media.

For centuries spoken and written word were the most important forms of communication. The link between sender and receiver was relatively simple: communication took place on a face-to-face basis or on paper. Since the end of the previous century, a large number of different media developed. These new - and mostly electronic - media can be distinguished from spoken and written word by the way in which sender and receiver are linked to each other: some kind of network intermediates communication.

In the early nineties the Dutch Media Council developed a model that describes the electronic link between sender and receiver. The model maintains two starting points. First of all, the model distinguishes between content and transport. The content of a message should be separated from the route that it takes. Secondly, the model describes the telecommunication process by means of a number of layers. Each layer in the model adds some kind of value to the previous layer(s). Services within one layer add the same kind of value. For an extensive description of layer

models see *Visser, Pires and Quartel, 1993*. In total the model consist of five layers. With regard to transport three layers are distinguished (*Smits & De Vries, 1993*).

- *Infrastructure*: services on this layer offer transmission capacity and (universal) access to the network.
- *Network Services*: these services route the information from a sender to the user. Examples are (mobile) telephony, data communication, and the distribution of the television signal.
- *Value Added Services*: these services provide additional services to the basic services. Examples are telephone service numbers, Teletext, Videotex, and E-mail.

With regard to content two more layers are distinguished.

- *Information Services*: on this layer the organisations that gather, process and make information available to the user can be found. Examples are NOS Teletekst, and Videotex NL.
- *Information*: the top layer relates to the content itself: examples are an E-mail message and a HTML-page.

Figure 2-3 A model of telecommunication (*Mediaraad, 1993*).

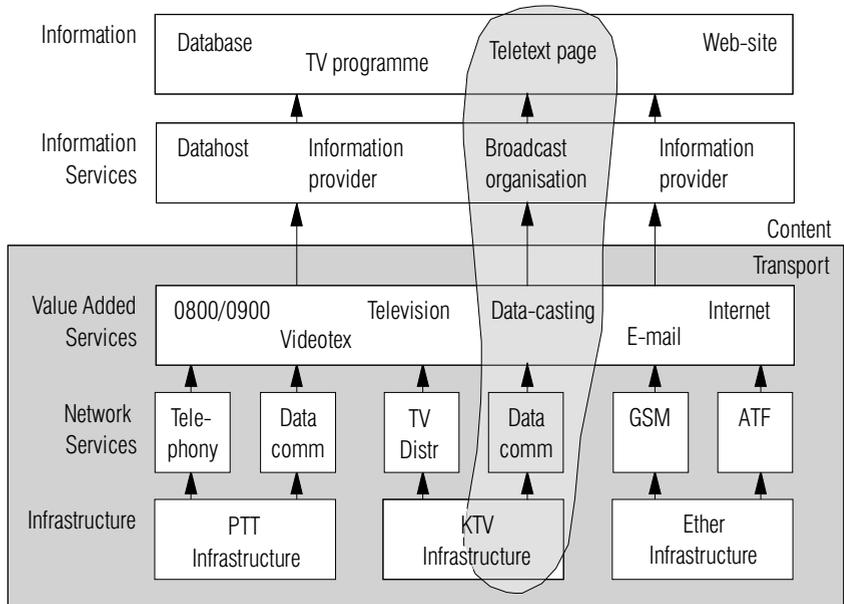


Figure 2-3 illustrates the distinction between transport and content and shows the five layers of the model. In each of the layers some examples are given. The model describes the elements of which a medium is constructed. The grey area in Figure 2-3 indicates which elements are needed for Teletext.

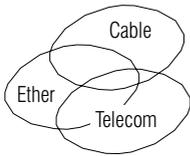


Figure 2-4 Network convergence

Basically three types of networks can be distinguished: the ether network, the fixed telecom network and the cable network (Arnbak et al., 1990). As a consequence of digitalisation and network developments these networks are converging. The different networks carry similar services.

2.1.3 Interactive media

A third way to distinguish between media in general and the media that are the object of research is based on interactivity. Interactivity is one of the most outstanding differences between media in general and the media in this research. The problem, however, is that all media are, in one way or another, interactive. As soon as a user pushes the 'on'-button there is interactivity. After all the machine responds by turning itself on. Interaction with the media in this research however, contains much more than turning a machine on or off. In order to define interactivity it is necessary to look at the role of sender and receiver.

A classification that relates to the role of the sender and receiver is the framework of Bordewijk and Van Kaam (1982). This framework relates to the degree of freedom that each of the two parties have on the content and on the time schedule. In the framework of Bordewijk and Van Kaam four communication patterns are distinguished on the basis of two criteria: the source of the data (individual user or a central organisation such as a broadcast organisation) and control over the scheduling of data reception concerning theme, timetable or speed (individual user or a central organisation). This results in four categories as displayed in Table 2-1, i.e. broadcasting, registration, consultation, and communication.

Table 2-1 Traffic patterns (Bordewijk and Van Kaam, 1982).

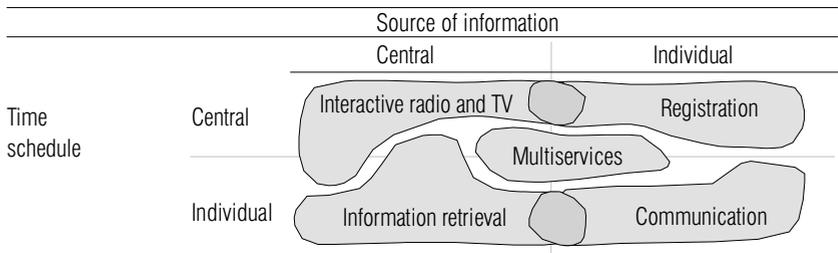
		Source of information	
		Central	Individual
Time	Central	Broadcasting	Registration
Schedule	Individual	Consultation	Communication

According tot Arnbak et al. (1990) these traffic patterns can be characterised as follows: *Broadcasting* is the distribution of information towards a group of individuals, where both the source of information and the time schedule are determined by a central authority e.g. radio or television. *Registration* is the collection of information that is distributed over many individuals by a central authority. Here the time schedule is determined by a central authority. However, the information is supplied by the individual. An example of registration is remote sensing. *Consultation* is the request of specific, centrally stored information, where the time schedule is determined by the individual e.g. Videotex and Teletext. *Communication* is the exchange of information between at least two

individuals, where both the source of information and the time schedule can be determined individually.

It appears, however, that this classification is not sufficiently expressive for many of the new media. New media such as interactive television do not fit nicely into this framework. More specifically, consultation media show overlap with both broadcasting media (e.g. Teletext) and conversation media (e.g. bulletin boards). The classification of Bordewijk and Van Kaam can be redrawn as is shown in Table 2-2. Five new types of services emerge: interactive television, information retrieval, registration, communication, and multiservices (Bornkamp, Eertink, Velthausz, and Van de Wijngaert, 1995).

Table 2-2 The fading border of traffic Patterns (Bornkamp et al., 1995)



The media that are central in this research are media for information retrieval. That is, media from which electronic information can be obtained. For different media this can vary between a relatively small, centrally coordinated database (for example, Teletext) to an incredibly large distributed store of information that changes constantly (such as WWW).

Williams, Rice, and Rogers (1988) place interactivity in a broader context. Their notion of interactivity not only concerns mediated communication but also face-to-face communication.

They define interactivity as the degree to which participants in a communication process have control over, and exchange roles in, their mutual discourse. *Mutual discourse* is the degree to which a given communication act is based on a prior series of communications acts, A's response to B depends on B's prior response to A's initial communication acts. *Exchange of roles* refers to the ability of individual A to take the position of individual B and thus to perform B's communication acts, and vice versa. *Control* is the extent to which an individual can choose the timing, content, and sequence of a communication act, search out alternative choices, add information into the service for other users, and perhaps create new system capabilities. And *participants* are at least one individual communicating with at least one source of information, or two or more individuals using common media. Based on these concepts, Williams et al. define three orders of interactivity. The highest order is face-to-face communication. The second order is (computer)mediated communication between humans.

The third and lowest order of interactivity is human-to-machine communication. This last category refers to the media in this research.

2.1.4 Summary

The purpose of this section was to provide an overview of media in general in relation to the media that are central in this research. Several perspectives were used to distinguish media in general from the media that are central in this research.

- A timeline showed that the development of new media is the consequence of convergence between the areas of broadcast, telecommunications, and computing.
- The layer model of telecommunications showed that the media in this research use a network of some kind to link sender and receiver together.
- The traffic patterns of Bordewijk and Van Kaam were used to emphasise the role of both the sender and receiver.

None of these viewpoints provide a clear-cut delineation of the research area. However, every distinction that is made sheds another light upon the research area. Together these perspectives do outline the research area: that of new media from which electronic information can be obtained.

2.2 Media that provide electronic information

The previous section has provided an overview of ways to look at media. This section will examine five media from which electronic information can be obtained. telephone service numbers, Teletext, Off-line Media (CD-i and CD-ROM) Videotex, and Internet are included in an overview of the Dutch market. This section provides insight into those aspects that are relevant to users and usage of these five media. The media are described in terms of four different criteria.

- *Past development*: a short description of the most important past developments of a medium.
- *Configuration*: the way services can be accessed, the way in which users can search for information and/or perform transactions.
- *Services and usage*: describes the degree of diffusion of services (e.g. number of services, market size, penetration rate, level of usage).
- *New developments*: future trends and possibilities.

2.2.1 Telephone service numbers

Telephone service numbers (i.e. Audiotex, Voice response, 0800/0900 or 06-numbers) basically stand for telephone-based information and

entertainment services for which consumers pay either more (kiosk or premium rate services) or less (green numbers, free phone) than the regular charges (Latzner and Thomas, 1993).

Past developments

Although it has been possible to request information using a telephone for a long time, it took until 1984 until the first toll free numbers were introduced. In 1986 premium rate services were introduced (PTT Telecom/Call media, 1993). In these first years the so called 06-numbers were primarily used for pornographic purposes. Both tapes and live chat were very popular. In 1989 eighty percent of the services were of a pornographic nature (Bouwman and Slaa, 1993). This gave telephone service numbers a dubious reputation. A number of unexplained excessive high telephone bills reinforced this image. This hampered the fast development of more serious service numbers.

In 1997 the prefix 06- was changed to 0800- (free) and 0900- (premium rate). The reason for this switch firstly was to harmonise with international number plans (06 for mobile communication and 0800/0900 for service numbers). Secondly, it opened up the possibility to change the controversial image of 06-numbers to a more acceptable one.

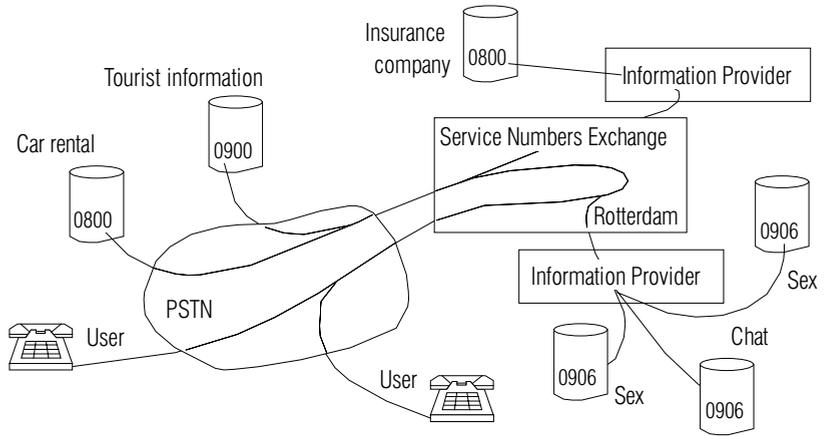
Configuration

The only thing that is needed to use a telephone service number is a telephone and a subscription. In most cases a normal telephone is sufficient. For some services a Dual Tone Multi Frequency (DTMF) phone (i.e. a phone that uses tones instead of pulses) is needed.

All 0800- and 0900- calls are directly routed to a special telephone exchange in Rotterdam. In this way a Service Number call is separated from the regular traffic. By doing so, possibilities such as no charges, extra charges and menu choices can be offered (PTT Telecom/Callmedia, 1996).

From the Service Number Exchange the telephone calls are re-routed to information services on the regular telephone network or forwarded to professional information providers who handle the calls, often for third parties. Figure 2-5 shows how a user can be connected via the Public Switched Telephone Network (PSTN) to a Service number.

Figure 2-5 Configuration of telephone service numbers



Searching for information with service numbers is limited to ‘audio-menus’: possible choices are read out loud to the user who can then choose by means of the telephone pad. Most Service Numbers also offer the opportunity to talk to an operator or to an expert.

Services and use

In 1997 PTT Telecom started with the Service Numbers 0800/090x instead of the old 06-numbers. The prefix refers to the type of information that can be found at a certain telephone number (see Table 2-3). Most part of Service Numbers still offer pornographic services. Over fifty percent of the services are related to this kind of entertainment. The rest of the services provide a large number of other possibilities. Examples are tourist information, ticket offices, medical information, and product information. About 35 percent of the services are free of charge. The remaining services (thirteen percent) are serious services for which extra charges have to be paid (KPN Telecom, 1997).

Table 2-3 Different types of service numbers (KPN Telecom, 1997)

Prefix	Service number	percentage
0800	Toll free services (public information)	24.4
0800	Toll free services (business information)	10.3
0900	Premium rate services (serious information and entertainment)	13.1
0906	Premium rate services (pornographic entertainment)	52.2

The difference between toll free and premium rate services can be explained in terms of who profits most from telephone contact: the service provider or the user. For toll free numbers the interest lies with the service provider. In many cases it concerns pre- and post sale activities. By introducing a toll free, low threshold entrance it is easier to contact

customers. The types of services that are provided by these information providers are depicted in Table 2-4.

Table 2-4 Type of information on Service Numbers (Response Partners, 1996).

Type of service	percentage
customer service	38
direct sales	17
product information	13
Complaints	10
Reservations	4

For premium rate services the interest lies with the user. Here it concerns services where the information itself is the product. The user is willing to pay for the information that is provided. In some cases the service provider eliminates alternatives and forces the caller to use the premium rate service. Tariffs vary from f 0.03 per minute to f 1.05 per minute (KPN Telecom, 1997).

Usage level

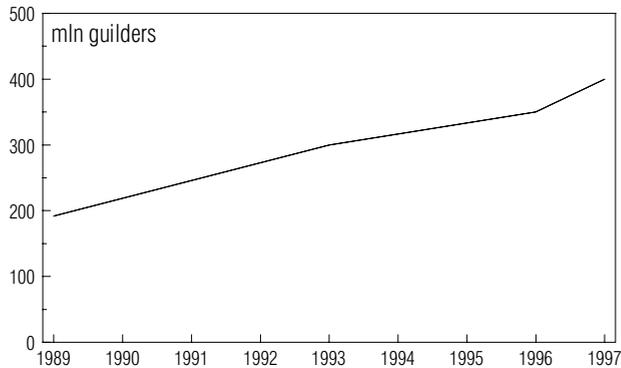
Approximately 95 percent of the Dutch households have access to a telephone. The average number of telephone calls per week is seventeen. Each call on average takes four minutes. Approximately ten percent of the telephone calls have a functional character: shops, information services, repair services, doctors etcetera (Bergman, Frissen and Slaa, 1995).

Almost everybody (98 percent) is familiar with telephone service numbers. Many people (92 percent) know that some of the numbers are toll free and others are not. How much has to be paid for a telephone call is less clear. Costs in general do not seem to influence whether users pick up the telephone or not. For consumers it is important that calling a service number is useful and easy. The fact that some money has to be paid for this service is less important. Costs are seen as a problem when the waiting time increases (PTT Telecom/Call media, 1996 I).

Market size

The market for Service Numbers is hard to estimate. KPN Telecom provides the infrastructure which is part of their concession. Approximately fifty percent of the turnover of the telephone service number market is part of the concession of KPN Telecom. (Bouwman, Van Stralen and Vlietman, 1997). Other parties provide information services or play an intermediate role. These parties are responsible for the other fifty percent of the turnover. Since the introduction of service numbers the turnover of this market has grown steadily. See Figure 2-6.

Figure 2-6 Estimation of Market size Service Numbers (Bouwman, Van Stralen and Vlietman, 1997)



New Developments

Pay per Call

At the moment the price of almost all service numbers is based on the amount of time a user is connected to a service. In the past every minute (or tic) was charged. Nowadays charges are paid by the second. A new development is pay per call. Pay per call offers the possibility to charge a certain amount of money each time a call is completed.

Call TV

Some time ago a new type of television programs emerged: Call TV. The program is mostly broadcasted during day-time and in the night. An anchorman talks to viewers on the phone. The viewers call an 0800-number for one guilder per minute. Sometimes several callers are on the telephone. The television program is filled with chat, television games and is financed by the commercials and callers.

2.2.2 Teletext

Teletext is a data information service offering information on demand. It is transmitted together with normal television signal. A television with Teletext facilities is used to receive the data.

Past Developments

Teletext started in the Netherlands in 1980. The Dutch version of Teletext (NOS Teletekst) started with some fifty pages of information with news, service, and broadcast information (De Grooff, 1980). Now NOS Teletekst consists of a few hundred pages of topical information on a variety of subjects. Besides NOS Teletekst also other broadcast organisations offer Teletext services. Examples are RTLtext and CEEFAX of the BBC.

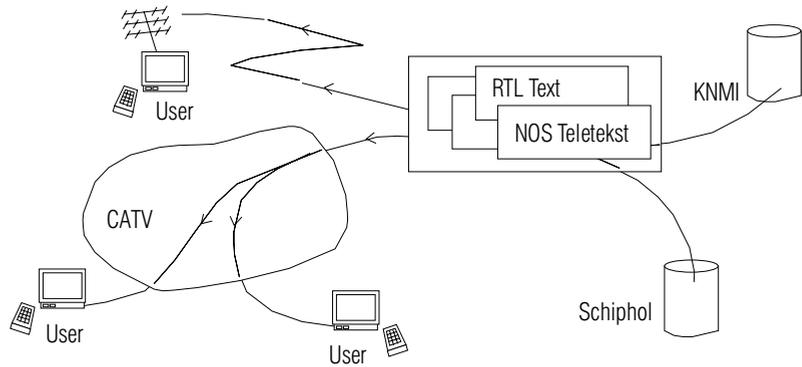
Since 1993 NOS Teletekst offers Program Delivery Control (PDC). PDC is a system that allows easy programming of a video recorder. The advantage of PDC is that the recorder starts when the program starts, even

when it is broadcasted later than was announced. PDC can only be used on video recorders that are equipped with a PDC facility.

Configuration

Teletext is a one-way system for the transmission of text and simple graphics through the air or via the cable system. The Teletext signal ‘hitch-hikes’ on the spare capacity of the television signal. The spare lines of a channel are used to carry the Teletext information. Each television channel can have its own Teletext pages. The most important service in the Netherlands is provided by NOS Teletekst. Teletext can only be received on a television set equipped with a Teletext decoder (Internet 3, 1998). Figure 2-7 shows how a user can be connected to the information in Teletext.

Figure 2-7 Teletext configuration



Teletext basically is a large set of pages that are transmitted continuously. The basic structure of Teletext is divided in pages and subpages. Teletext allows viewers to select which pages they want to see. This selection takes place by means of the television remote control. (Aumente, 1987, Arnbak et al., 1990). Using Teletext is free of charge.

Figure 2-8 Several pages in NOS Teletekst
a index page
b financial page
c weather page

Services and use

As NOS Teletekst is the most important supplier of Teletext services in the Netherlands, only this service will be discussed here.

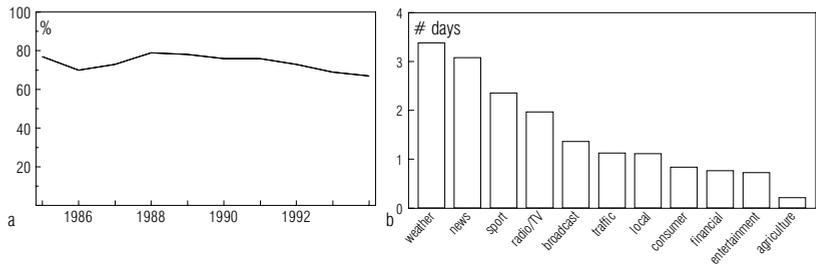


The headings in NOS Teletekst are: news, weather, radio, and television: programming information, roads, and travel, financial information, sports, entertainment, agriculture information, and subtitles. Figure 2-8 shows several pages of NOS Teletekst.

Level of use

In 77 percent of the Dutch households a television set with a Teletext decoder is available. Although Teletext use is declining slowly, use has been high and constant over the past ten to fifteen years (see Figure 2-9a). In 1994, 67 percent of the people used Teletext at least once a week. In general Teletext as a whole is appreciated: the average mark that is given over the past years is 7.5 (on a scale from one to 10). The only disadvantage of Teletext is the long waiting time: 45 percent of the users experience the waiting time as an inconvenience (Meijs, 1995).

Figure 2-9 Teletext use
 a. Number of regular users
 b. Average number of consults per subject per week



Weather, news, and sports are the most important sections in Teletext, followed by information on radio and television, and the Dutch public broadcast organisations (Meijs, 1995). Figure 2-9b shows which headings are used a lot and which are less important.

New developments

Resolution and Fasttext

New Televisions are equipped with a new generation Teletext chips. These new chips allows higher resolution pictures and Fasttext. Fasttext is comparable to hyperlinks in Internet. However, in Internet usually a word or picture is a hyperlink. Fasttext works with colours, for example, red for the previous page, yellow for the next page, blue for more information on the subject. The remote control of the television has four coloured buttons that correspond to the hyperlink.

Interactive Teletext

In Teletext users choose the pages they want to see, comparable to watching only a few television channels while all channels are broadcasted. Interaction is thus restricted to selection. A development in Teletext technology is interactive Teletext. Here the user can actually influence what information is transmitted. Services that are offered are train departure information and information from insurance companies.



Figure 2-10 A telephone pad

The telephone is used as a return channel. Because a telephone only offers the keys zero through nine, * and # interaction is still very much restricted. Typing a word for example is a laborious process (1 for A, 2 for B, 3 for C, ...). Moreover, people need to possess a DTMF telephone and the TV and telephone have to be within sight of each other. Because of these reasons Interactive Teletext has not been very successful yet (Hartkamp, 1993).

Teletext on the Internet

One of the best visited Internet sites in the Netherlands is the site of NOS Teletekst (Boumans, 1997). From this website it is possible to retrieve all information from NOS Teletekst. In places where a TV is not available and Internet is (for example in the workplace), many people use this form of Teletext to obtain topical information such as news and weather (Internet 4, 1998).

DAB

DAB stands for Digital Audio Broadcasting, in other words, digital radio. Digital radio uses bits unlike an analogue signal where the radio waves are a direct representation of the original sound. The data feature of DAB has the capacity to deliver 150 Teletext-like pages per second, to download Internet pages hundred times faster than the average telephone line. A PC, and a DAB PC card can give newspapers, Teletext-type news services, educational material to back up radio programmes, maps, and illustrations (Internet 5, 1998).

2.2.3 Off-line media

Of course there are many off-line media, such as books and records. However, in this research project *electronic* media are studied. Therefore CD-i and CD-ROM are object of research. The difference between CD-i and CD-ROM and other electronic media is that there is no intervening (public) network between the user and the information that is retrieved. Users have 'physical' access to the information, where CD-i is a television-based system and CD-ROM a computer-based system.

Past developments

In the early seventies Philips experimented with the storage of moving images on disk. At that time it involved analogue technology. By the end of the seventies the step from the analogue laser disk to digital technology was made. In co-operation with Sony, Philips introduced the first audio CD in 1980. In comparison to the LP CD's are small, robust, and produce perfect sound quality. In 1983 follows the public breakthrough of the CD Audio (Van Bussel, 1993).

The next step was the development of a CD that could not only reproduce sound but also text, graphics, and images. More important was the possibility to interact with the system. Interactivity allows the user to browse through information and retrieve only that information that is requested. New standards for CD-ROM (computer) and CD-i (television) follow in respectively 1985 and 1988 (Van Bussel, 1993). After that developments mostly aimed at making faster machines.

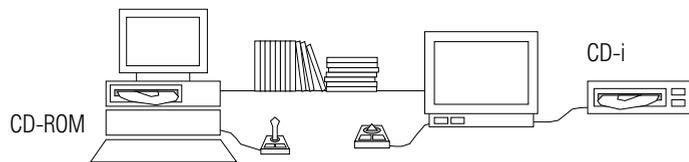
Configuration

Because there is no intermediary network, the configuration is relatively simple. The following elements are needed:

- *an information carrier*: the CD-ROM or CD-i title. Disks are not exchangeable between CD-i and CD-ROM as the operating system is very different for the two systems;
- *a player*: for CD-ROM it is often built in the computer, for CD-i an extra device comparable to an audio CD-player or VCR is needed;
- *a presentation tool*: a computer for CD-ROM and television for CD-i and
- *an interaction tool*: a keyboard, joy-stick or trackball.

Figure 2-11 shows the configuration for CD-ROM and CD-i.

Figure 2-11 CD-configuration



Although the configuration of CD-i and CD-ROM looks very similar, there is one major difference. CD-i is intended to be a plug-and-play system. The installation of a CD-ROM still requires a certain amount of computer experience.

Searching for information using off-line media depends on the way in which a CD-i or CD-ROM is implemented. Possibilities are menus, searching with key-words, and links. Because of the off-line character of these media, communication nor transactions are possible without the use of other media.

Services and use

Over fifty percent of the CD-ROMs that are sold contain games, followed by edutainment and reference guides. As a consequence of the introduction of electronic encyclopaedias, references guides are gaining market share. An overview of all genres is depicted in Table 2-5.

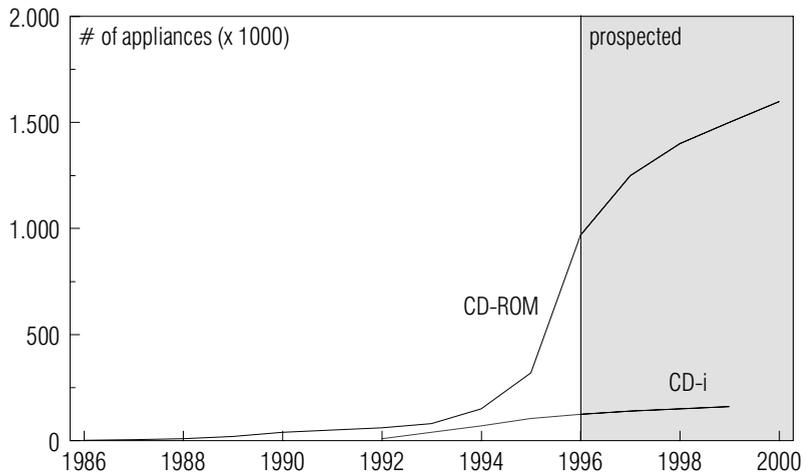
Table 2-5 Turnover for genres in percentage in 1997

	Percentage		Percentage
Games	52	Shareware	5
Infotainment	12	Pornography	4
Reference	7	Home productivity	4
Children	8	Other	2
Education	6		

Level of use

The penetration rate of CD-ROM drives has doubled in 1996 (as well as in 1995). Almost fifty percent of the newly bought personal computers have CD-ROM drive. In November 1996 the penetration rate of personal computers in Dutch households was 42 percent (Internet 6, 1998). The number of CD-i players is much lower as is shown in Figure 2-12. The expectations on the consumer market are also not very positive. However, CD-i is often successfully applied in the business market as a point-of-information (Boumans, 1997).

Figure 2-12 Development of the number of CD-ROM and CD-i appliances in Dutch households (Boumans, 1997)



Several reasons explain this difference between CD-i and CD-ROM. Firstly, Computers often have a built-in CD-ROM player. When a new PC is bought a user automatically gets a CD-ROM. A CD-i player has to be bought separately. Secondly, more and more computer software is distributed on CD-ROM. In order to use a computer it is necessary to have a CD-ROM. A television can be used without CD-i. Thirdly, the number of available titles is much lower for CD-i than CD-ROM. Fourth, television use is at the moment not aimed at active information retrieval. Computers are used much more in that way.

Books versus CD market

Although CD-ROMs will never replace the market of books, there is a relationship between the two media. Many bookstores sell CD-ROMs nowadays and some types of books are gradually replaced by CD-ROM, more particularly, there is a fast growth in the encyclopaedia and reference guide CD-ROM sector. Each year almost one billion guilders is spend on books. Approximately one 164 million is spend on CD-ROM titles. However, this turnover is realised by a much smaller group of active CD-ROM users. (NBLC/Boekblad Business Media, 1997/1998). Table 2-6 shows an overview.

Table 2-6 Comparison of books and CD market (NBLC, Media Business Press, 1997, 1998).

	Books	CD-ROM
Number of sold titles	36,000,000	2,040,000
Number of active users	±14,000,000	400,000
Average number of items per user	2.5	5.1
Turnover (Dfl.)	886,391,000	164,400,000

CD-on-line, WebTV

New developments

A development with regard to CD-i is the consequence of the convergence between broadcast, computing and telecommunication. A television is equipped with a special CD-i player that allows users to access the Internet. This concept is often referred to as CD-on-line, ImageNet or WebTV. Costs and possibilities are comparable to a normal (PC) connection to the Internet (see also section 2.2.5).

2.2.4 Videotex

Videotex is an interactive system that electronically delivers screen text, numbers and graphics via the telephone line (Aumente, 1987).

Past developments

Videotex started in the Netherlands in 1981. The system was called Viditel and was based on the Prestel concept. People had to subscribe to the system which was rather expensive. Videotex use never really took off at the time. In 1990 Videotex was relaunched, based on a Télétel like system. People could access information services by means of a Minitel Terminal or PC and modem. According to Bouwman and Christoffersen (1991) Videotex is a limited success because it is an interlocked innovation: the introduction of Videotex is a combination of innovations on three levels:

- innovation in the telecommunication infrastructure;
- innovation in the supply of new services and
- innovation in the way users fulfil their specific communication and information needs.



Figure 2-13 The Videotex logo

Successful introduction is very hard if one or more of the innovations lags behind. In particular, the supply of new services and transformation of consumer behaviour turned out to be hard to achieve. Besides the difficulties of an interlocked innovation, the development of Videotex was surpassed by Internet. Illustrative of this development is that Videotex has become part of World Access (an Internet Provider). Currently Videotex is mainly used for a number of specific services, mostly aimed at the business market.

Configuration

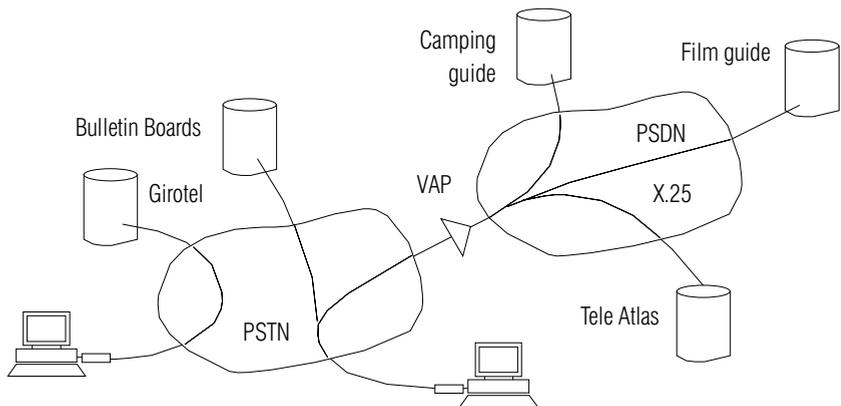
In order to use Videotex a user needs either a PC with modem and the appropriate software or a Minitel terminal. A subscription to a provider is not necessary; all information is (on payment) accessible to the public.

Videotex can basically be used in two ways:

- via a special Videotex number and then to several databases on the public switched data network (PSDN or X.25). The special Videotex numbers are divided in several tariff groups: 06-7400 to 06-7900 number (the highest tariff is one guilder per minute) and
- via a telephone number that provides access to specific services such as Girotel and bulletin boards via the public switched telephone network (PSTN).

This configuration allows the possibility of anonymous use of services (See also Figure 2-14).

Figure 2-14 Videotex configuration



In the beginning of Videotex developments users had to learn commands like *90# but since 1995 the software has a more 'windows-look' and using Videotex is much simpler. Figure 2-15 shows a several Videotex pages.



Figure 2-15 Screens in Videotex

The advantage of Videotex technology is that it is robust and safe. The technology is relatively simple. It is possible to run Videotex on an old PC.

Services and use

The services in Videotex are divided as follows: Enquiries: twenty percent, Telebanking: forty percent (more specifically, Girotel), Business Communication and transaction services, twenty percent, and entertainment (of which many are pornographic) another twenty percent. Table 2-7 offers an overview.

Table 2-7 Type of services in Videotex

Type of service	Percent	Example
Enquiries	20	
Telebanking	40	Girotel
Communication and transaction	20	
Entertainment	20	Suzie (see Figure)

There are 700.000 active users of Videotex. However, not all users (especially the large group of telebankers - forty percent of total use) are aware of the fact that they are using Videotex protocols. The large part of Videotex use is business oriented and many business users also use Videotex for personal use. However, private use of Videotex does not lead to business use. In total Videotex use mounts up to 400 million minutes a year. The length of each session varies between twenty seconds up to fifteen to twenty minutes. Over the years sessions tend to become shorter. In the first place because modems have become faster and secondly because more services provide the opportunity to work off-line and only connect to send all information at once.

New developments

VEMMI

Recently, a new Videotex standard (VEMMI: Videotex Enhanced Men Machine Interface) was introduced. This standard is more Windows oriented and uses the client server model.

Videotex on Internet,
Internet on Videotex

Another development is the possibility to access Internet through Videotex. It only allows text browsing (such as Lynx) but the advantage is that an

Internet subscription is not necessary. The other way around, Videotex via Internet is introduced in 1998. A special URL allows access to Videotex services. The services can be paid for in the same way as normal Videotex services.

2.2.5 Internet

The Internet is a world wide network of computers. The network offers the possibility to exchange information between computers that are connected (LaQuey 1993).

Past developments

While the roots of the Internet have been developed some thirty years ago, it took until the nineties before the Internet made a world wide break through. In May 1993 one of the first Dutch public Internet Service Provider (ISP) called XS4ALL opened up. That same day 500 people subscribed. The Internet became well known to the public when in January 1994, an experiment called 'De Digitale Stad' - The Digital City- started. In this experiment the metaphor of a city was used to provide free access of electronic information. Within weeks all modems were sold out in Amsterdam and The Digital City was accessed more than 100.000 times. Figure 2-16 shows the main gate of The Digital City at a time when a Graphical User Interface was still in the future.

Figure 2-16 DDS 2.0 in 1994 (Internet 7, 1998)



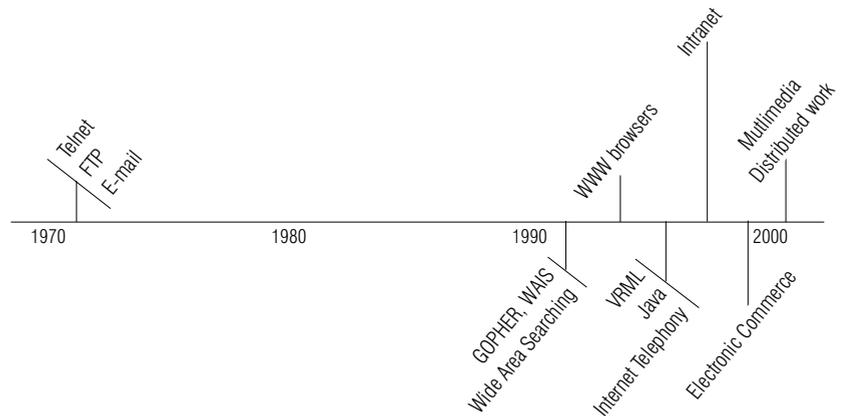
A real explosion in Internet growth came with the development of the World Wide Web. More specifically, applications like Mosaic, Netscape, and later Internet Explorer offered the possibility to (hyper)link documents and added the possibility to include (moving) images, sounds and such. This way the Internet became much more attractive. Consequently, the Internet transformed from a network for the academic and research community to a commercial communications network in a short period of time. After this fast growth several new developments can be distinguished.

- New software technologies such as Java and VRML (Virtual Reality Modelling Language) allowed more advanced applications.

- Intranets (corporate or enterprise network using the Internet Protocol, not necessarily connected to the public Internet) became popular.
- More and more, there is interest in the possibility to perform transactions via the Internet. However, experiments such as I-pay and E-cash have not been very successful. The development of electronic commerce is seen as one of the most important growth areas of the Internet.
- Another area is that of multimedia via the Internet. For the future it is to be expected that capacity problems will gradually be solved. Multimedia applications will then become viable.

Figure 2-17 shows an overview of Internet developments over the past thirty years and near future.

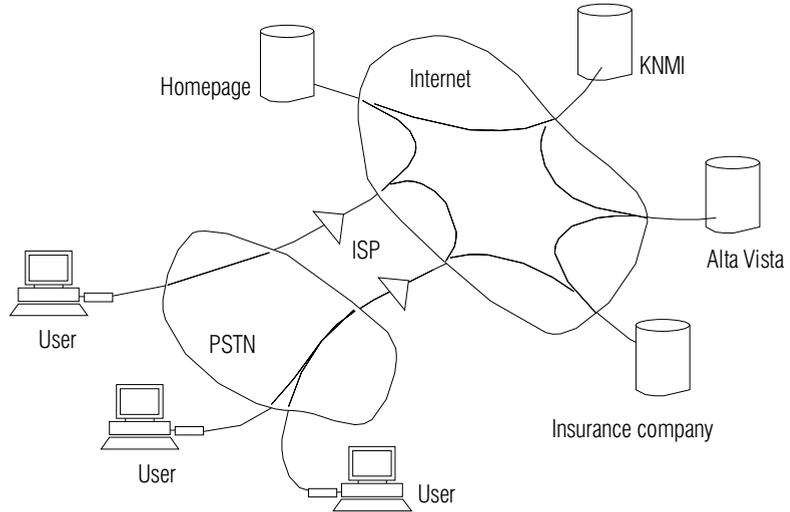
Figure 2-17 An overview of Internet developments



Configuration and usage

In technical terms, the Internet is a loose amalgam of thousands of computer networks, connected via satellites and telephone lines, reaching millions of people all over the world. The network offers the possibility to exchange information between computers that are connected (LaQuey 1993). See Figure 2-18.

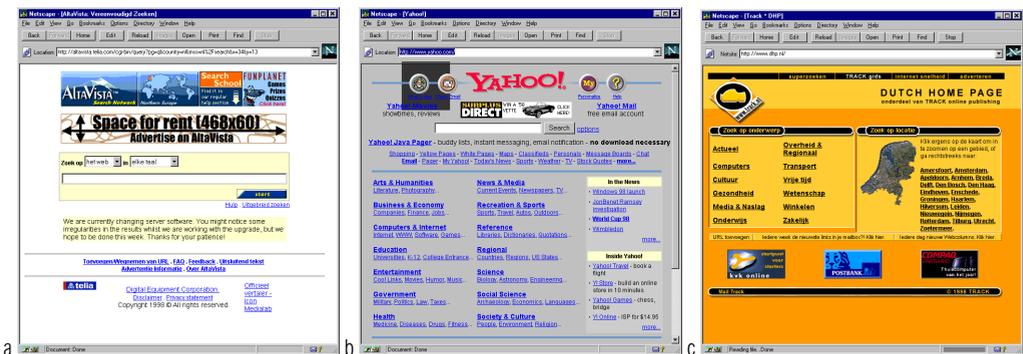
Figure 2-18 Computer and computer network connections on the Internet



In order to obtain access to the Internet individual users need a PC and modem. Moreover, they need to subscribe to an Internet Service Provider. A provider allows a user to gain access to the Internet. For approximately thirty guilders a month individual users can obtain access to the information that is available on Internet (WWW). Also, users can use E-mail and maintain a homepage.

An important tool in the WWW environment is the search engine. A search engine is like a signpost. A search engine has two parts: A "robot" or "crawler" that goes to every page or representative pages on the Web and creates a huge index. The second part is a program that receives a search request, compares it to the entries in the index, and returns results (Internet 8, 1998). Figure 2-19 shows screens from different search engines: AltaVista, Yahoo, and The Dutch Home Page (Internet 9, 10 and 11, 1998).

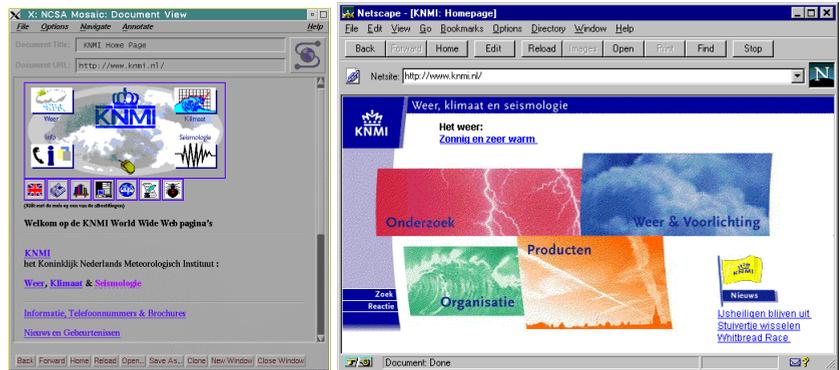
Figure 2-19 Three search engines
 a Alta Vista
 b Yahoo
 c Dutch Home Page (Internet 9, 10 and 11)



Services and use

The Internet characterises itself by the variety of its content: information on everything is provided. In news groups, discussion lists, and World Wide Web (WWW) pages of information on any subject can be found. In other words: 'No matter how eccentric the hobby, how rare the disease, how special the plant, how exotic the holiday: the information can be found on WWW' (De Jong and Van der Veen, 1997). This is what makes Internet special. The success of the Internet can be explained because, for a large part, it is made by ordinary people. Everybody contributed a small part of their expertise. The sum of this expertise is the whole Internet. Because everybody contributed their share, the Internet has become a colourful space in which all kinds of styles find their own place. Consequently, the quality of the information on the Internet is not always of the same level. Some sites provide good quality information but other sites are hopelessly out of date. Professional suppliers of information were for a long time very reserved with regard to the provision of information. For a long period of time organisations used WWW as a simple signboard or cover. Organisations now realise that a WWW site is more than a brochure on the Internet. Figure 2-20 shows two versions of the KNMI (The Royal Dutch Meteorological Institute), one is of summer 1995 and one is spring 1998.

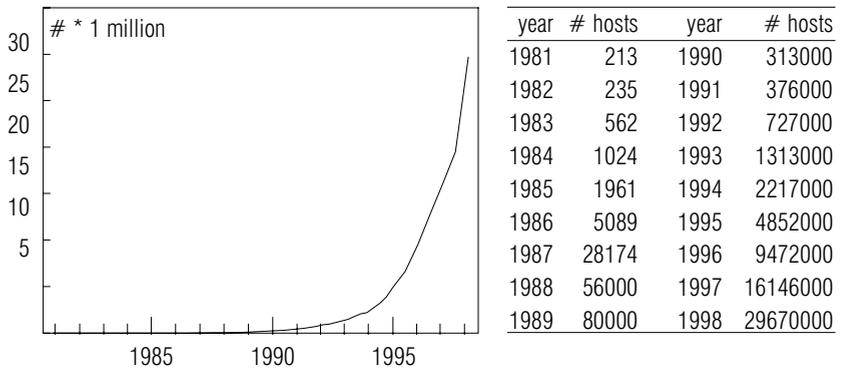
Figure 2-20 KNMI website in 1995 and in 1998



The size of Internet

It is hard to estimate the size of the Internet as it changes, grows and alters every day. The number of hosts provides an estimate of the size of the Internet. In Figure 2-21 an overview of the number of hosts from 1981 to 1998 is presented (Internet 12, 1998). The figure reveals a dramatic increase of the number of hosts.

Figure 2-21 The number of Internet hosts from 1981 to 1998 (Internet 12, 1998).



Not only the number of hosts on the Internet shows an exponential curve like this. A similar curve can be drawn for the number of users, the number of websites and the amount of traffic (IDC/EITO, 1998).

Number of users

The number of Dutch Internet users has doubled to eight percent over the past year (1998). 1.3 million people now have access to the Internet in the Netherlands. Over eleven percent of Dutch households have access to the Internet in 1998 (compared to six percent in 1997). In comparison to other European countries, the Netherlands takes a middle position middle. Scandinavian countries lead with twenty to 32 percent of the people that have Internet access. In the UK this is approximately ten percent, Germany seven percent and in France and Italy the percentage is less than two percent. In the USA thirty percent (62 million) of the population is on-line (Internet 13, 1998). The number of households with access to Internet is expected to rise to 1.3 million in 1999 in the Netherlands (twenty percent of the total number of households). The number of ISDN connections will also increase considerably (Telecombrief, 1998).

Most important sites

On a world wide level, the top 25 visited sites consists mainly of software companies, search engines, Internet Providers, and News Services (Internet 14, 1998). A Dutch report (Boumans, 1997) lists sites with the most hits in the Netherlands in the Netherlands. See Table 2-8.

Table 2-8 Best viewed sites in the Netherlands (Boumans, 1997).

Website	Website
1 Planet Internet	6 De Digitale Stad
2 IDG	7 WebBorn
3 De Telegraaf	8 Veronica
4 Omroep.nl	9 KPN
5 The Internet Plaza	10 World Online

In all overviews pornographic sites are systematically left out. However, the success of Internet can presumably be explained by the possibility to anonymously download large numbers of smutty pictures.

New trends and developments

TV and PC

The integration of TV and PC takes place in two ways. On the one hand a PC is getting more and more characteristics of a TV (Webcasting). The other way around the TV gets characteristics of a PC (WebTV).

Webcasting is the prearranged updating of news, weather, or other selected information based on a user profile (Internet 8, 1998). Currently, Internet users basically search for information themselves. Webcasting sends specific information to the user. An application of this technology is Pointcast. This is an example of an information push-service. The information sent to the user is based on personal interests (Internet 15, 1998).

WebTV is the convergence of the World Wide Web with television. By means of a set-top box it is possible to browse Web pages. WebTV uses a television set as an output device but the signal is transported through a modem and a telephone line (Internet 16, 1998).

Intelligent agents

An intelligent agent (or simply an agent) is a program that gathers information or performs some other service without the immediate presence of a user and on some regular schedule. Typically, an agent program, using parameters that a user has provided, searches all or some part of the Internet, gathers information someone is interested in, and presents it to the user on a daily or other periodic basis (Internet 8, 1998).

2.3 Conclusion

This chapter basically has two parts. In the first part media in general were compared to media from which electronic information can be obtained. The second part gave a description of five of these media.

The most important force behind the emergence of new media in the past and future is convergence. Since the fifties, information and communication technology, telecommunication and broadcast have developed rapidly. Technologies have integrated and converged. These developments are the consequence of the digitalisation of information, but other technological developments have also contributed to the convergence of the previously separated areas.

The five media that were central in the second part of this chapter have emerged from converging areas. Internet is for example the consequence of convergence between telecommunication and information technology. Future developments are still characterised by convergence. The possibility

to obtain information from Teletext via Internet indicates the convergence from two relatively new media to another new medium.

Although convergence can explain new technological possibilities, it does not explain the actual use of new media. Media use depends on what people can do with media. This in turn depends on a user's evaluation of these media. The next chapter addresses the question of how users perceive these five media: what do they think is important and in what way is it important.

Secondly, the use of new media not only depends on the existence of these media. A medium is chosen from a broad range of media: both electronic or not, old or new and on-line or off-line. Chapter five explores this issue.

Preliminary research - Technology, task and (user) context

This chapter provides a first exploration of what factors influence the process of communication for new media. The central issue in this chapter is to find those factors that influence the process. Four meta-analysis studies are taken as a starting point for the preliminary research. Empirical research, based on Q-methodology, shows the importance of technology, task and (user) context. The match between task and technology (i.e. which question with which media) and the match between (user) context and technology (i.e. accessibility) prove to be important.

3.1 Introduction

In the first chapter a process model of communication was presented. This model only says something about the phases in the process of communication, but the model does say little about the way in which the process takes place. This chapter provides a first exploration of how the process really works. An attempt is made to get a general overview over the factors that influence the process of communication with regard to several media from which electronic information can be obtained. Also, the relative importance of these factors is sought. The research questions in this section therefore are as follows.

- Which (clusters of) factors influence the process of communication in general according to a theoretical point of view?
- Are the same (clusters of) factors relevant for media from which electronic information can be obtained?

These research questions will be answered in several steps. First of all a general literature study is performed. The goal of this literature study is to

obtain insight into a range of factors that influence the process of communication. A number of meta-analysis studies serve as input for this study.

Based on these theoretical insights, an empirical study with regard to the relevance and importance of the found (clusters of) factors will be performed. The goal of the empirical research is to obtain insight into the most important factors. Q-methodology will be used as a method of data gathering, followed by factor analysis for data analysis.

3.2 Theoretical background

This section provides a general overview of theoretical insights with regard to information needs, media choice, and media use. This literature study is based on several meta-analysis studies. Meta-analysis is a structured method of literature research. The aim of meta-analysis is to perform a literature study in an objective and scientifically accepted way, by (Light and Pillemer, 1984):

- formulating an exact and accurate research question;
- systematically search for relevant studies and
- extracting and analysing data from studies in such a way that they can be imitated and replicated.

In this study separate meta-analysis study will not be performed. Instead, this study will build on several meta-analysis studies of others. Of course, the disadvantage of this approach is that none of the studies exactly matches our research question. The advantage however, is that (due to the variance in research questions) this allows us to obtain a broad view on media use. It is more effective to combine several studies of other people rather than to perform a meta-analysis ourselves. Based on an extensive literature study, four relevant meta-analysis studies were found and included in this research:

- Atkin and LaRose (1994): A meta-analysis of the Information Services Adoption literature;
- Bouwman and Neijens (1991) A meta-analysis of Videotex literature: an attempt to formulate an adoption model for the consumer market;
- Van den Hooff (1997) A study on the variables and relationships with regard to the adoption, use and effects of electronic mail in organisations and
- Benbasat and Lim (1993) The effect of group, task, context, and technology variables on the usefulness of group support systems.

All of these studies provide the reader with a large number of variables that influence media use in one way or another. Although several terms and names are used by the authors, all variables or factors can roughly be placed

in one of the following categories: contextual characteristics (i.e. user, group, organisational, and context characteristics), task characteristics, and characteristics of the technology. Below, the focus is on the results for each of the three clusters of factors. This overview will give a general outline of existing theories. In Chapter 4 several theoretical insights will be described in much more detail. In this chapter the sole goal is to obtain a general overview of the factors that influence the process of communication.

User, group,
organisational, and
context characteristics

A first and often used cluster of variables consists of a number of socio-demographic characteristics such as age, income, education, and occupation.

A second cluster of factors is related to attitudes, opinions, and ideas of users towards technology in general and a certain innovation in particular. People with a positive attitude tend to adopt a medium sooner than people with a negative attitude. Willingness to change, creativity, and innovativeness are other factors that influence the way in which people adopt media. Rogers (1983) provides the best known study with regard to the adoption of innovations.

The third cluster of (user) context characteristics, mentioned most strongly by Bouwman et al. (1991), relates to experience and information seeking behaviour. Habits strongly influence media use. This also related to the (dis)continuity factor mentioned by Atkin and LaRose (1994). If habits need to be changed drastically, it is very hard to get a medium adopted by a large group of people.

A fourth cluster of user characteristic relates to the type and amount of equipment a user possesses. This factor, mentioned by Bouwman et al. (1991), first of all, determines whether or not a potential user is physically able to use a medium. Secondly, there is a relationship between the possession of much modern equipment and a more positive attitude towards technology.

The last cluster of factors with regard to (user) context characteristics refers to the context in which communication takes place. Individual characteristics are not alone in playing a role in media use, also the group in which someone takes part influences behaviour. If there are, for example, many other users of a medium, one tends to join in. Critical mass theory strongly relates to these ideas on a meso and macro level of research (see Maxwell and Oliver, 1993). On the individual level, the social influence model of media use uses the same ideas (Fulk, Smitz and Steinfield, 1990). In an organisational context factors like introduction strategy, type of organisation, group size, formal hierarchy, group history, membership proximity, and network participation are relevant (Van den Hooff, 1997 and Benbasat and Lim, 1993).

Task characteristics

The number of variables that relate to task characteristics is much smaller than the number of variables that relate to (user) context characteristics. Bouwman and Neijens (1991) distinguish between information, communication and transaction tasks.

Both Van den Hooff (1997) and Benbasat and Lim (1993) derive their variables with regard to task characteristics from media richness theory (Daft and Lengel, 1986, 1987). To put it briefly, this theory comes down to the idea that certain tasks can best be performed with certain media. Other tasks can best be performed with other media. The right match between task and medium results in effective communication. Moreover, tasks are characterised by their equivocality and uncertainty and media are characterised by their richness. Chapter 4 contains a detailed description of media richness theory.

Characteristics of the technology

Atkin and LaRose (1994) emphasise the type of the innovation. They distinguish between continuous and discontinuous innovations. Continuous innovations get adopted more easily than discontinuous innovations. Also the symbolic meaning of an innovation can influence the adoption process.

The type of innovation is also mentioned by Bouwman et al. (1991) and Van den Hooff (1997). They again use the ideas of Rogers (1983). He characterises innovations in terms of relative advantage, compatibility, complexity, triability and observability. Other characteristics of a technology are interactivity, user friendliness, the type and number of services, costs, and transparency. The types of services provided by a medium gain a lot of attention in Bouwman et al. (1991). They distinguish information retrieval services (both topical and stable information), communication services (e-mail), transaction services (banking, ordering, shopping), and entertainment services (games). Benbasat et al. (1993) define technological characteristics in terms of level of support, facilitation, and improvement of design. Bouwman et al. (1991) mention marketing as a factor that can influence the success or failure of a service. In their terms marketing involves the availability of trigger (or so called 'killer') applications, the degree to which a service is introduced on a large scale, the provision of information and the quality of the help-service. In Table 3-1, an overview of all meta-analysis studies in relation to the three categories is provided.

Table 3-1 An overview of several meta-analysis studies with regard to the process of communication

Author(s) and subject	User, group, organisational, and context characteristics	Task characteristics	Technology characteristics
Atkin and LaRose (1994) Adoption of Information Services	Demographics Innovativeness Creativity Experience	Uses	Continuity Symbolism
Bouwman and Neijens (1991) Factors that influence adoption of Videotex	Demographics Information seeking behaviour Possession of equipment Willingness to change Number of services Attitude towards technology in general and medium	Need for information and/or communication	Compatibility Interactivity User friendliness Observability Type of services Costs and transparency Marketing
Van den Hooff (1997) Adoption, use, and effects of e-mail	Type of organisation Implementation strategy Critical mass Social Influence Attitude towards technology in general and medium Innovativeness Network participation	Uncertainty Equivocation	Relative advantage Compatibility Complexity Triability Observability
Benbasat and Lim (1993) Usefulness of group support systems	Membership proximity Group size Formal hierarchy Group history	Task complexity Solution multiplicity Reward	Level of support Facilitation Improvement of design

This description of available theoretical ideas is very short and does not do justice to the theoretical frameworks that have been developed over the years. However, this description was intended to obtain the basis for a large number of variables, factors and aspects that might influence the process of communication and that goal was attained. Using this list of factors empirical research will be started. The research is aimed at the selection of the most important factors for the process of communication with regard to media from which electronic information can be obtained. Chapter 4 will provide a much more detailed description of relevant theories.

3.3 Research design

This section deals with research design. First of all, several techniques for data gathering will be presented. Secondly, Q-methodology background and

procedures will be explained in detail. Then, the implementation of these procedures within the research will be discussed, followed by a description of the statistical methods that were used to analyse the data.

3.3.1 Available research methods

Section 3.2 has identified a large number of factors that are of relevance with regard to the process of communication. The question in this phase of the research is which of these factors are important. Moreover, the goal is to find factors that are important from the perspective of the user. The interest lies in the subjective evaluation of several media.

In order to answer that question several ordering techniques can be used. Based on Segers (1983) several techniques will shortly be described. The advantages and disadvantages of the following techniques will be compared: ordering, comparing, scaling, and finally the focus is on Q-methodology.

Ordering

There are several ordering techniques that try to place items on a scale that for example varies from disagree to agree or unimportant to important. The data can for example be gathered by asking respondents to pick the most important item(s) from a list of items. This leads to a nominal level of measurement: items are either important, or they are not. Another ordering method is to let respondents pick, for example, three items from a list and ask them to order these items. These techniques are relatively poor because no value can be given to the items that were not picked. They can for example be a little bit less important than the items that were picked or they can be not important at all. An additional possibility is to let respondents order all items in a long row. This results in an ordinal level of measurement. A disadvantage of this method is that the overview might get lost. A method to get some information on the relative importance of all items is to ask respondents to distribute points or coins (to emphasise the scarcity of relative importance) over several items. The result of this method is a ratio level of measurement, providing the best possibilities for quantitative data analysis.

Comparing

In another set of techniques several items are directly compared to each other. Several times a set of two (pairwise comparison) or three (triads) items are presented. Respondents are asked which of the two or three items is most important. This provides the researcher with rich information on how all items relate to each other for each respondent, subgroups, and the whole group. A disadvantage of this technique is that many comparisons have to be made if a large number of items is to be compared. The number of comparisons that have to be made can be computed as $n(n-1)/2$. For four items this results in six comparisons, for eight items already 24 comparisons

Self Rating Scales

		Father						
happy	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	sad
hard	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	soft
slow	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	fast
...								...

Figure 3-1 Osgoods semantic differential

Q-methodology

have to be made. The large number of factors in this research would lead to an unacceptable number of comparisons that would have to be made.

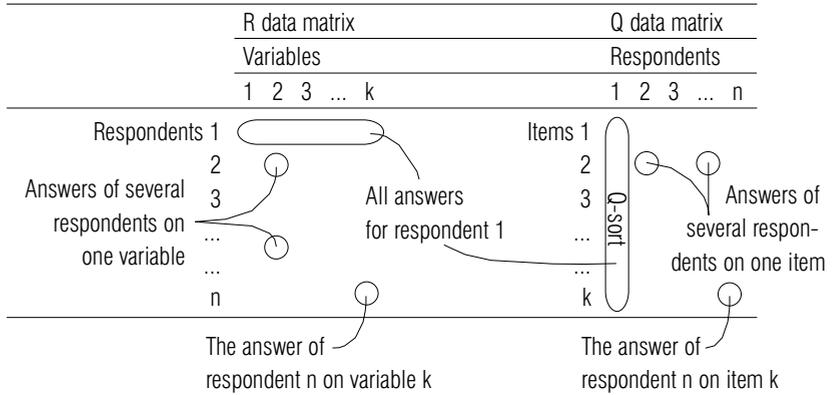
Self rating scales let the respondent place themselves on a scale with regard to a subject. Another possibility is to present items and let respondents place them on a scale. The best known scaling technique is the semantic differential (Osgood, Suci and Tannebaum, 1957). Here a respondent is asked to place him or herself on a multidimensional scale with regard to a subject. The ends of each dimension show each other's opposites (adjective pairs). The subject of research is considered from a large number of perspectives. According to Osgood, eventually all subjects can be placed in a multidimensional space. Statistical methods like factor analysis are appropriate to analyse data that are gathered this way.

Q-methodology combines aspects of several of the above mentioned techniques. A large number of items with regard to a subject are presented to respondents. They are asked to place the items on a scale that, for example, varies from disagree to agree. The strength of an opinion can be expressed by placing an item on the extremes of the scale. The advantage of Q-methodology over other methods is that a combination of both a large number of factors and quantitative statistical method for data analysis can be made. This is the reason that Q-methodology was chosen as a research method. In the following section Q-methodology techniques are explained in detail.

3.3.2 Basic principles of Q-methodology

Q-methodology is an orientation towards the systematic study of human subjectivity. McKeown and Thomas (1988) state that the major concern of Q-methodology is not with how many people believe such-and-such, but with why and how they believe what they do. In Q-methodology, not the respondent as such, but his or her opinions or attitudes is the central issue (Brown, 1980). This also relates to the letter Q. In most research an R data matrix is used. In an R matrix the results for one respondent for all variables are in one row. In a Q-matrix the results for each respondent is represented by a single column. A Q-sort is the ranking order a single respondent has given to the items. Figure 3-2 makes the difference between an R and a Q-matrix visible.

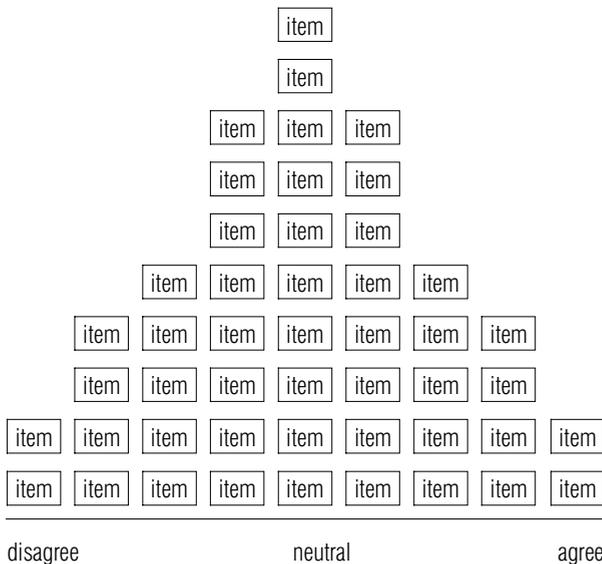
Figure 3-2 The difference between R and Q data matrix



In this report Q-methodology helps to find factors that people use to evaluate media that provide electronic information by confronting a relatively small number of respondents with a large number of statements on several media. Items like 'There are few users of Internet' and 'Internet is suited for information on weather and traffic' have to be ordered on a scale which varies from 'totally disagree' to 'totally agree'. In the middle the scale means 'neutral', which stands for 'do not know' or 'not important'. This offers an overview of the aspects users perceive as important in their evaluation of media that provide electronic information.

The items need to be ordered following a normal distribution. In Figure 3-3 a normal distribution for 48 items is shown. In this way, the extreme items (the items to which a respondent agrees or disagrees most) are best displayed.

Figure 3-3 A normal distribution of 48 items



From the perspective of the respondent, the items do not need to be normally distributed. This method forces the respondent to distribute the items in a normal distribution. Consequently, this method forces the respondent to think carefully about what he or she thinks is *really* important. Consequently, the extreme items, which are the object of analysis, become more visible.

Q-sample

In Q-methodology one of the first and most important tasks is to collect a set of items on the subject of research. This set is the so called Q-sample. A choice has to be made on the number of items in the Q-sample. In this project a set of 48 items was chosen for the following reasons.

- It still enables the respondent to have a good overview of the items. A larger number of items would have a negative influence on this overview.
- It provides a good overview of all aspects of media that provide electronic information. With a smaller set of items it is not as easy to get a reasonable overview of all aspects.
- It allows the distribution of items in the shape of a normal distribution.

To create items the variables that were found in the literature study were used as a basis (Section 3.2). In several brain storm sessions the items were formulated.

The Q-sample was made in five different versions: one for each of the media in the research: telephone service numbers, Teletext, off-line media, Videotex, and Internet. For each medium the same set of items was used; only the name of the medium was changed. Examples of items are as follows.

- *User, group, organisational, and context characteristics*: for example, 'Users of medium x need a lot of experience', 'Users of medium x have a high education', and 'Medium x is an outdated system'.
- *Task characteristics*: for example, 'Medium x is suited for information on products and services', 'Medium x is suited for games', and 'Medium x is suited for live issues'.
- *Characteristics of the technology*: for example, 'Medium x is suited for many different questions', 'The information in Medium x is very expensive', 'The information in Medium x is outdated', 'Medium x has a difficult way of searching', 'Medium x is too slow', and 'Medium x is not suited for communication'.

A complete overview of items is presented in Appendix A.1.

Selection of respondents and data gathering

Another part of Q-methodology relates to the selection of respondents. Although representativity of the respondents is not crucial –after all, the items are assumed to be representative, not the respondents– it is

important to select respondents carefully. The goal is to select a set of people with a broad range of opinions on the media in the research. For each medium a group of eighteen respondents was selected. Given the research goal (an explorative study) this is a reasonable number of respondents. Within each medium several subgroups were distinguished. The goal of this distinction is to get a broad range of opinions on the media in the research. The three subgroups are: users of a medium, suppliers of a service or information on a medium, and experts (i.e. researchers). Respondents were asked to only make Q-sorts of those media they are familiar with. The number of respondents in each group is depicted in Table 3-2.

Table 3-2 Division of respondents

	Users	Experts	Suppliers	Total
TSN	11	3	4	18
Teletext	9	5	4	18
Off-line	8	5	5	18
Videotex	7	5	6	18
Internet	18	-	-	18
Total	53	18	19	90

After the Q-sample and a set of respondents were established, the actual interviews started. The interviews were conducted using a computerised version of the Q-methodology. A tool was specially developed for this purpose. A full description of the tool can be found in Appendix A.2.

Data analysis

In this phase of the research the goal of statistical analysis is to find structure in the data. Several methods can be used to structure data, for example clustering techniques (for example hierarchical and K-means), data reduction techniques (for example factor analysis), and scaling techniques (for example, multi dimensional scaling). Each of these techniques have their own advantages and disadvantages.

Clustering is a good technique to use if the goal of analysis is to classify the data into groups. Data reduction methods attempt to describe the original data as well as possible while reducing the number of variables. The goal of scaling techniques is to place objects in a space in order to compare the relations among objects. In other words, scaling techniques attempt to place objects on a scale instead of developing the scale itself. Moreover, a technique like multi dimensional scaling is only useful when only two or three dimensions are of relevance. However, in this phase of the research the attention is on finding (the number of) dimensions. For both cluster analysis and factor analysis it is possible to begin analysis with no prior knowledge of group membership or the number of groups or factors.

Factor analysis and hierarchical clustering attempt to group those people together that resemble each other. However, factor analysis also provides the opportunity to see *what* groups people together whereas cluster analysis only shows *who* cluster together and the strength of the clusters. Therefore, factor analysis is used in this research. Factor analysis attempts to identify underlying variables, or factors, that explain the pattern of correlations within a set of observed variables.

A full description of the procedures in factor analysis can be found in Appendix A.3.

3.4 Results

The results of factor analysis are presented in this section. First of all, the results of factor analysis will be presented per medium. For each medium the factors and the coherence between the factors will be discussed. After that several media will be compared to each other on a somewhat higher level of abstraction.

3.4.1 Factors per medium

Before the results of data analysis will be interpreted, first, a short check on the adequacy of the data is run. In order to test this the Kaiser-Meyer-Olkin (KMO) test was used. More detail about this test can be found in Appendix A.3.2. The results of the KMO test for the data are depicted in Table 3-3.

Table 3-3 Results of KMO test of adequacy

Service	KMO	Interpretation
TSN	0.73	middling
Teletext	0.85	meritorious
Off-line	0.79	middling
Videotex	0.58	miserable
Internet	0.81	meritorious

The data for Teletext and Internet is best suitable for factor analysis, followed by off-line media and telephone service numbers. The data for Videotex scores 'miserable'. Prior research (Herfkens and Bouwman, 1994) also showed that the evaluation of Videotex is equivocal. Here, the researchers also experienced difficulties with factor analysis on Videotex data. In sum, in general the data that was gathered is suited to perform factor analysis. For Videotex, conclusions can only be drawn with great care.

The number of relevant factors

The number of factors of factors that is included in the analysis is different for the five media in this research. Off-line media are for example explained by means of three factors whereas Internet is explained by means of two factors. There is not one standard criterion that can be employed to establish the number of relevant factors. In most literature it is recommended to combine several criteria to judge how many factors should be used for further analysis. In this study a combination of two criteria will be used: the eigenvalue > 1 criterion and the scree plot criterion. In Appendix A.3.3 a detailed description of the use of these methods is presented.

Interpretation of the factors

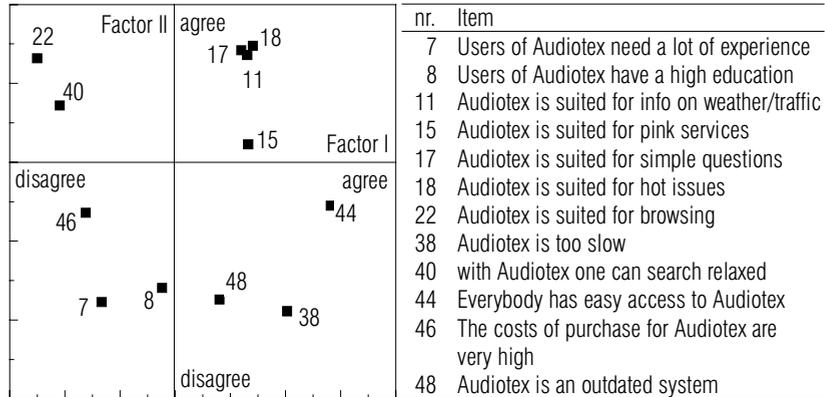
The factors that were found should be interpreted in terms of a certain view one can have of a medium as opposed to another view (represented by another factor). In other words, a factor does not represent one aspect of a medium such as accessibility or the kind of information that can be retrieved. Instead each factors can relate to both these issues. One factor can show a positive image with regard to these issues while the other factor shows a negative image. The description of the factors that are found is aimed at distinguishing these views.

Telephone service numbers

The number of factors that should be included for further analysis is forthright. The first two factors are used for further analysis. Together they explain 44 percent of the variance, a rather limited amount of explained variance. Although the factors 3 through 6 do have an Eigenvalue > 1 they are not included in further because their additional value is limited (see Appendix A.4.1).

The first factor is very negative and the second factor is very positive. In Figure 3-4 the results of factor analysis are presented. The goal of the figure is to facilitate interpretation of the two factors that were found. In the figure the items that score extreme on either one of the factors are presented. The two factors show the two-dimensional factorial space in which the items take their place. For example, item numbers 11, 15, 17, and 18 have a positive score on both factors. On the other hand, item numbers 22 and 40 have a negative (i.e. disagree) score on Factor I but a positive (agree) score on Factor II. The factors therefore differ on these items.

Figure 3-4 Results for TSN (See Appendix A.4.1 Table A-3)



A first observation that can be made is that both factors agree on what telephone services can be used for: simple and topical issues such as weather information. Also pornographic services are popular. The following quotes were derived from the interviews.

'The information is up-to-date and extensive'.

'telephone service numbers can answer the questions of a broad public quickly, governmental information is well suited for this'.

Secondly, the telephone is evaluated as a very accessible medium. Both factors state that little experience is needed to use it. The following statements affirm this:

'Calling is just very simple, the directions are very simple, it is just very handy'.

'Everybody has a telephone, everybody can use a telephone'.

The two factors differ on the way information can be found in a voice response system. Factor II is positive and states that finding information with a voice response system is relaxed. The system provides a quick and modern way to obtain information. Factor I on the other hand is very negative: obtaining information is not relaxed and the telephone is not suited for browsing, it is too slow and old fashioned. Here are some remarks of a supplier of an information service:

'The experience learns that there are many complaints of users. I myself regularly call our service and then can not obtain any information. If I have an urgent question, I get very irritated by the structures'.

'There is a lack of overview over the tree structure'.

Summarising, the telephone service numbers are evaluated on the information that can be found, accessibility, and on the search structures. The factors differ on the ease with which information can be found. See Table 3-4.

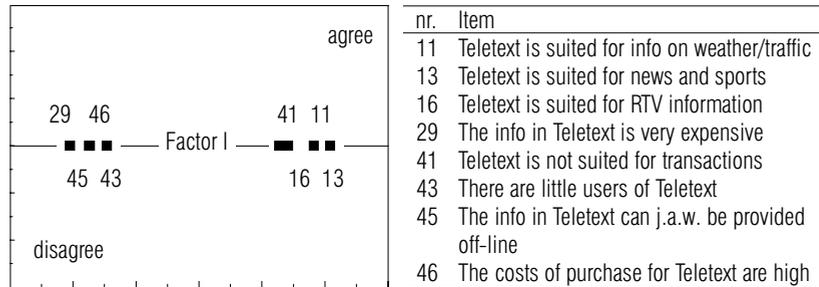
Table 3-4 Summary of Telephone Service number factors

Aspect	Factor I	Factor II
The information that can be found	Simple and topical issues	Simple and topical issues
Accessibility	Good	Good
Search structures	Negative	Positive

Teletext

Only the first factor is used for further analysis. This factor explains 53.1 percent of the total variance. Because the eigenvalue of the second and third factor is only a fraction over 1, they will not be included. The data of Teletext can thus be described in one factor. This means that all users of Teletext have more or less the same ideas about the service. This indicates that everybody more or less has the same ideas about this medium. The factor explains 53 percent of the total variance (see Appendix A.4.2). Notice that Teletext is evaluated very positively. Three issues are relevant for Teletext: accessibility, topicality of information, and interaction.

Figure 3-5 Results for Teletext (See Appendix A.4.2 Table A-5)



Teletext is easy to access. This can be concluded from (perceived) low costs of purchase, cheap information, and the existence of a large number of other users. The following quote expresses this as follows:

‘There is a high penetration of Televisions with Teletext, you do not have to be able to use a keyboard or set up a special connection. The information originates from a reliable source. The service is primarily non-commercial. The information is available 24 hours per day’.

The second issue that is relevant for Teletext is its suitability to provide topical information, such as weather, traffic, news, sports, and information about television programs.

'Teletext for me is a medium to get to know simple trivia like the weather, news and sports at a moment that it suits me. It is not that the information is very specific or detailed, but just that it can be important to find out at a certain moment'.

The (only) disadvantage of Teletext is that it is not suited for communication or transactions.

Summarising, Teletext is evaluated on the information that can be found, accessibility, and the possibility to perform transactions and to communicate with others. Table 3-5 summarises this.

Table 3-5 Summary of Teletext factor

Aspect	Factor I
The information that can be found	Topical information
Accessibility	Good
Interactivity	No communication or transaction

Off-line media

The data for off-line media were gathered from two groups of respondents. Seven respondents had experience with CD-i and eleven respondents with CD-ROM. The first three factors that were found are included in further analysis. The scree plot (See Appendix A.4.3) shows that these are the three factors that contribute significantly to the explained variance.

The first factor is mainly scored by CD-ROM users, the second factor by both CD-i and CD-ROM users and the third factor mainly by CD-i users. Together the three factors explain 55 percent of the total variance. They can be summarised as follows.

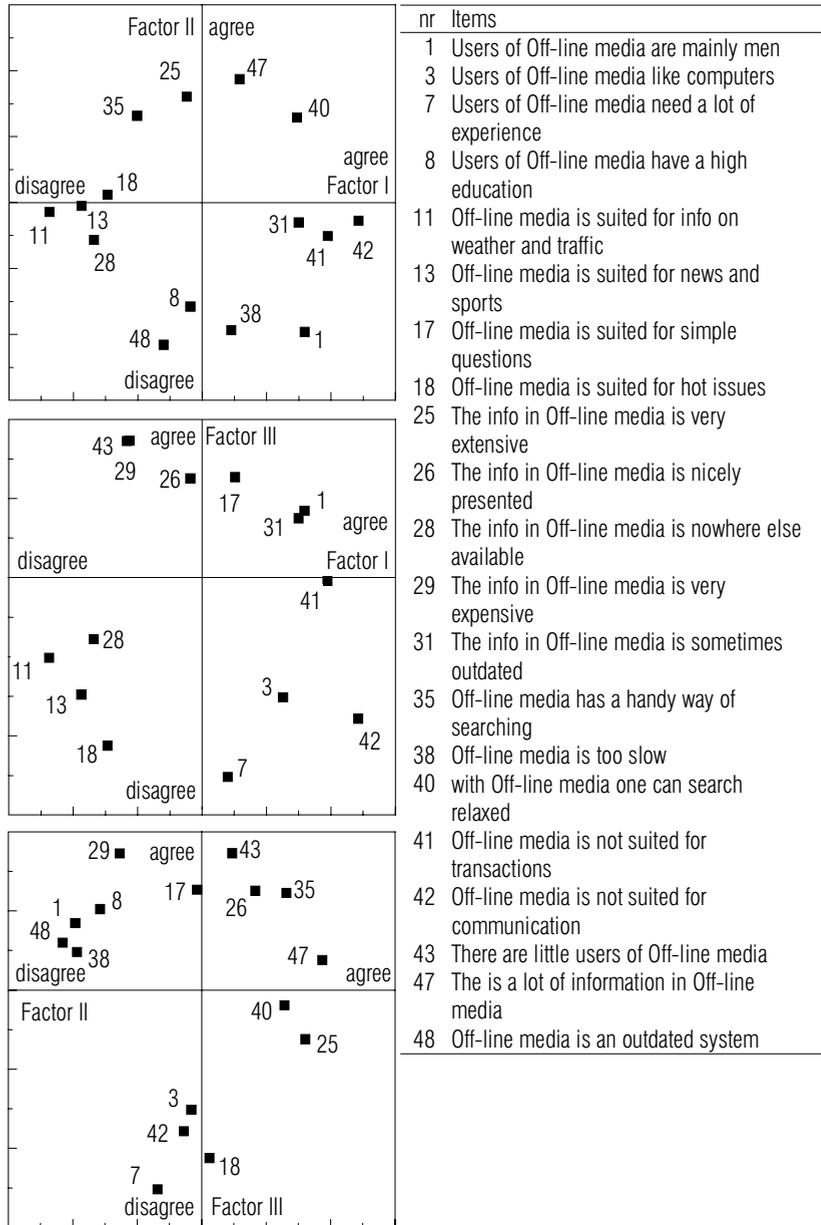
For both Factor II and III search methods are important. Moreover, the way in which the system can be used is evaluated positively for both factors, though on slightly different aspects. Factor II stresses robustness, speed, and relaxed possibilities for searching. Factor III continues with the nice presentation of information. A negative aspect of factor III is that respondents state that off-line media are not suited to get a quick answer to a question.

'Users of CD-i need little experience to move the cursor. Searching is relatively simple, searching is associative and is guided by intuitive choices'.

Factor I and III strongly disagree on the number of users and the price of information: Factor I states that it is cheap and there are many users, whereas Factor III states the opposite. Factor III adds to this that users do not need a lot of experience. Factor II also emphasises accessibility, but

uses different aspects: the costs of purchase are low, users own a lot of modern equipment but do not have a high education.

Figure 3-6 Results for off-line media (See Appendix A.4.3 Table A-7)



Factors I and III both emphasise the off-line character of CD-i and CD-ROM. Factor I stresses that information is sometimes outdated and unsuited for live issues like information on weather and traffic or news and sports.

'It takes time to develop and distribute a CD-ROM and therefore CD-ROM is not suited for live issues'.

Factor III stresses another application for off-line media: the suitability for commercial purposes is mentioned. This is emphasised by the fact that off-line media are seen as suitable for communication. Though this seems to be inconsistent with the off-line character of these media, it can be explained. Here, 'communication' is not interpreted as person-to-person communication, but as communication from an organisation to a customer. In other words, off-line media are seen as a good medium for marketing and public relations.

*'CD-i is primarily suitable as 'a point of sale' or 'point of information'.
'CD-i is very well suited for commercial purposes, it has got a high-tech image and a lot of information can be stored on a compact carrier'*

In conjunction with the evaluation of the information aspect, Factor I strongly stresses that off-line media are not suitable for communications nor for the performance of transactions.

A remark that was made by several respondents was the lack of software for off-line media:

'I am not content with the availability of CD-i's. The places where I can buy them are rather scattered. I once bought a Jazz CD-i in a book-store and the next day I saw the CD-i "Denkend aan de Dapperstraat" (A CD-i carrying well known Dutch poems) in a music store. One would expect it to be the other way around.'

Summarising, off-line media search methods, the context of other users, the possibility to interact with others and the possibility to use off-line media for commercial purposes. See Table 3-6.

Table 3-6 Summary of Off-line media factors

Aspects	Factor I	Factor II	Factor III
Respondents	Mainly CD-ROM	Both	Mainly CD-I
Search methods	-	Positive	Mixed
Context	Cheap, many users	-	Expensive, little users
Interactivity	No communication or transaction	No communication or transaction	-
Commerce	-	-	Suited for commercial purposes

Videotex

As a consequence of the poor quality of the data for Videotex (KMO=0.58) it is hard to provide a clear cut interpretation of the results of factor analysis. Three factors have been chosen because this seems to provide an optimal choice between the number of factors needed and the amount of variance explained. These three factors together explain fifty percent of the total variance (see Appendix A.4.4).

Factor I has a very negative character. The other two factors are more positive. Though all factors state something about the way in which the Videotex can be used, the accent is put differently within the factors. Of the three factors, Factor I expresses the importance of the way in which the system can be used most strongly and moreover provides a very negative image. For Factor II and III it is stressed less and provide a more positive image. Both Factor I and II agree on the item that Videotex is too slow, the system is outdated and there are little users. Factor I then continues with unclear, unhandy and difficult search methods, unsuitability for browsing, not enough help information is provided, and the information is not presented nicely. One of the respondents expresses his discontent:

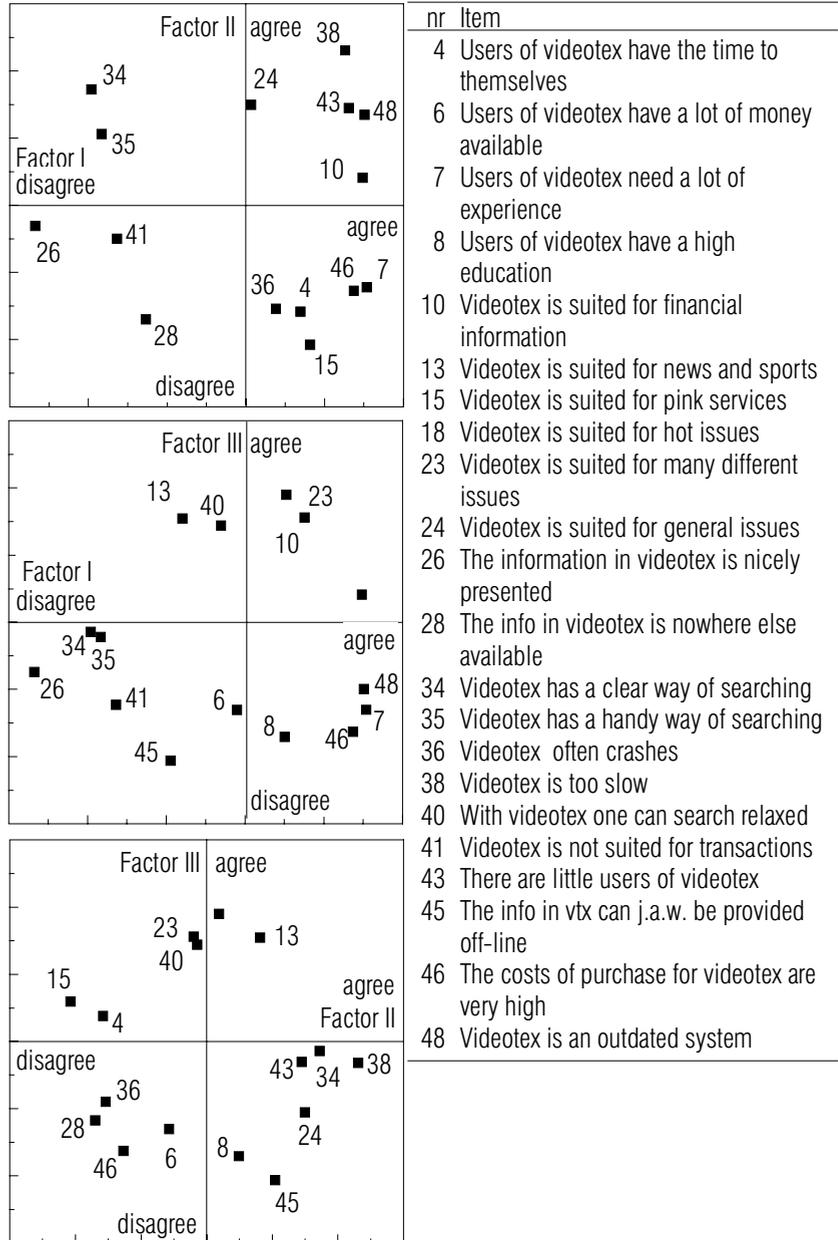
'Videotex is, graphically spoken, a disaster, it is not very flexible and uses a prehistoric protocol. One wonders what the added value of the system is'.

In contrast, Factor II states that search methods are quite clear and suited for browsing. Moreover the system is seen as robust. Finally, according to Factor III, Videotex permits relaxed browsing and provides a quick answer to a question.

All three factors score on the items about the costs of purchase. However, Factor I expresses that costs are high, whereas the other factors state that costs are low. Factor III adds to this that users do not have a lot of money available.

'Users often worry about who is going to pay for the connection time for users are the ones who will have to look at commercial statements'.

Figure 3-7 Results for Videotex (See Appendix A.4.4 Table A-9)



Factor I again scores negatively on the need for experience, whereas Factor III is again more positive about the need for experience. Moreover, Factor III states that users do not need to have a particularly high education.

'If you choose for numerical menus experience is not needed'.

The information that can be obtained via Videotex plays an important role in Factor II and III. Note that all factors state that the information is Videotex is also available elsewhere. Factor II states that Videotex is not suitable for pornographic services or games (i.e. entertainment), but is suited for general issues. Factor III mainly concentrates on live issues like news and sports, weather and traffic and so forth which can not be provided off-line.

'The information I come across to in Videotex almost always is available elsewhere (paper, telephone, Teletext)'.

Finally, Factor I and III however, do state the suitability for transactions.

Summarising, Videotex is evaluated on the information that can be found, the search methods and the costs. The first factor is very negative. The other two are more positive.

Table 3-7 Summary of Videotex media factors

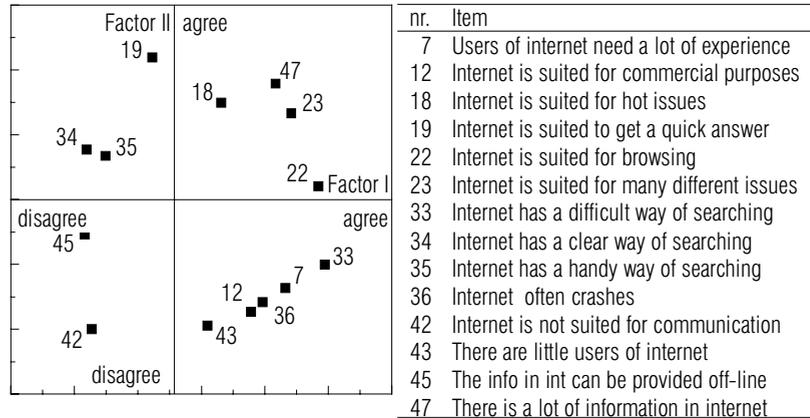
Aspects	Factor I	Factor II	Factor III
Information that can be found	-	Information in general	Topical information
Search methods	Bad	Mixed	Good
Costs	High	Low	Low

Internet

For the Internet data two factors have been chosen because the scree plot shows the sharpest bend after the second factor. The two factors together explain 53 percent of the total variance (see Appendix A.4.5).

The first factor provides a very negative evaluation, whereas the second one, in contrast is very positive. The difference in perspective could be explained by different tools that are used for retrieving information (Gopher versus for example Netscape) or the level of experience respondents have.

Figure 3-8 Results for Internet (See Appendix A.4.5 Table A-11)



The two factors that were found strongly differ on the subject of accessibility of information. Factor I is very negative whereas Factor II is positive. The following two quotes are from people that belong to Factor I:

'Searching the Internet is horrific. The structure (as far as there is a structure) is clearly in the hands of system managers (that is computer system managers and not information system managers).'

'There is hardly any filtering of information, as a consequence it is hard to find out who sent the information and therefore whether or not the information is reliable'.

Both factors praise the amount and diversity of the information that can be obtained with Internet. The following quote is of a respondent that belongs to Factor II.

'The Internet is a very suitable way to get a quick answer to a question. The net can provide direct a query for information very well. Especially the newsgroups and discussion groups provide the possibility to ask a question to a group of experts (or people who say they are experts).'

The huge amount of information that is available can also be a disadvantage, according to one respondent:

'The hard thing about finding information on Internet is the diversity of means that are available. It is mainly a matter of experience to know which means should be used for which problem'.

Last, but not least, both factors strongly state that Internet is very well suited for communication purposes. This refers to the possibility to use e-mail to communicate with other people. The following quote says it all:

*'Internet * is * communication'.*

Summarising, Internet is evaluated on accessibility, the information that can be found, and interactivity. The second factor is more positive than the first.

Table 3-8 Summary of Internet factors

Aspect	Factor I	Factor II
Accessibility	Negative	Positive
The information that can be found	Positive	Positive
Interactivity	Positive	Positive

Conclusion

A first conclusion that can be drawn is that items from all three of the initial (theoretical) clusters of items (user/context, task, media/technology) are represented. Sometimes items are interpreted positively, and sometimes an item presents a negative aspect.

3.4.2 Comparing media

In the previous section the attention was on the items that scored extremely on the factors for each medium separately. In this section the emphasis is on the relation between the items and differences between the media in the research.

In order to make such a comparison, only the items that scored extremely on a general level are included in the interpretation. In order to find the extreme scoring items, weighted sum of the squared factor scores for all eleven factors (two for telephone service numbers, one for Teletext, three for both off-line media and Videotex and two for Internet) was used.

The items will not be interpreted as separate units as was done in the previous section. In this section the relation between an item and the medium will be made. Consequently, we can look in to the relation between task and technology and the relation between (user) context and technology:

- connections between items from the task cluster and items from the technology cluster becomes visible and
- connections between items from the (user) context cluster and items the technology cluster become visible.

Task - Technology combinations

The first set of clusters relates to task - technology (in casu, media characteristics) combinations. The starting point is that certain tasks can best be performed with certain media, other tasks can best be performed

with other media. Which tasks can best be performed with which media is the subject of this section. In order to facilitate interpretation several (sub)clusters are distinguished. This clustering is based on the similarity between items with respect to their content. Three clusters of items are distinguished: topicality, interaction and uniqueness. The items that form these clusters are depicted in Table 3-9.

Table 3-9 Task - media combinations

Clusters	Nr	Item
Topicality	11	... is suited for info on weather and traffic
	13	... is suited for news and sports
	18	... is suited for live issues
	45	The info in ... can be provided off-line
Interaction	41	... is not suited for transactions
	42	... is not suited for communication
Uniqueness	17	... is suited for simple questions
	22	... is suited for browsing
	28	The info in ... is nowhere else available
	40	with ... one can search relaxed
	47	There is a lot of information in ...

The factor scores for all these items can be found in Appendix A.5 Table A-12

Topicality

Media can be characterised in terms of their ability to supply topical information. The suitability to provide live issues like news, sports, weather and traffic are strongly correlated. The strongest scores can be found for telephone service numbers and Teletext. These media are well suited for topical information. On the opposite side, off-line media score negatively on this aspect. Videotex and Internet score more mixed and more neutral on this aspect. Figure 3-9 illustrates these results.

As can be seen, this figure consists of four smaller figures, one for each item that belongs to the topicality cluster. Each of these small figures shows the relation between an item and the factors that were found for the media (once more, two for telephone service numbers, one for Teletext, three for both off-line media and Videotex and two for Internet). In the first figure, for example, shows that item 11 (suitability of a medium for information on weather and traffic) has a positive and approximately equally strong score for both factors of telephone service numbers. For telephone service numbers, item 11 has a factor score of 1.3 for Factor I and 1.4 for Factor II. For Internet, for example, item 11 has a negative (i.e. disagree) score for Factor I and a positive score for Factor II. For Internet both factor scores are less extreme than the scores for telephone service numbers: respectively -0.3 and 0.5.

Figure 3-9 through Figure 3-15 show a positive (i.e. agree) factor score on the right side of the vertical line and a negative (i.e. disagree) factor score on the left side of the vertical line. This was done for all eleven factors that were found for the five media in the research. Note that for some of the items left and right is switched in order to facilitate interpretation. This is done for items that were posed in a negative sense. The further a factor score is removed from the vertical line, the more extreme the factor score. Finally, the first factor is always depicted with a black dot, the second factor with a dark grey dot and the third factor, if there is one, is indicated with a light grey dot. For each medium the same shading of the dot refers to the same factor.

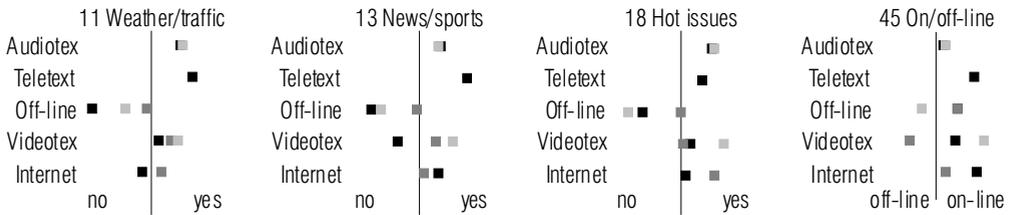
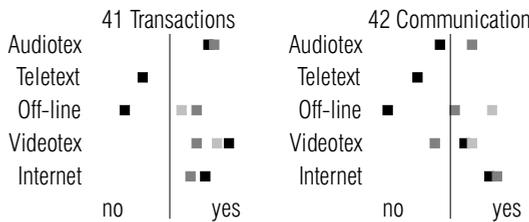


Figure 3-9 Topicality (Factor scores in App. A.5, Table A-12)

The second cluster in the task - technology combination relates to the question whether it is only possible to obtain information or if it is also possible to communicate with others or to perform a transaction. Teletext clearly shows a lack of these possibilities. Also off-line media score poorly on these items. Some people stated that off-line media can be used for commercial ‘communication’. The other media do provide the opportunity to perform communication and transactions. See Figure 3-10.

Interaction

Figure 3-10 Transaction and communication (Factor scores in App. A.5, Table A-12)



Uniqueness

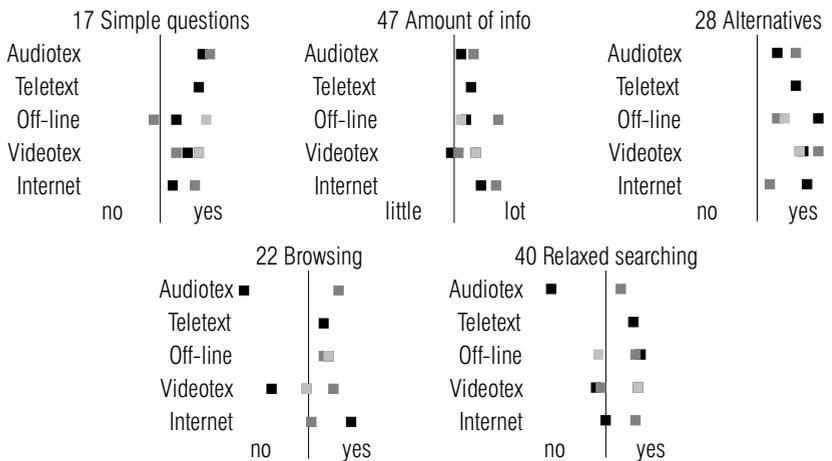
The last cluster of items that is related to the task - technology combination is labelled ‘uniqueness’. This last cluster of items is less obvious than the other two clusters of items. With regard to the task, the label uniqueness relates to unusual questions or questions that are only asked rarely as opposed to questions that are very common or posed on a daily basis. With regard to technology uniqueness relates to the search possibilities, offered by a medium. For example, the possibility to browse for information. Also the amount and diversity of information that can be obtained relates to the

idea of uniqueness. The availability of other sources of information is the last item that relates to uniqueness.

With regard to search possibilities Teletext, off-line media and Internet score positively. The other two media (Videotex and telephone service numbers) have a mixed score. Note that telephone service numbers (and Videotex to a certain degree) has a very strong and negative score here. The rigid menus are a bother for many people. The possibility to browse correlates with the possibility to search for information in a relaxed way. Also here one of the telephone service numbers factors states that relaxed search is absolutely not possible.

The amount and type of information, in general, is an important criterion for the media in the research. All factors either score neutral or have a positive score and indicate that there is a lot of information available. See Figure 3-11. Two peaks can be found for Internet and off-line media. Note that all media and all factors unanimously state that the information is also available elsewhere.

Figure 3-11 Uniqueness
(Factor scores in App. A.5, Table A-12)



(User) context - technology combinations

Besides task - technology combinations, it is possible to formulate (user) context - technology combinations. Again a number of (sub)clusters can be made. Each of these clusters (again based on similarity with respect to content) relates to the idea of accessibility. Four clusters are distinguished: physical, financial, cognitive and affective accessibility. The items that relate to these aspects of accessibility are depicted in Table 3-10.

Table 3-10 (User) context - media combinations

Theme	Nr	Item
Physical	43	There are little users of ...
	44	Everybody has easy access to ...
Financial	6	Users of ... have a lot of money available
	29	The information in ... is very expensive
	46	The costs of purchase for ... are very high
Cognitive	7	Users of ... need a lot of experience
	33	... has a difficult way of searching
	35	... has a handy way of searching
Affective	1	Users of ... are mainly men
	8	Users of ... have a high education
	36	... often crashes
	38	... is too slow
	48	... is an outdated system

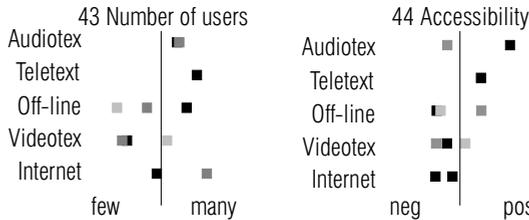
The factor scores for all these items can be found in Appendix A.5, Table A-13.

Physical accessibility

Accessibility relates in the first place to the possibility to physically use a medium and get the information that is sought. For the item ‘Everybody has easy access to ...’ only telephone service numbers, Teletext and off-line media have a factor that shows a clear positive score. All other factors and media either score neutral or negative.

Also, the number of users of a medium is important for all media. For both off-line media and Videotex two out of three factors state that there are few other users. Both factors for telephone service numbers, Teletext and one of the factors of off-line media and (extremely) Internet state that there are many other users.

Figure 3-12 Physical accessibility (Factor scores in App. A.5, Table A-13)

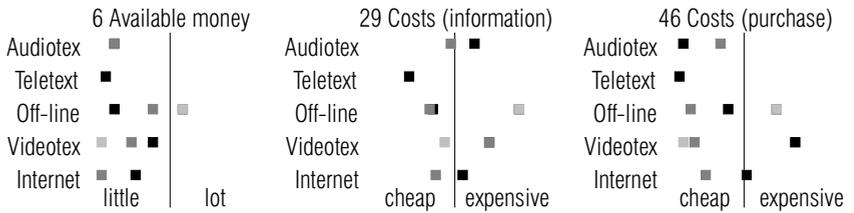


Financial accessibility

A second aspect of accessibility relates to costs, the most important indicators of which are: costs for purchase and costs for the information that is retrieved. Costs for purchase are evaluated as cheap for telephone service numbers, Teletext, and Internet. For both off-line media and Videotex the evaluation is mixed. Some people find it expensive to purchase a system with which it is possible to use the medium, others find

it cheap. See Figure 3-13. With regard to the information that can be retrieved Teletext is the only medium that makes an outspoken statement: information is cheap. All other media provide a mixed picture. Some people find in cheap, others find it expensive. For off-line media the opinions differ most strongly. On the user side almost all factors state that users have little money available.

Figure 3-13 Financial accessibility
(Factor scores in App. A.5, Table A-13)

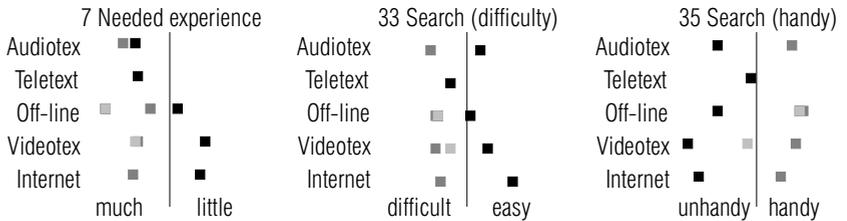


Cognitive accessibility

The third aspect of accessibility is the amount of experience that is needed to use a medium. Telephone service numbers and Teletext are the most accessible in this respect, off-line media also have a relatively positive score. For Videotex and Internet the scores are mixed. Some people find that a lot of experience is needed, others find that experience is not needed at all. In general, this item scored very extreme for all media. See Figure 3-14.

Cognitive accessibility also relates to the difficulty to find information with a medium. Now, accessibility can be explained in terms the way in which a system can be used: difficulty and convenience of the searching possibilities. For all media but Teletext the opinions about search methods differ. Some people find it convenient and easy, others find it difficult and unhandy. The three items are strongly correlated. People that state that a lot of experience is needed, also find it difficult and unhandy to use the medium. See Figure 3-14.

Figure 3-14 Cognitive accessibility
(Factor scores in App. A.5, Table A-13)

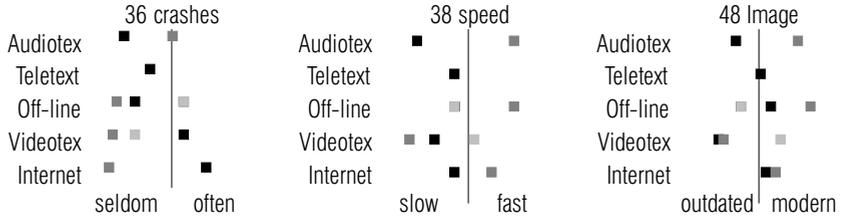


Affective accessibility

The last dimension of accessibility relates to the general evaluation of a medium. Whether a medium has a modern image, its speed and robustness are important criteria. Teletext is most neutral in this respect. It is evaluated neither extremely positive nor negative. Videotex is both evaluated strongly and negatively on this aspect. Telephone service numbers

and Internet show diverging opinions. However, telephone service numbers is much more explicit than Internet. See Figure 3-15.

Figure 3-15 Affective accessibility
(Factor scores in
App. A.5, Table A-13)



Besides robustness, speed and image in general two other items that had extreme scores relate to affective accessibility. The two items education and sex generally correlate with the other three items.

3.5 Conclusions

The research goal of this chapter was to obtain insight into the factors that influence the process of communication for five media from which electronic information can be obtained.

Based on four meta-analysis studies, a large number of variables, factors and aspects that influence the process of communication were found. It is possible to combine all those variables, factors and aspects to three clusters of factors that influence the process of communication.

- *User, group, organisational and context characteristics.* These characteristics refer to the environment in which media are used. Not only the individual level is important, but also a group, organisational and societal level can be distinguished.
- *Task characteristics.* This cluster refers to the way in which activities a user wants to perform can be characterised. Equivocality and uncertainty are the best known characteristics.
- *Technology characteristics.* This last cluster refers to media characteristics. The way in which information can be obtained and the possibility to search for information or communicate with others are examples of technology characteristics.

Based on this list of factors, empirical research was started. The research was aimed at the selection of the most important factors for the process of communication with regard to media from which electronic information can be obtained.

Q-methodology was used to find an answer to that question. Q-methodology is an orientation towards the systematic study of human subjectivity. In total ninety Q-sorts for five media (telephone service numbers, Teletext, off-line media, Videotex and Internet) were gathered.

For each medium not only users but also service or information providers and researchers were asked for their opinion.

The second research question in this chapter is which (clusters of) factors are relevant for media from which electronic information can be obtained. Factor analysis and a comparison of the five media in the research has led to the following conclusions.

- Variables from all three theoretical clusters of variables turn out to be of relevance. The variables that were found in meta-analysis studies are also relevant for media with which electronic information can be found.
- The three theoretical clusters of factors that were used, cannot be seen as separate units. Variables within the clusters correlate with variables in other clusters. The two most important combinations between clusters are the task - technology combination and the user - technology combination.
- The task - technology combination relates to the kind of questions that can be answered by using a certain medium. The starting point is that certain tasks can best be performed with certain media, other tasks can best be performed with other media. Three clusters of items are distinguished: topicality, interaction and uniqueness. Noteworthy is that it is not so much task characteristics such as complexity that seem to be important. The content as such seems to be important.
- For the user - technology combination also a number of (sub)clusters can be made. Each of these clusters an aspect of accessibility. Four clusters are distinguished: physical, financial, cognitive and affective accessibility.

In the next chapter, the task - technology combination and the user - technology combination are used as predictors of media choice.

Theoretical background - Information need and media choice

In this chapter a tentative model of media choice is developed. This model is based on two theoretical perspectives. The first is that media use can be explained by taking the users need as a starting point. Uses and gratifications is the first approach to place the users need in a central position. Several other theories that enhance or complement uses and gratifications are presented. The second theoretical perspective that is used is the contingency paradigm. The basic idea of contingency is that there is no one best way of doing things. Depending on the situation, there is only an appropriate way of doing things. The final model asserts that differences between information needs and differences between users explain media choice.

4.1 Introduction

A quick look at popular computer and telecommunication magazines reveals that industry wants us to believe that technology is the central issue in the success or failure of new media. It is all about faster modems, higher resolutions and quicker processors. In this research, there is no explicit mention of media or technology characteristics as a factor to explain media choice. Instead, media choice is primarily explained from a user perspective. Of course technology and media characteristics do play a role. The difference is that characteristics of technology are not used as explaining factors themselves but are always expressed in relation to a specific task or person. Technology is expressed in the eventual media choice: the (perceived) best match between a need for information, individual differences and a medium. With this approach technology is not

a goal in itself but a means in obtaining a goal: solving a need for information.

In this chapter media use will be discussed from a theoretical point of view. The uses and gratifications theory will be applied to the use of media with which electronic information can be obtained.

Theoretical background

In communication research two main approaches can be distinguished: the media effects approach and the media uses approach. A major difference between the media uses and the media effects approach is that effects research most often looks at the mass communication process from a communicator's end, whereas a media uses research takes the 'audience member as a point of departure (Windahl, 1981).

The two approaches are often seen as each others opposites. It may be better to say that both approaches developed in reaction to each other. Criticism of one approach led to the development of the other and the other way around. By building on each other, both approaches were more able to explain peoples media behaviour.

In section 4.2 the uses and gratifications approach - as a representative of the media uses approach - is taken as a starting point. Section 4.3 deals with the criticism that was expressed with regard to the uses and gratifications approach in the course of time. Then a model that will be used for further research will be presented. The hypotheses with regard to the research question are also presented in the last section (4.5)

4.2 Uses and gratifications

The uses and gratifications approach initially developed as a consequence of the inability to empirically prove the model that was employed by the traditional effects research. The premises made in the transfer model (sender - channel - receiver) (see for example, Shannon and Weaver, 1949) were subsequently refuted. For example, the assumption that all communication is intentional (i.e. the effect that the sender aims at is automatically produced) was not in accordance to reality. The agenda setting theory (Cohen, 1963) and knowledge gap theory (Tichenor, Donohue and Olien, 1970) proved that not all communication is intentional. Another assumption made by the transfer model is that communication is a-symmetrical. Receivers were presumed to respond unguarded to a message sent by a sender. Several theories show that communication is not as a-symmetrical as the traditional model states (Stappers, 1993).

The first theory that rejected the transfer model of communication is the uses and gratifications approach (Stappers, 1983). The roots of the uses and gratifications lie in the statement of Waples, Berelson and Bradshaw (1940): "What reading does to people is not nearly so important as what people do to reading". Waples implied that it is not the media that create the effect, it is the people using media and their reasons for doing so that explains the effect.

Uses and gratifications is an approach to the study of media audiences which proposes that audience members' consumption of media output is motivated and directed towards the gratification of certain individually experienced needs. The uses and gratifications approach suggests that when we use media we are in fact gratifying needs (O' Sullivan, Hartley, Saunders and Fiske, 1983). Consequently, in the uses and gratifications approach the emphasis is on the functions that media have for people.

Strictly defined, Katz, Blumer and Gurevitch (1974) state that uses and gratification research is research on 'the social and psychological origins of needs, which generate expectations of the mass media or other sources which lead to differential patterns of media exposure (or engagement in other activities), resulting in need gratifications and other consequences, perhaps mostly unintended ones'. There are several basic assumptions made in the uses and gratifications approach (Palmgreen, Wenner and Rosengren, 1985).

- The public is active. Communication behaviour, such as media use is typically goal-directed or motivated.
- People select and use communication sources and messages to satisfy felt needs or desires. Media use is a means to satisfy wants or interests such as seeking information to reduce uncertainty.
- Media compete among themselves for selection, attention, and use.
- People are well capable of expressing their needs, desires and motives.
- There should be no value judgement of media content. The public has to find its own terms.
- Social and psychological factors mediate communication behaviour. Behaviour is a response to media only as filtered through one's social and psychological circumstances such as the potential for interpersonal interaction, social categories, and personality.

In order to provide an interpretation for the concept of 'gratification', several authors have provided gratification typologies. In fact, a point of critique on the uses and gratifications approach is that there are as many gratifications typologies as there are authors. Many typologies resemble each other and categories strongly overlap, often different terms are used for the same gratifications. Here, the typology made by McQuail, Blumler and Brown (1972) will be presented. In 4.3 we will have a closer look at some other typologies.

- *Diversion*. The media provide material which is used by people to escape or be diverted from routines - for example work routines and a wide variety of problems that confront and constrain them.
- *Personal relationships*. Media provide material that gratifies the needs for companionship and sociability.
- *Personal identity*. Here media contents may be used symbolically to explore, challenge, adjust, or confirm the individuals sense of identity and self.
- *Surveillance*. The media provide material which gratifies the need for information about the immediate and more distant social world: information about issues and events that directly or indirectly influence the individuals life.

A general outline of the uses and gratification approach is depicted in Figure 4-1. This picture is the general framework that can be used for media gratifications research. In this figure, the central concepts and relations of the uses and gratifications approach are bundled. The central theme in the figure are the social psychological origins of needs, values and beliefs, which give rise to motives for behaviour, which may in turn be guided by beliefs, values and social circumstances into seeking various gratifications though media consumption and other non-media behaviours. The gratification processes are seen as taking place within a field of interaction between societal structures and individual characteristics, an interaction calling forward specific realisation of the potentials and restrictions inherent in those structures and characteristics (Rosengren et al., 1985).

The authors themselves acknowledge that the number of arrows and concepts may appear bewildering, but they also state that they represent a minimum of concepts and relations to be included, for these complex phenomena are to be grasped at all.

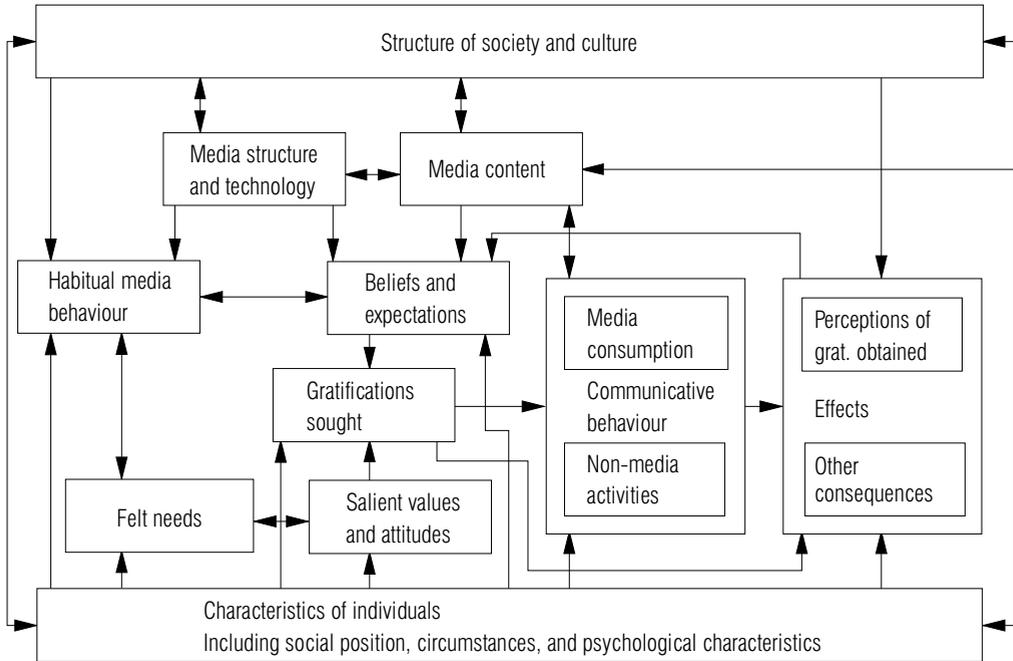


Figure 4-1 General media gratifications model (Rosengren et al., 1985)

As was mentioned before, the uses and gratifications approach has been criticised for the lack of consistent use of terms and concepts. This is not the only point of criticism the uses and gratifications approach had to deal with. Several other problematic issues have been raised in the course of time (Stappers, 1993):

- the relation between a use and a gratification is of a tautological nature;
- audience activity can not be demonstrated empirically;
- only the factors that explain media use are studied, not the process that underlies communication;
- terms and concepts are used inconsistently (as was already stated above);
- the uses and gratification approach does not take the context in which communication takes place into account;
- media choice is not explained in the uses and gratification approach.

Many theories have been developed to fill these gaps. However, all these new theories shed a light on the process of communication from a different angle. Consequently, all of these theories provide a different image. None of the theories provide a complete image (Severin and Tankard, 1988, p.308). The best theoretical framework is obtained when the strengths of several theories are combined. That is why uses and gratifications is retained as a starting point and other theories are used to overcome the criticism that was expressed with regard to uses and gratifications. The reasons to take uses and gratifications as a starting point are twofold.

- The uses and gratifications approach provides a general framework. This broadness has resulted in critique but has also led to openness and flexibility. As a consequence of this openness, uses and gratifications has overcome the criticism that has been expressed over time. Maybe even of more importance is the fact that most assumptions made in the uses and gratifications approach still stand strong after more than 25 years.
- A second reason is that electronic information services differ from the traditional (mass) media. For this reason, it would be plausible to assume that uses and gratifications is not applicable. However, there is a reason to believe that uses and gratifications is applicable to new media. Most new media do not simply send information to a receiver. The receiver has to explicitly seek for information. This strongly supports the assumption of an active audience. In other words, uses and gratifications should be better suited to explain the use of new media better than the media uses and gratifications originally was designed for.

4.3 Criticism on the uses and gratifications approach

Before the hypotheses of this research project are presented, first the focus is on the points of critique that have been expressed with regard to the uses and gratifications approach. We will try to refute the criticism by using alternative theories.

4.3.1 The tautological nature of uses and gratifications

The relation between a ‘use’ or a ‘need’ and a ‘gratification’ has been criticised as tautological. What is it that distinguishes a need for information and media use from a gratification (the fulfilment of needs)? The question of ‘what causes what’ can be raised. Does, for example, a certain situation lead to the need for diversion or does certain media content lead to escapism? Needs, and especially the intensity of needs, are hard to measure. What is measured are the gratifications, which are then converted to needs and subsequently to uses. It is not made clear whether the use comes before the gratification, whether it might provoke the gratifications, or may be even the other way around. In order to overcome this problem the distinction between ‘gratifications sought’ and ‘gratifications obtained’ was made in the expectancy-value model (Palmgreen and Rayburn, 1985).

In this research the difference between a need and a gratification can be made. The need is expressed in the need for information. The gratification is expressed in the solution to (or a reduction of) the need for information (an answer to the question).

4.3.2 Factors or processes to study media use

Another basic problem is that the uses and gratifications approach tries to explain media use by solely looking at the correlation between factors such as needs, motivation and behaviour. In doing so, uses and gratifications does not take the *process* of communication into account. Other approaches such as the 'Nutzenanzats' and 'Dynamisch Transactionelle Anzats' approach media behaviour from the viewpoint of the user's activity or actions (i.e. 'handelen') (Nelissen, 1991). In the latter approach media use is seen as a system of supply (the sender) and demand (the receiver). Both parties play a role. The sender has information he wants to 'sell' to a receiver in exchange for attention. The receiver sells attention in exchange for information. Both parties play, in response to each other, an active but different role. However, this game of supply and demand, still does not provide insight into how the process of communication actually takes place.

In this research the process of communication, as it was described in chapter 2, was taken as a starting point. Then, the object of research was delimited to the relation between information need and media choice. Summarising, this project only studies part of the process of communication. In order to elaborate on the process of choice, decision theory is used.

Decision theory

Making a decision is involved with the process of people choosing one alternative over another and the causes and consequences of that choice. Theoretical insights about the process of decision making with regard to consumer behaviour can mainly be found in marketing research. From a marketing perspective the decision process ultimately involves the question whether a product will or will not be bought. A general outline of the process of decision making is captured in several phases: motivation and need recognition, search for information, alternative evaluation, purchase and outcomes (Einhorn and Hogarth, 1981, Engel, Blackwell and Miniard, 1990 and Baxter, 1993). The relation between the phases, the variables influencing the process, the information processing and input in relation to the process is depicted in Figure 4-2, which is taken from Engel, et al. (1990).

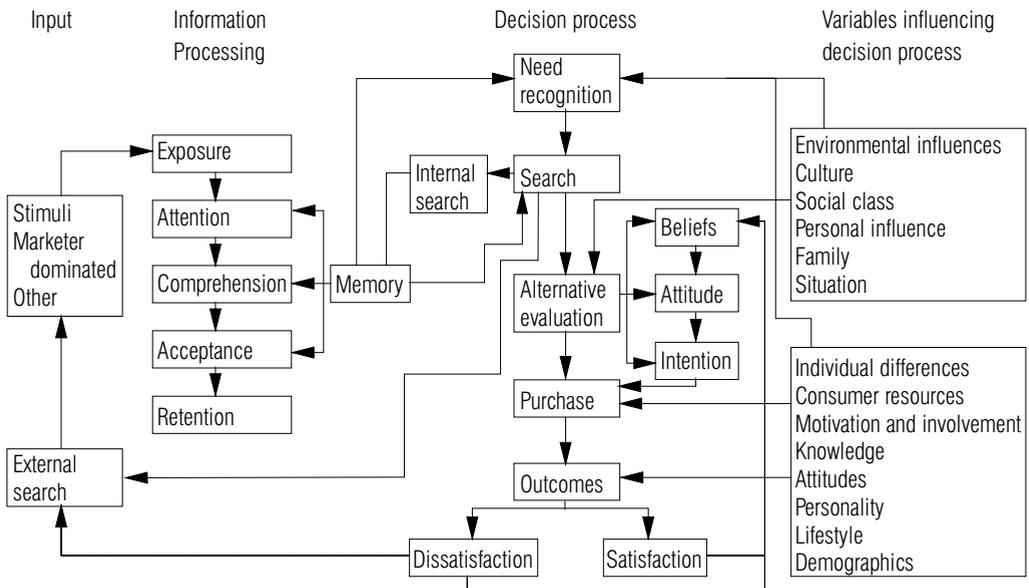


Figure 4-2 Model of consumer behaviour (Engel et al., 1990)

- *Motivation and need recognition*: the perception of the difference between the desired state of affairs and the actual situation sufficient to arouse and activate the decision process. Need recognition is subject to environmental influences and individual differences.
- *Search for information*: the activation of knowledge stored in memory (internal) or acquisition of information from the environment (external).
- *Alternative evaluation*: the process by which a choice alternative is evaluated and selected to meet consumer needs. Decisions must be made initially about which alternatives to consider and the criteria to use in judging the alternatives. The relative performance of the considered alternatives along the evaluative criteria must then be judged. A decision rule is then applied to these judgements in order to select a particular alternative. Beliefs, attitudes and intentions may influence the process of alternative evaluation.
- *Purchase*: the process of acquiring a product (or service) involves answering questions like where, when and how to buy. This may be influenced by individual differences, beliefs, attitudes and intentions.
- *Outcomes*: relate to the degree of satisfaction or dissatisfaction as a consequence of the purchase. Outcomes may influence held beliefs in another decision process.

Limited and extended problem solving (LPS and EPS)

There are basically two ways in which the decision process as described above can be passed through: extended problem solving (EPS) and limited problem solving (LPS). For EPS the decision making process is especially

detailed and rigorous. For LPS the same stages will basically be followed, but with a major difference in extent and rigor (Engel et al., 1990).

Baxter (1993) states that researchers have paid much more research attention to EPS than to LPS, even though most purchases follow a LPS process. Baxter explains the difference of attention for both processes as follows: EPS is, scientifically spoken, more challenging for researchers and marketers. Secondly, the less complex structure of LPS should easily be deduced from the complex EPS structure. Note that EPS and LPS are the extremes of a continuum. Most needs will be solved using midrange problem solving. The main differences between EPS and LPS in relation to the phases in the decision process are depicted in Table 4-1.

Table 4-1 Differences between EPS and LPS (Engel et al., 1990)

Phase	Extended Problem Solving (EPS)	Limited Problem Solving (LPS)
Motivation and need recognition	High involvement and perceived risk	Low involvement and perceived risk
Search for information	Rigorous evaluation process Multiple sources used, including media, friends, and point of sale information Information processed actively and rigorously	Low motivation to search Exposure to advertising is passive and information processing is not deep. Point-of-sale comparison likely
Alternative evaluation	Rigorous evaluation process Multiple evaluative criteria used, with some more salient than others Alternatives perceived as significantly different Compensatory strategy where weakness on given attitudes can be offset by others Beliefs, attitudes and intentions strongly held	Non-rigorous evaluation process Limited number of criteria, focus on most salient Alternatives perceived as essentially similar Non-compensatory strategy, eliminating alternatives perceived to fall short on salient attributes. Beliefs, attitudes and intentions not strongly held
Purchase	Will shop many outlets if necessary Choice of outlet may require a decision process Point-of-sale negotiation and communication often needed	Not motivated to shop extensively Often prefer self service Choice often prompted by display and point-of-sale incentives
Outcomes	Doubts can motivate need for post-sale reassurance Satisfaction is crucial and loyalty is the outcome Motivated to seek redress if there is dissatisfaction	Doubts can motivate need for post-sale reassurance Satisfaction motivates repurchase because of inertia, not loyalty Main consequence of dissatisfaction is brand switching

Habitual decision making

The basic distinction that can be made with regard to habitual decision making is that between brand loyalty and inertia. Brand loyalty is a motivated, difficult-to-change habit of purchasing the same item or service, often rooted in high involvement. Inertia is a motivation that leads to habitual decision making due to the lack of sufficient incentive to consider alternative brands (Engel et al., 1990).

The process of media choice

With regard to the process of *media* choice, the decision making process can be illustrated based on the model of Engel et al. (1990). See also Figure 4-3. The upper half of the figure shows how an information need is solved. The lower half of the picture shows that a medium is chosen much in the same way as the need for information is solved. In this way, media choice is a sub problem of solving an information need. The need in the upper half of the picture is: what information is needed to solve problem x. The need in the lower half of the picture is: what is the best medium to find an answer to problem x. An example illustrates the process of solving a need and choosing a medium.

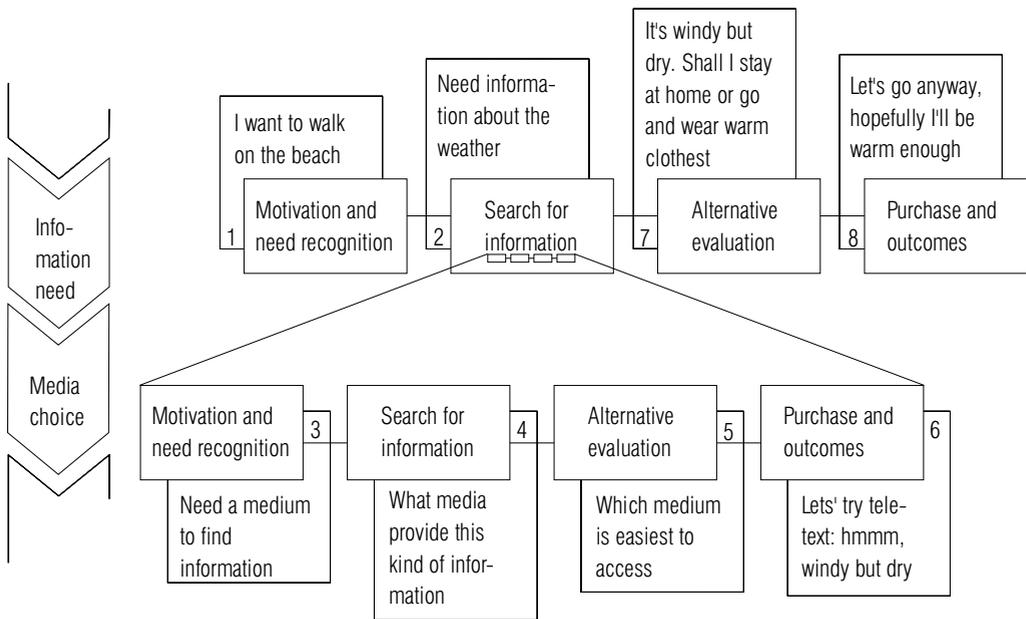


Figure 4-3 Decision process for media choice

For sake of clarity, this research studies steps 1 through 6. The steps 7 and 8 are not part of the object of research. The process of media choice is related to the steps 3 through 6.

The way in which the decision process takes place for media choices, it can be concluded that in this research, the choice for a medium to solve a problem typically is an issue of limited problem solving. Only in a small number of cases choosing a medium for a certain need for information

requires a well considered choice. In most cases limited problem solving will be adequate for medium choice. Media choice is a low involvement issue. Choosing a wrong medium to find out what the weather will be like, can not be compared to choosing a wrong mortgage. The phases of decision making for media choice will now be described.

- *Motivation and need recognition (Step 3)*. The first issue relates to the goal of going through the process. In cases of a medium choice, the goal is to find a medium that can provide an answer to a certain question.
- *Search for information (Step 4)*. The next goal is to find information about alternative possibilities. In terms of media choice, this would involve finding information about several media in order to compare them. In most cases this search for information will be limited to an internal search. In low involvement situations an internal search usually is sufficient to make a medium choice. A user is not expected to be motivated enough to go and find information about the characteristics of several media before choosing a medium to solve another information need.
- *Alternative evaluation (Step 5)*. After that, the decision process involves the number of alternatives that are involved, the way in which alternatives are compared, the criteria that are used and the decision rule that is used. When only one alternative is perceived as being useful, that medium will be chosen. When more alternatives are available, the issue of accessibility becomes apparent.
- *Purchase and outcomes (Step 6)*. The usual method of media choice is ‘trial and error’. If expectations are fulfilled, it is to be expected that a new problem of the same nature will again be solved with that medium. If the medium does not provide an adequate answer to a question, it is not likely that the medium will be chosen if a comparable problem would emerge.

The administrative model

The models that have been presented until now present a rational and analytical picture of the process of decision making. In contrast to this economic rational approach a more intuitive approach emerged. The administrative model (March and Simon, 1958) recognises that managerial decision makers have a limited view of the problem they are confronted with. Not all alternatives are known and information about the alternatives that are known may not be complete. The alternative that is eventually chosen, is the alternative that meets the criteria for acceptability. In other words, the decision that is eventually made is a satisficing decision rather than an optimal decision. Moreover, the rationality with which people make decisions is bounded. People lack the cognitive skills that are required to solve problems in a completely objective and rational way.

Table 4-2 The administrative versus the rational-economic model (Greenberg and Baron, 1993)

Assumption	Rational-Economic model	Administrative model
Rationality of decision maker	Perfect rationality	Bounded rationality
Information available	Complete access	Limited access
Selection of alternatives	Optimal choice	Satisficing choice
Type of model	Normative	Descriptive

Image theory

Image theory uses an intuitive approach (Beach and Mitchel, 1990). The theory allows the possibility to think about personal goals and standards when making a decision instead of only weighing all the options. The theory argues that making a decision is rapid and simple. People do not ponder or reflect long over a decision. Decisions are made intuitively. Image theory consists of two steps.

- *The compatibility test* is the first step: a comparison of the degree to which a particular course of action is consistent with various images. When a certain alternative is not compatible with for example individual principles, goals or plans, the alternative is rejected.
- *The profitability test* is the second step: an assessment of the remaining alternatives is made based on which alternative fits values, goals and plans best.

These tests are performed within a decision frame. The decision frame contains information about past successes and failures.

In this research decision making is approached from the administrative angle. In real life, people do not dwell about what medium to choose to find an answer to a question. Limited problem solving is more likely than extended problem solving when solving information needs.

4.3.3 Confusion of the tongues

As was stated in section 4.2, many gratification typologies have been developed over the course of time. Many typologies resemble each other and categories strongly overlap, although often different terms are used for the same uses and gratifications. Below a brief overview of typologies.

- Surveillance, relaxation and interpersonal usefulness (Levi and Windahl, 1984).
- Information, relaxation, boredom, ritual, security and social prestige (De Bock, 1980).
- Information/education, escape/relaxation, boredom/loneliness and watch the world (Overste, 1978).

The critique (of not having a unequivocal set of concepts) can easily be overcome by clearly defining the meaning of the gratifications that are used.

Apart from this critique, this research focuses on only one type of use: the need for information. Of course several media can be used for other

purposes such as entertainment and social prestige, but the main focus of the research is on information seeking.

In the information seeking approach Sepstrup (1977) defines information need as the difference between the way things are and the way an individual would like them to be. The basic idea is that there is a perceived (i.e. subjective) difference between the available knowledge and the knowledge that is needed to perform an activity. Size and type of the difference between available knowledge and needed knowledge determines size and type of the information need. In addition, refinements on the information uses have been made (Weights, Widdershoven, Kok and Tomlow, 1993):

- a need for new information;
- a need to elucidate the information already held and
- a need to confirm information already held.

To this, two more needs can be added: a need to elucidate beliefs and values and a need to confirm beliefs and values held (Wilson, 1996).

Another categorisation is that of Chew (1994):

- orientation: seeking to discover what is happening;
- reorientation: seeking to check that the person is on the right track and
- construction: seeking to form an opinion or solve a problem.

These refinements however, do not have any explanatory power for media choices. Almost any medium could provide new information or confirm ideas already held. For this research other criteria that explain media choice will have to be used. We will elaborate on this issue in section 4.3.6.

4.3.4 Measuring audience activity

With regard to audience activity assumption, the uses and gratifications approach was heavily criticised. The criticism consisted of the fact that user activity could not be demonstrated as well as uses and gratifications would predict. Rubin tackled this criticism from a motivational perspective. Rubin (1984; 1993) explains audience activity by demonstrating that most (mass) media use is ritual (i.e. habitual) and only some media use is instrumental (i.e. functional). The difference between the two types is that there is an active audience for instrumental media use but there is hardly any audience activity for ritual media use. This notion could be demonstrated empirically.

Thus, in addition to the previous section it can be said that our research is aimed at instrumental information seeking behaviour. Again, this does not mean that ritual use of new media is not possible, but it is not part of this research.

4.3.5 The system, the context and the user

In the first years of the development of uses and gratifications research the relation between people and their uses and gratifications was not investigated in relation to the context in which needs emerged. Later other approaches such as sensemaking (Dervin, Jacobson and Nilan, 1982) and 'Nutzenanzats' (Nelissen, 1991) emphasise the influence of context.

In the 'sense-making-approach' the concept of an active user is developed from a perspective of the user-context. In this approach the way in which people make sense of the world around them is central. One of the assumptions in the approach is that users, by definition, have an incomplete image of the world. As the world is constantly changing, people are confronted with 'gaps' in their knowledge. Consequently, 'searching for information is not a means of a rational adaption to reality, but rather the way in which people subjectively bridge the gaps they are confronted with' (Nelissen, 1991).

The Nutzenanzats emphasises the interpretation of the message. This approach is building on the assumptions of symbolic interactionism. Symbolic interactionism is 'an approach to social relations that emphasises the importance of negotiated meanings associated with symbols exchanged in interaction between self and others' (O'Sullivan et al, 1983). In this light the connection to context can be made. Communication takes place within a framework of shared meaning: the context.

Also in this research, the idea of context plays a role. The context in which an information need emerges can influence media choice. This will be taken into account in the research design. The detailed description of context that the two described approaches have cannot be taken into account. In this research, context is limited to the place in which an information need emerges and the physical accessibility of media in that context. The importance of context is acknowledged, but a choice was made not to perform detailed research with regard to context because of pragmatic reasons.

4.3.6 Media choice

The last criticism relates to the lack of attention on media choice in the uses and gratifications approach. Even though one of the assumptions is that media compete with other forms of communication for selection, attention, and use, little is done with this notion. In the section on decision theory the attention was already on the *process* of media choice. This section will elaborate on the relation between need and choice. From organisational theory several insights can be used here. Media richness (Daft et al., 1986; Trevino, Daft and Lengel, 1990) and the social influence model (Fulk et al., 1990) of media use provide starting points for media choice with regard to

this research. The basic assumption in these theories is that a good task/medium fit is essential to effective communication. Media richness approaches this from a rational perspective whereas the social influence model states that task and media perceptions are subjective and socially constructed.

The premise of the media richness theory is that organisational success is based on the organisations ability to process information of appropriate richness to reduce uncertainty and clarify ambiguity (Daft et al., 1987). Uncertainty and ambiguity are expressed in the concept of message equivocality. Equivocality means the existence of multiple and conflicting interpretations about an organisational situation (Trevino et al., 1990).

Richness refers to the capacity of a medium to process information. Rich media have the highest capacity to facilitate shared meaning. Lean media have the lowest capacity. The richness of a medium is based upon a blend of four criteria: (1) the availability of instant feedback, making it possible for communicators to converge quickly upon a common interpretation or understanding; (2) the capacity of the media to transmit multiple cues such as body language, voice tones, and inflection, to convey interpretation; (3) the use of natural language, rather than numbers, to convey subtleties; and (4) the personal focus of the medium: a message will be conveyed more fully when personal feelings and emotions infuse the communication (Trevino et al., 1990). Based on these criteria a media richness scale can be made such as Figure 4-4.

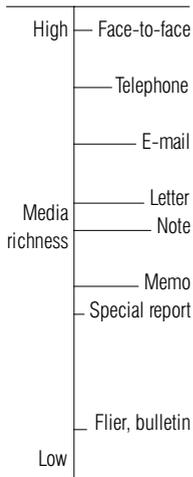
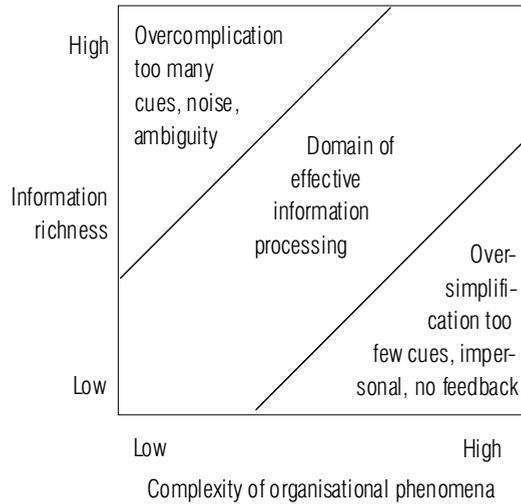


Figure 4-4 Hierarchy of media richness (Trevino et al., 1990)

A good fit between medium and message consists of the choice for a lean medium for an unequivocal message and a rich medium for an equivocal message. If a lean medium is used for an equivocal message or in a rich medium is chosen for an unequivocal message, a mismatch occurs. In the first case the problem is oversimplified, too few cues are processed, the medium is too impersonal and there are too few feedback possibilities. In the second case, a situation of overcomplication emerges: too many cues are sent. Consequently noise and ambiguity are conveyed (Daft et al., 1987). As is shown in Figure 4-5 there is a certain bandwidth where communication is effective.

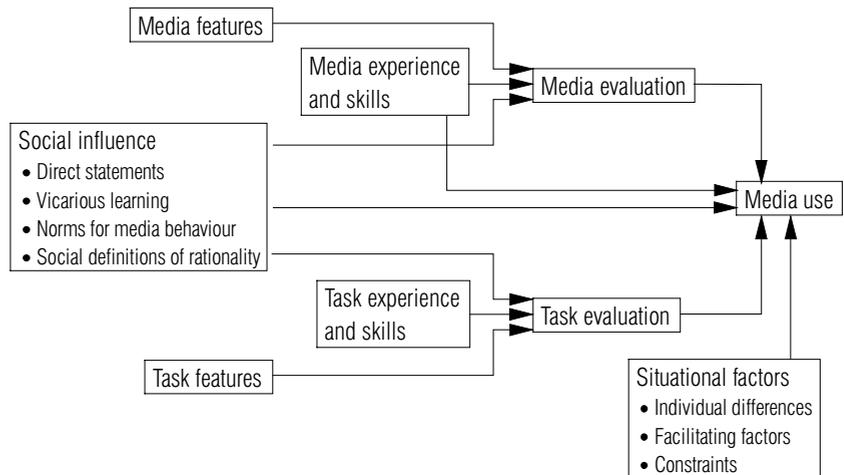
Fulk et al. (1990) argue that medium characteristics and attitudes are in part socially constructed. Medium use processes are influenced by past statements, behaviours and social norms. Consequently, in contrast to the beliefs of rational choice models, medium choice is subject to social influence.

Figure 4-5 Model of information processing (Daft et al., 1987)



Fulk et al. propose that determinants of medium choice are medium evaluations, task evaluations, social influence and situational factors. The importance of social influence in the model of Fulk et al. is evident from the hypothesis that social influence not only affects medium choice directly, but also affects medium evaluations and task evaluations. Social influence in the model is thought to consist of direct statements by co-workers, vicarious learning, group behavioural norms and social definitions of rationality. An outline of the model is presented in Figure 4-6.

Figure 4-6 Social influence model of media use (Fulk et al., 1990)



With regard to the choice for media in this research, the same mechanisms of finding the right task/medium fit are relevant. The combination of a task (i.e. an information need) and media choice is investigated. However, both

the concept of media richness and that of task complexity is not maintained. As media richness deals with *communication* media (i.e. media as a channel) the actual *content* of communication is disregarded. In chapter 3 factors were found that do relate to the content that is provided by media. For example the suitability of media for topical and unique information was found to be relevant to media choice. Also the idea that both tasks and media can be placed on a unidimensional scale is not applicable to the diversity of information needs as they are used in this research. Besides topicality and uniqueness, also the possibility to perform transactions and or to communicate and the context in which needs emerge are found to be relevant in the Q-sort research.

4.4 Gender issues

There is a difference in the way in which men and women use media. For example, about twenty percent of Internet users are women (see Chapter 2), the rest of the users are men. Women tend to use the telephone longer and more socially than men. Women tend to watch television in a different way than men.

A simple explanation which is often used to explain this difference is that women have less interest in information and communication technology because of their psychological structure. Women are supposed to pay interest in, for example, more social activities. However, these social-psychological factors do not explain the differences between men and women very well. After all, twenty percent of the users of the Internet are women and they can be very interested and well educated users of information and communication technology. On the other hand, men can talk for hours about their cars, sports, computers and women. Moreover, a group that is often forgotten in discussions about women lagging behind, is a large group of men that are not very well educated in information and communication technology.

Bergman and Van Zoonen (1996) state that the differences between men and women can better be explained by other factors than these social-psychological factors. According to them, structural and cultural factors produce higher barriers for women than the individuals psychological gestalt. Structural factors are differences between men and women in, for example, education, income and social position. As a consequence, women have different patterns of media use. Women, for example, on average have lower incomes than men. Therefore they have less money to spend on computers, modems, software, on-line services and other infrastructure necessary to get access to for example WWW.

The cultural dimension, mentioned by Bergman and Van Zoonen refers to the idea that all domains of interest such as cars, children, computers and clothing are dominated by either men or women. For example, cars, computers and technology in general acquire meaning as a masculine domain. On the other hand, subjects like children, clothing, health are dominated by a feminine influence. Moreover, it seems that a masculine domain is very hard to access for women and men can hardly access the feminine domains. The domain of new media and information and communication technology is dominated by masculinity, as it logically builds on the masculine domain of technology. Consequently, few women will find their way to this technology.

4.5 The model used in this research

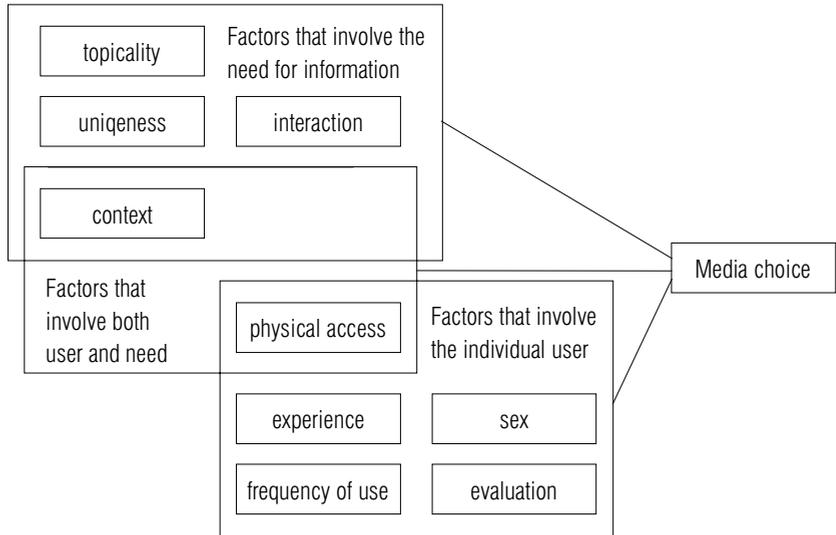
The theories that are presented here provide a number of starting points for the formulation of hypotheses. In fact, a selection is needed in order to keep this research to a equitable size.

The basics of the model in this research is the combination of uses and gratifications and media richness complemented with notions from several other theoretical approaches and previous research. Uses and gratifications provided us with the starting point of a need for information. Media richness provided the notion of a combination between need and choice. The social influence model stresses the importance of subjective evaluation. A number of other theories and the preliminary research helped to characterise differences between needs. Three clusters of factors that influence media choice are distinguished:

- factors that relate to the need for information;
- factors that relate to differences between users, and
- factors that relate to the combination of needs and users.

The results of the Q-method research are the basic guideline for the selection of factors that are included in this chapter. Factors that proved to be important in Chapter 3 are included in the model that is used in this phase of the research.

Figure 4-7 Model of media choice



In Figure 4-7 an overview of the factors that are included in the research is presented. The factors that influence media choice and accompanying hypotheses will now be presented.

In their model Palmgreen, Wenner and Rosengren (1985) show the importance of individual differences for the explanation of media use (Figure 4-1). There are many (user) context characteristics that could be distinguished. In this research the only user characteristic that is taken into account is sex. Although Bergman et. al. (1997) argue that differences should be explained from male and female domains (instead of just sex) the scope of this research only allows measurement of sex.

Both Rosengren et al. (1985) and Rubin (1984; 1993) stress the importance of habitual use of media. They state that the more people use a medium, the more likely it is that this medium will be used again: see hypothesis 2. The same argument is valid for experience with media use. The more experienced a user is with a medium, the more likely it is that a medium is chosen when confronted with a task: see hypothesis 3. Hypothesis 4 relates to beliefs and expectations about a medium. This influences media use, according to Palmgreen, Wenner and Rosengren. A positive evaluation is more likely to lead to media use than a negative evaluation. Topicality (hypothesis 5) and uniqueness (hypothesis 6) are important characteristics of the need, directly resulting from the Q-methodology research. Whether an information need concerns only information retrieval or does also include communication and/or transaction is also supported by the Q-sort research. Hypothesis 7 relates to this subject. The importance of context is stressed by many researchers. Not only Palmgreen, Wenner and Rosengren, but also Dervin and others

pay attention to context. Also from the Q-sort research the importance of context can be derived. Two hypotheses are derived from the concept of context. Hypothesis 8a relates to the accessibility of media in a certain context and 8b relates to the place where information is needed.

Table 4-3 Hypotheses

Number	Subject	Hypothesis
Hypothesis 1	Sex	Men and women have different patterns of media choice.
Hypothesis 2	Frequency of media use	It is more likely that media are chosen that respondents use regularly or often than media that are used never or little.
Hypothesis 3	Experience	It is more likely that media are chosen for which respondents are experienced or freaks than media for which people are lay or beginner.
Hypothesis 4	Evaluation of media	It is more likely that media are chosen that respondents evaluate as positive than media that are evaluated as negative.
Hypothesis 5	Topicality	For information needs with a topical character more often on-line media will be chosen; for information needs with a stable character, more often off-line media will be chosen.
Hypothesis 6	Uniqueness	For a unique need for information media will be chosen that offer a wide variety of subjects; for common information more often is chosen for media that offer a limited number of subjects which are needed on a daily basis.
Hypothesis 7	Interaction	For an information need that involves transaction and/or communication, more often an interactive medium will be chosen. For information needs that only require information retrieval more non-interactive media will be chosen.
Hypothesis 8a	Context	Physical access is a necessary but insufficient condition for media choice.
Hypothesis 8b		Different contexts lead to different media choices.

Now that all hypotheses are presented (Table 4-3) it is time to look at the research design, the following section pays attention to this subject. The design of a research protocol to explore these hypotheses is discussed in the next chapter.

Empirical research - Policy capturing

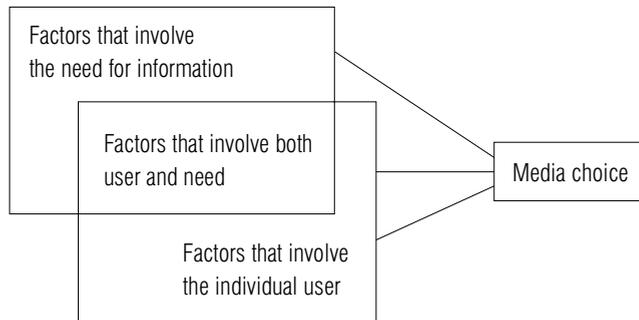
This chapter presents the research design, analysis and results of a Policy capturing study of media choice. In Policy capturing studies, respondents are confronted with hypothetical cases. In this research respondents (538 Dutch university students) are confronted with various information needs. The effect of differences between information needs and differences between users on media choice can now be measured. Using hierarchical logistic regression results, in general, show that users actually try to match media, tasks and (user) context when making a choice: a specific need, in a specific (user) context is solved with specific media. A good match depends on several factors. First of all, physical accessibility of a medium in a certain context, is a necessary but insufficient condition for media choice. Secondly, differences between information need explain more than differences between users.

5.1 Introduction

In this chapter the relation between need for information and media choice will be studied. The basis for this study is the factors that were found in the previous chapter. More precisely the goal is to determine in what way a certain need for information is related to media choice, while taking into account differences between users. An example of differences between users that could influence media choice is experience with media use. If a user has more experience with a medium it is more likely that he or she will choose that medium to solve the problem. An example of a factor that is related to the information need is topicality. An information need can have a stable or a topical character. A topical need for information (such as the weather) is more likely to be solved with an on-line medium (such as

WWW) and a stable information need (such as a book reference) is more likely to be solved with an off-line medium (such as a book or CD-ROM). A factor that is related to both need and user is physical access to a medium in that context. The context in which information is needed (for example at home or at work) and the physical access in that context together influence media choice. A graphical presentation of the basic model is presented in Figure 5-1.

Figure 5-1 Conceptual model of research framework



The central research questions in this chapter are:

- What is the effect of differences between information needs on media choice?
- What is the effect of differences between users on media choice?

In the previous chapter these questions were answered from a theoretical perspective. The result is a model that describes what factors explain media choice. This chapter will focus on this model. An empirical approach will be used. The focus is on how the factors in the model influence media choice.

In order to obtain an answer to the research question a Policy capturing study is performed. Why this approach was chosen and a detailed description of the approach can be found in section 5.2.1. A summary of the approach is presented here.

A questionnaire was distributed among a large group of students. In the questionnaire several hypothetical information needs (cases) are presented to the respondents. Respondents are asked to choose a medium with which this information need can be solved. An example of a case is:

‘Suppose, in the break of a lecture, you and your fellow students decide to go to a movie tonight. You do not know what movies are on tonight. How do you find out which movies you can go to?’

In a multiple choice question, the respondent is asked which medium he or she would choose. In the same way several other needs for information, with varying characteristics, are presented. For example, the same cinema-

case is presented in a home context. The analysis focuses on the effects of differences between needs and differences between users concerning media choice.

In section 5.2, the chosen method of research (policy capturing) is described in detail, followed by a description of the research design. The survey sample and way in which the questionnaire was constructed, will be discussed.

The results of the research will be presented in section 5.3. This section begins with descriptive statistics. This will provide general insight into the data. After that the effect of differences between needs and users on media choices will be discussed. The section concludes with multivariate analysis, using logistic regression.

Section 5.4 contains the conclusions of this chapter. The relation between the theoretical background and the results that were found, is discussed.

5.2 Research Design

From section 4.5 it can be concluded that ultimately this chapter is about choice to solve an information need. The question that is raised is: 'How do media choices differ when people and needs differ?'. So the starting point is a choice and numerous factors influencing this choice. One method to study 'choice' is policy capturing. Policy capturing (Rossi and Nock, 1982) (also known as factorial survey or vignette studies) combines the advantages of multivariate experimental designs with sample survey procedures. From the experimental tradition, the policy capturing borrows and adapts the concept of manipulation and from the survey tradition it borrows the greater richness of detail and complexity that characterises real-life circumstances. It is a method for uncovering the principles that lie behind human evaluation.

The method can be used in studies in which there is presumed to be some kind of social component to the judgement of all kinds of objects. In practice, factorial surveys consist of providing individuals with contrived hypothetical situations or objects. In this research, the hypothetical situations that are to be evaluated are the information needs. The judgement to be made is a medium choice. Because the differences between the needs are known, the differences between users can be measured, and the final choices can be measured, it is possible to answer the research question. How the policy capturing procedure works in practice, is explained in detail in the following section (5.2.1).

5.2.1 Policy capturing

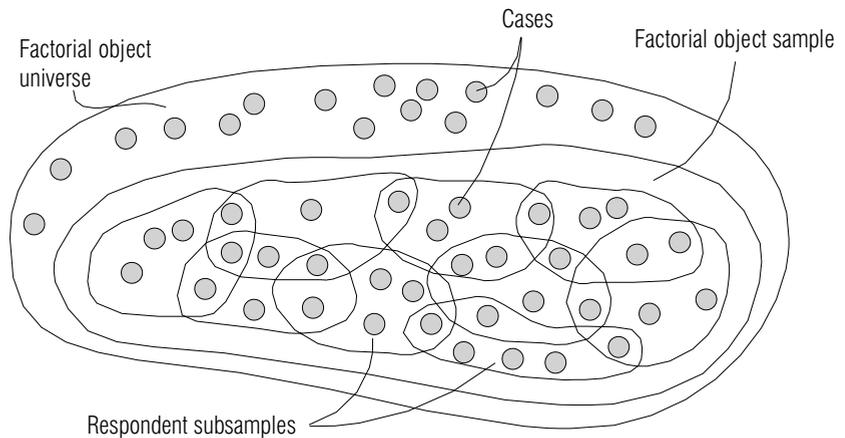
This section provides a review of the policy capturing method, the terminology and techniques. Also some examples of research that used policy capturing procedures, will be presented briefly.

Creation of the cases

The starting point in the creation of the hypothetical situations are the dimensions (i.e. the variables in the research). The dimensions define what characterises the situation. The levels of a dimension are similar to the values of a variable. The combination of levels of all dimensions (i.e. values of all variables) characterise a situation. The set of all possible combinations of all levels in all dimensions is called the factorial object universe. More formal, the factorial object universe consists of the set of all unique objects formed by all possible combinations of one level from each of the dimensions (Rossi et al., 1982).

A simple calculation demonstrates that only a few dimensions, with a few levels can already create a huge number of objects. Because it is not useful to use all possibilities the factorial object sample is made. The factorial object sample is an unbiased sample of the objects in a factorial object universe.

Figure 5-2 Factorial object space



This sample consist of all cases that are in the research. Then again, the respondent subsample is an unbiased sample of a factorial object sample that is given to a single respondent for judgement. The relation between the factorial object universe, the factorial object sample and the respondent subsample, is depicted in Figure 5-2. Table 5-1 summarises the key concepts in policy capturing.

Table 5-1 Key concepts in policy capturing

Concept	Description
Dimension	One dimension is a single characteristic of an object. For example colour of eyes. Dimensions are comparable to variables.
Level	A level is the value within a dimension. For example: blue is a level, as is brown. A level is comparable to a value of a variable.
Case	A combination of levels for all dimensions: blue eyes, blond hair.
Factorial object universe	All possible combinations of all levels in all dimensions
Factorial object sample	An unbiased sample of the objects in a factorial object universe
Respondent subsample	An unbiased sample of the factorial object sample that is given to a single respondent for judgement.

Research in which policy capturing was used as a method

Policy capturing is not a very wide-spread method of research. One of the first policy capturing studies is of Rossi and Anderson (1982). It measures the social definition of sexual harassment. There are also two studies of policy capturing in the field of information and communication technology.

- Martocchio, Webster and Baker (1993). Decision-making in management information systems research. This research illustrates the use of policy capturing in two decision-making situations: computer training and software selection.
- Webster and Trevino (1995). Rational and social theories are used as complementary explanations of communication media choices. The research is on two policy capturing studies that support the notion that media richness and social influence theory are complementary, rather than competing. The relative importance of choice factors depends on the medium. A comparison of policy capturing and survey findings points to policy capturing as a useful research methodology. Results also suggest that rational and social factors should be included in comprehensive models of media choice that address both traditional and new media.

5.2.2 Research design in detail

This section deals with the question how policy capturing procedures are applied in this research. First of all, the dimensions and levels within dimensions will be determined. Then the procedures for obtaining the factorial object universe into the factorial object sample and respondent subsample are presented.

The dimensions, levels and cases

The hypothetical situations of this research are information needs. These information needs are the cases that are presented to the respondents. These information needs are created by systematic variation on several

dimensions. These dimensions relate those characteristics of the need that were defined in section 4.5. The dimensions and levels within dimensions are as follows.

- *Topicality* refers to the degree to which information changes. The levels within topicality are high or low, or, in other words: topical or stable.
- *Uniqueness* is also divided in two levels: common and unique. Uniqueness primarily refers to the question whether information is commonly available or is hard to get.
- *Interaction* refers to the question whether solely information is needed or whether also transaction or communication is part of the need. The levels therefore are: information and communication and/or transaction.
- *Context* refers to the context in which a need for information is set, for example at home or at a university or some other place. The two levels in the research are home and university.

All dimensions are divided in two levels. The reason to do so is that a distinction can more easily be made using two levels than it is when more levels were to be used. For example, it is not difficult to find the difference between a typically stable or typically topical need for information.

Although not impossible, it is much harder to find a need for information that is a little bit topical and a little bit stable. By only looking at the extreme ends of a dimension the difference between the two levels becomes clear.

The factorial object universe, object sample and subsample

In order to compute how many cases are in the factorial object universe, all levels within all dimensions are combined. As four dimensions, all with two levels we distinguished, there are $2^4 =$ sixteen combinations. Thus, the factorial object universe consists of sixteen combinations of values within dimensions.

Now, the factorial object sample will be constructed. In policy capturing, the factorial object sample is an unbiased sample of the objects in a factorial object universe. This is where this research does not follow the policy capturing procedure. Some of the combinations do not lead to real life situations. Especially if sample of respondents (students) is taken into account. Even though Rossi et al. (1982) see it as a merit to have all kinds of combinations, there is a disadvantage in presenting people with unrealistic cases. There is a severe chance that an unrealistic case leads to an unrealistic answer. For example the combination: common, university, transaction or communication, topical did not lead to a realistic need for information with regard to students. The combination communication/transaction and topical information is unrealistic. The only example that comes to mind is buying or selling shares of a company. This is, for the students who are in the sample, not a very likely situation. These

cases were left out of the object sample. Summarising, the factorial objects sample was not a unbiased sample of the factorial object sample. Only the combinations that were seen as realistic within a student context were included in the research.

The final factorial object sample consisted of ten different combinations of dimensions and levels. For each combination two to four cases were constructed. The cases were designed in such a way that for every case there is an alternative case that differs on only one dimension. In other words, the factorial object sample consists of pairs of cases that are exactly the same, but for one level on one dimension. For example: One need is to find out what movies are on in the cinema while at university and another is to find out the same thing while at home. The only difference between the two is the dimension context. The level in the first case is university and in the second one the context is home. In Appendix B.2 an overview of all combinations (Table B-1) and all cases (in Dutch) (table B-2a and b) is provided.

The factorial object subsample, finally consists of ten cases. Each respondent received one case from each combination. The ten cases were chosen in such a way that only one case from each subject was in a subsample. In other words, the two cases that were described above are never in one subsample.

5.2.3 The sample of respondents

The sample of respondents is taken from the population of students of Dutch universities. In order to determine a sample a choice has to be made between feasibility and the degree to which results can be generalised. By way of illustration; a random sample from the Dutch people provides the best opportunity to generalise. The question however is whether meaningful information (in relation to the research question) can be gathered from such a sample. Very few people in the sample will for example even have physical access to the Internet. As a consequence for many people the new media (which this research is mainly about) will not be a realistic option.

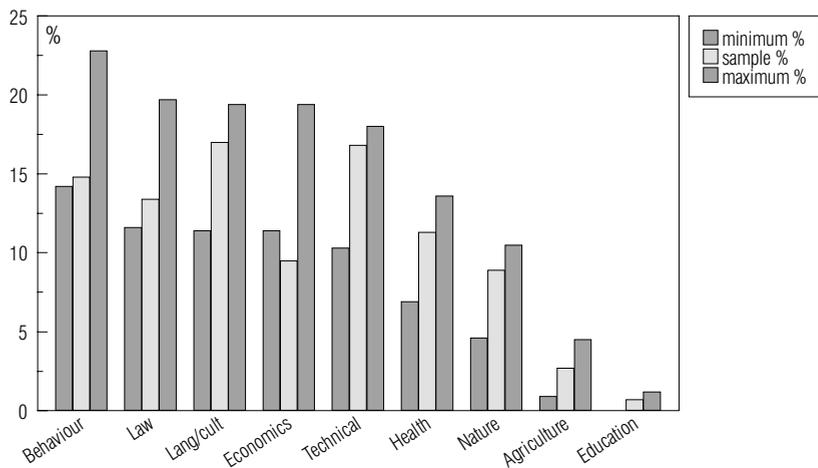
Therefore, it is important to choose a group of respondents that is relatively familiar with the possibilities of new media. In this research Dutch university students are chosen as a source of information. Moreover, the goal of the research is to find out how several factors influence choice (the pattern) and not what the Dutch public thinks of new media. The only question that remains unanswered is whether this pattern is the same for students and for other sections of the population. However, this uncertainty compensates the disadvantage of not having a sample that does not provide an answer to the research question.

Representativity

Because a database with all students names and addresses from which a random sample could be taken was not available, another method to draw the sample was used. In order to create a representative sample of students, disciplines defined by The Ministry of Education, Culture and Science in the Higher Education and Research Plan (HOOP), 1996 are used as a criterion for selection (CBS, 1997). The number of students in each discipline is reflected in the sample. Based on Equation 1 the confidence interval for N= 538 was computed. See also Appendix B.3.1, Table A-3.

Equation 1 $95 \text{ percent confidence interval} = p \pm 1.96 * \sqrt{\frac{p \cdot (1-p)}{n-1}}$

Figure 5-3 Minimum, actual and maximum values of each subject of study in the research



In Figure 5-3 a bar chart of the minimum number of students in the sample, the actual number of students and the maximum number of students is presented. The sample bar should for each subject of study fall right in between the minimum and maximum value. From Figure 5-3 it can be concluded that all but one subjects of study are presented well in the sample. Only economics lags behind. However, the difference is relatively small and will be disregarded.

Data gathering

In order to reach students from the nine disciplines lecturers at several universities and departments were approached. The teachers who were contacted were mostly willing to co-operate themselves. Some would refer

to another teacher because they had no time available or were not giving courses at that moment.

Teachers were asked to grant ten minutes of an college hour. This time was used to explain the goals of the research to students, motivate them to fill out the questionnaire and distribute the questionnaire among students. Some teachers would give ten minutes, others gave more time. This time was used by students to fill in the questionnaire. This has lead to the relative high degree of response (approximately eighty percent). When students had to leave early, they were provided with an envelope that was already addressed and stamped.

The final sample

The sample consists of 538 students from nine disciplines, more than forty subjects and more than ten different universities which are spread around the country. There are 55 percent male and 45 percent female students in the sample, which is in accordance to the proportions in the population of students (CBS, 1997). Their age varies between seventeen and 31. The largest group consists of eighteen and nineteen year old students. The number of students gradually become smaller as students become older. In accordance with this, an overrepresentation of first year students exists. Even though in the population first years' students are also a large group, their share in the population is twenty percent (CBS, 1997). This, in contrast to almost 41 percent in the sample. This overrepresentation was caused by the way in which data was gathered. First of all, the lecturers who were asked to make time available during a lecture to fill out the questionnaire, preferred courses for students of the first year. An explanation for this may be that the time pressure is lower in the first year than in later years. Another explanation is that lecturers were asked to choose lectures that are attended by a relatively large group of students. Those lectures are often only given in the first year.

It is not probable that the overrepresentation of students from the first year will cause problems during analysis of the data. First of all, also students from later years are represented in the sample. Secondly, 'year of study' should, theoretically, not influence media choice directly. It is conceivable that students from the first year have for example, access to less media or less experience with media. These are factors that could influence media choice. However, physical access and experience *are* measured as a separate variables. Consequently, there should be no problem for further analysis as physical access and experience can be controlled for.

5.2.4 The questionnaire

The questionnaire consisted of three parts: questions on usage characteristics, the cases and some questions on socio-demographical variables. Although the questions on socio-demographical variables were the very last in the questionnaire, they will be presented here first.

Socio-demographical variables

Questions on socio-demographical variables were posed on the last page of the questionnaire. All questions were short and straightforward. In a multiple choice question sex could be specified. In open questions respondents were asked to specify their age, discipline, university and level of the course.

Right after these questions there was some space for comments. Most respondents did not comment at all. About sixteen percent of the respondents stated their name and address in order to obtain research results, indicating interest in the research and sometimes a positive remark about the questionnaire. Only a very small number of respondents stated that they did not like the questions.

The first part of the questionnaire contained questions with regard to physical access, regularity of use, experience, functions of the media and attitude.

Accessibility

The possibility to use a medium in a normal situation, specified to context (i.e. at home or at the university) was asked in a simple yes/no multiple choice question.

The questions on regularity of use, experience and evaluation are all questions on the ordinal level. It was decided that short descriptions with which the respondent could identify him or herself were to be used. It is much easier for people to state whether or not they belong to a certain group of people (for example telephone freaks or Internet newbies) than to indicate how many times a month they use the telephone or Internet.

The cases

In the central part of the survey ten hypothetical information needs are presented to the respondents. A full description of all cases and their characteristics is presented in Appendix B.2, Tables B-2a and B-2b.

The question which medium a respondent would choose is raised. In two multiple choice question the following questions were asked:

- the media that the respondent could possibly choose (more than one answer was possible) and

- the medium that the respondent would eventually choose (only one answer possible).

Then, for each case, two multiple choice questions followed. The first question relates to the reasons for choosing the medium that was chosen and the second question concerns the degree of motivation to get an answer to that question.

Results

In this section research results will be presented. The section begins with descriptive statistics such as the distribution of cases among values of a variable. This will provide general insight into the data. After that the correlation between variables will be presented using contingency tables and accompanying statistical measures such as Chi-square tests and Cramers' V. The section concludes with multivariate analysis, using logistic regression models.

5.3.1 Descriptive statistics

This section describes how basic (user) context characteristics are represented in the sample. Analysis is based on frequencies of respondents sex, age, study, year of study and university. Later (some of) these variables will be used as predictors of media choice. Other variables are used to provide insight into the representativeness of the sample.

(User) context characteristics

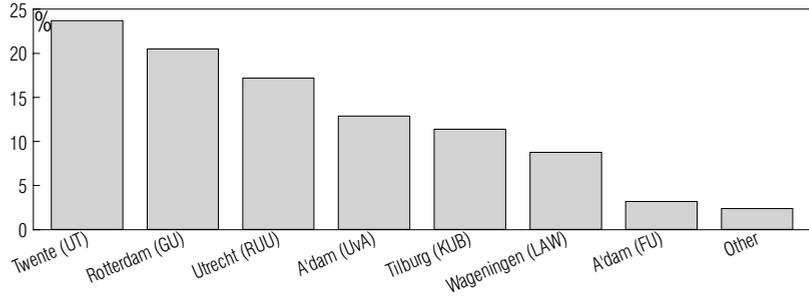
The sample consists of 292 male and 241 female students, which is a valid percentage of 55 percent male and 45 percent female respondents on a total of 538 cases. This is a reasonably good representation of the proportion in the population of students: 56 percent male and 44 percent female. In Appendix B.3.1, Table B-1, frequencies are summarised.

Sixty percent of the students are between 18 and 21 years old. The average age is 21 year. In Appendix B.3.1, Table B-2 and in Table B-5 frequencies and statistics are summarised.

The largest groups of students are students of language and culture, followed by technical studies, social sciences and finally, law students. As was stated in section 5.2.3 the sample provides a fairly good reflection of the population, only students of economics are underrepresented. A summary of the distribution of subjects of study is presented in Appendix B.3.1, Table B-3. The average number of years students have already studied is 2.3.

Most students in the sample are from the University of Twente, followed by Erasmus University, Utrecht University and University of Amsterdam. In Figure 5-4 the way in which students are distributed over several universities is presented. See also Appendix B.3.1, Table B-6.

Figure 5-4 Percentage students per university

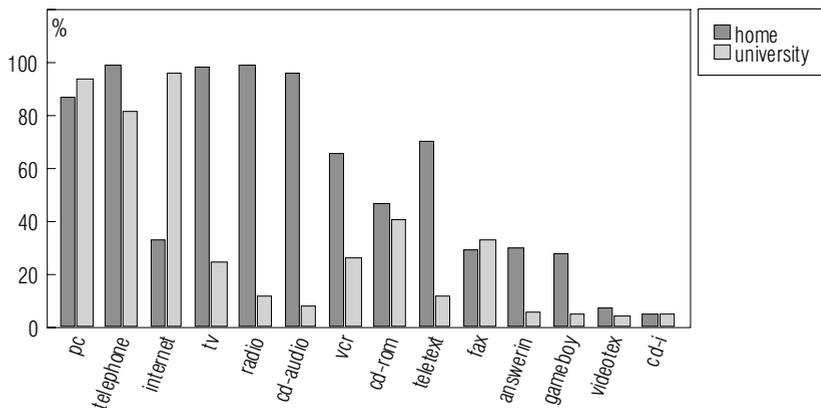


The level of media use

In this section level of media usage is presented in terms of physical access, frequency of use, experience, functions of the media and attitude.

Physical access to media is presumed to be one of the important thresholds for media choice. In Figure 5-5 a bar chart of the media that are available to students at home and at the university is presented.

Figure 5-5 Percentages of accessible media and other devices at home and university



From Figure 5-5 it can be concluded that, at home, most students have access to the traditional mass media and several new media. Radio, CD-player, television (including teletext) and VCR are accessible for most students. Also personal computers (often complete with CD-ROM and Internet connection) are widely available to students. Lastly, almost all students have access to a telephone at home. At the university personal

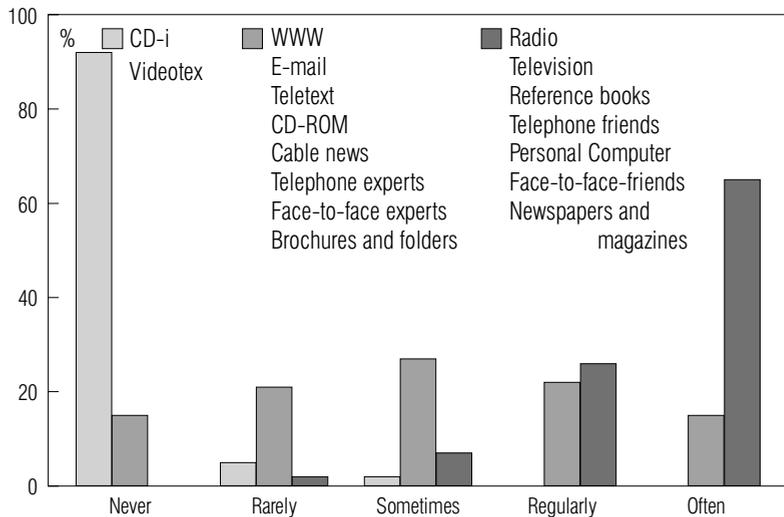
computer, Internet connection and telephone are reported to be most often physically accessible. Media that are hardly accessible at home and at universities are CD-i and videotex. In Appendix B.3.2, Table B-7, frequencies, percentages per context and per medium are provided.

The results for the three questions on frequency of media use, experience with media use and evaluation of media are presented here. The media were clustered according to the pattern in which answers were given. In order to do this hierarchical cluster analysis was used. The result of this analysis is that media that show the same pattern of answers (for example a rising or declining line) are gathered in the same cluster. The bars in Figure 5-6, Figure 5-7 and Figure 5-9 show the average number of times an answer was given in a certain category for the media in a specific cluster.

Frequency of media use

For example in Figure 5-6 three patterns can be distinguished: a declining bars for CD-i and videotex, a rising bars for among others radio and television and a 'normal distribution' for the remaining media. The light grey bars represent CD-i and videotex. The bars show a strongly declining pattern. Most students state that they never use CD-i or videotex. Only a few students state that they rarely use these media and almost nobody uses these media sometimes, regularly or often. The opposite pattern (indicated by dark grey bars) shows media that are often used by students. Here are the traditional mass media (radio, television, newspapers, books), talking to friends (either over the phone or face-to-face) and personal computer. Hardly anybody never uses these media, most respondents often use these media. The third pattern (indicated by medium grey bars) shows media that have more or less equal number of people in each level of usage. They represent both traditional media such as telephone and brochures and new media such as cable news, CD-ROM, e-mail, teletext and WWW. In Appendix B.3.2, Table B-8 frequencies per medium are provided.

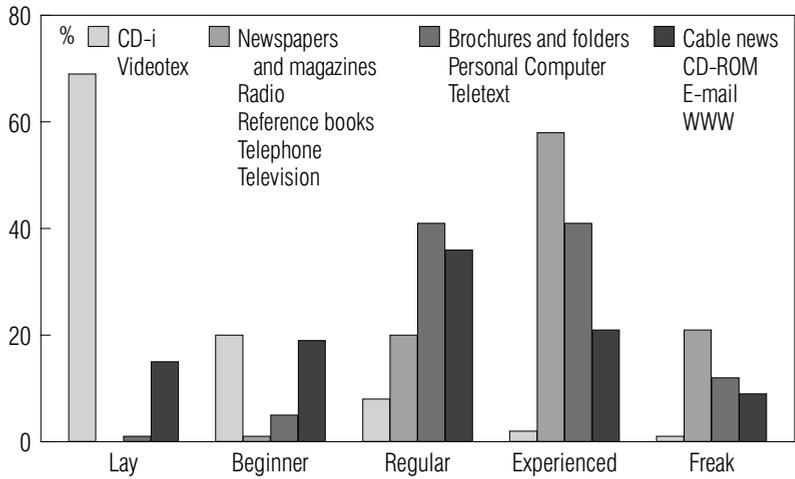
Figure 5-6 Frequency of media use



Experience with media

In the same way as for frequency of media use, the results for experience with media are presented. In Figure 5-7 again the average number of people that have given a certain answer in a cluster is presented. Four patterns can be distinguished for experience with media use. The lightest grey pattern is again formed by a cluster of CD-i and videotex. A large number of people consider themselves as lay with regard to these two media. The light grey bars represent the pattern for newspapers, radio, television, telephone, and reference books. This pattern strongly peaks at experienced users. This pattern shows relatively little variance. The pattern formed by medium grey bars represents brochures and folders, personal computer and teletext. This pattern is skewed in the direction of regular and experiences users, but not as strong as the light grey pattern. The dark grey pattern is more or less normally distributed. This dark grey pattern is represented by cable news, CD-ROM, e-mail and WWW. Most people regard themselves as regular users, some people are more experienced, others are less experienced. There are as many lay people as there are freaks. In Appendix B.3.2, Table B-9, frequencies per medium are provided.

Figure 5-7 Experience with media use



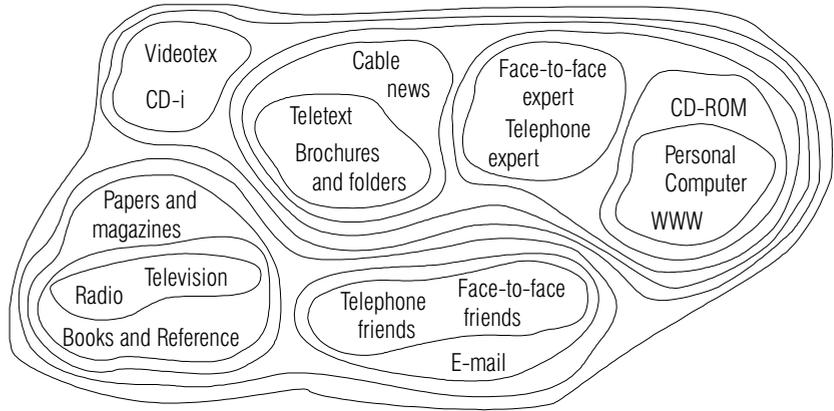
On a higher level of abstraction, this figure provides insight into the degree of success of several media. There are two failing new media (i.e. CD-i and videotex). Bars are gradually sloping down. Students are experienced users of the media that are accepted in society and are part of daily lives of people (i.e. newspapers, magazines, books, television, telephone, indicated by white line). For several new media (i.e. CD-ROM, e-mail and WWW, black bar) there are some experienced users but there is also less experienced group of people. Students are relatively experienced users of teletext and personal computers (dark grey bars). These two relatively new media have already gained a place in the daily life of students.

Functions of the media

In the questionnaire respondents were asked for what purposes they use several media. These functions of the media were gathered as 119 binary variables (seventeen media times seven functions). In order to analyse the data hierarchical cluster analysis was used. First of all the data was recoded in seventeen variables and seven cases, one case for each function. The cells of the new data matrix show the number of times a particular function was mentioned for a particular medium. Next, hierarchical cluster analysis was performed, using squared Euclidean distances as a measure of distance and furthest neighbour as a method for clustering several variables. The statistical results are provided in Appendix B.3.2, Table B-10.

Based on the dendrogram in Appendix B.3.2, Table B-11 Figure 5-8 can be composed. In this picture media that cluster together, based on their functions are placed on the same 'altitude'. Media that are on the same 'mountain' have more in common than media that are on different 'mountains'. From this basically six clusters of media can be distinguished. By looking at which functions are important for which media, the meaning of the clusters can be denominated.

Figure 5-8 Clustering of media based on functionality



- *News.* Teletext, brochures and folders and cable news: news is the most important function of these media. For teletext and cable news, this was to be expected. Surprisingly people also use brochures and folders for topical information. The time to produce a folder is apparently short enough to contain information that changes regularly. A second function of these media is reference information.
- *Traditional.* Television, radio, books and reference guides and newspapers and magazines: the traditional mass media have traditional functions: news, entertainment, identification and reference. They provide a good deal of entertainment and relaxation. They are a means of developing ones selfhood and lastly a way to find information. It is noteworthy that communication and transaction are not mentioned. These media are still very much one-way.
- *Information.* Experts by telephone and face-to-face: the main purpose of calling or visiting expert is reference i.e. finding information or asking a question. Transactions are also an important function of calling or visiting an expert.
- *Chat.* Friends by telephone and face-to-face and e-mail: for these media communication and entertainment are the most important functions. Students ‘talk’ to their friends either by phone, computer or face-to-face in the first place for sake of fun, but also for news and novelties and as a means of stressing their selfhood.
- *Work and play.* Personal computer, WWW and CD-ROM: these media are used for reference and entertainment. Here entertainment was to be expected, people play CD-ROM games using their personal computer and CD-ROM-player. Furthermore, people also stated that they use WWW for entertainment purposes. Although hardly any games can be played on WWW, people stated that they surf the Internet ‘just for fun’. News and communication were also mentioned. This can mostly be attributed to personal computer in combination with WWW. Finally

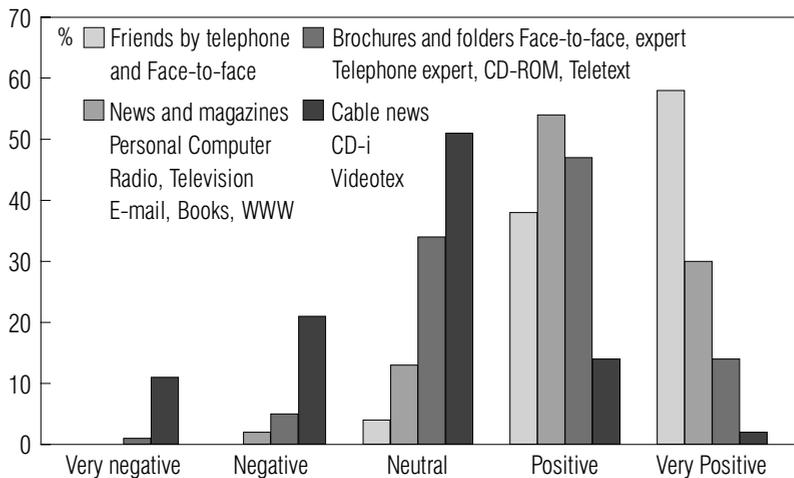
‘Other purposes’ was often mentioned as a function. This can be attributed to the personal computer, which is also used for many other things such as writing, programming etcetera.

- *Nothing*. Videotex and CD-i: the last cluster is also the strongest cluster, videotex and CD-i resemble each other in the sense that many students answered that they do not use these media at all.

Evaluation of media

In general, the different media were evaluated relatively positive. In Figure 5-9 four clusters can be distinguished. The cluster that is formed by the lightest grey bars is the most positive of all. This cluster consists of talking to friends, either by telephone or face-to-face. Most people are very positive about these media. The second cluster is light grey and formed by newspapers and magazines, radio, television, books, e-mail and WWW. This cluster peaks at positive. The third cluster also peaks at positive but the answers are distributed more evenly over the categories, with neutral scores higher. This cluster is medium grey and represents talking to an expert, either by phone or face-to-face, brochures and folders, CD-ROM and teletext. The dark grey cluster represents CD-i and Videotex, this time complemented with cable news. This cluster shows a large number of cases in the middle and few cases towards the extremes. Most people evaluate these media as neutral, some are more positive, some are more negative. A table with the results is in Appendix B.3.2, Table B-13.

Figure 5-9 Evaluation of media

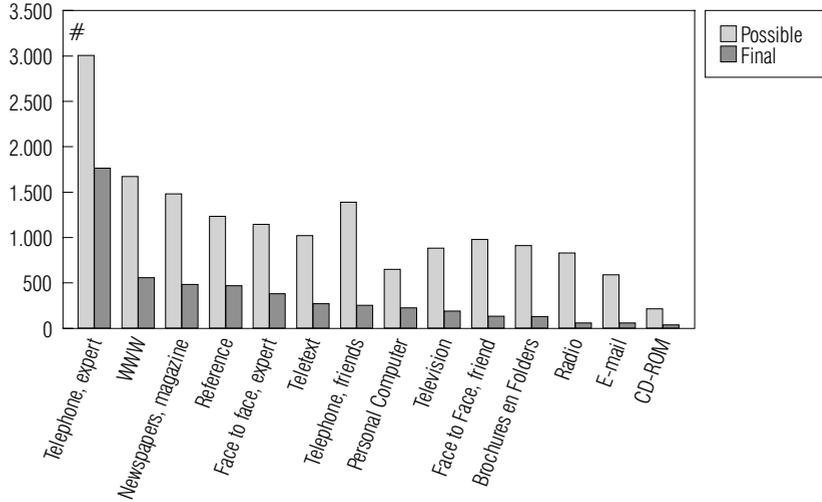


Media choice

In this section the attention is on media choice in general and reasons for choosing media. The overall results of media choice for all cases are presented in Figure 5-10. The number of times a medium was mentioned

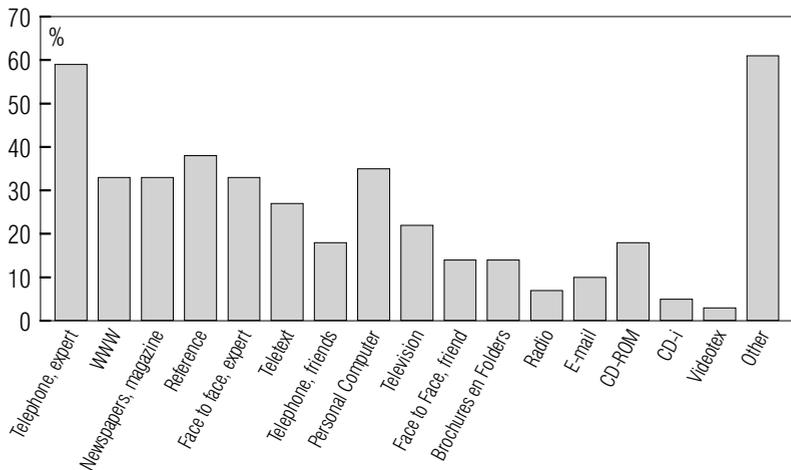
as a possible medium (light) and as final choice (dark) is presented in this figure.

Figure 5-10 Distribution of possible and final choice



The results in Figure 5-10 show that calling an expert was chosen in a vast majority of the cases. A good second place is for WWW, followed by newspapers and magazines, books and reference and visiting experts. In the tail of the row the least popular media, again videotex and CD-i, can be found. See also Appendix B.3.3, Table B-14 and B-15.

Figure 5-11 Ratio possible and final choice



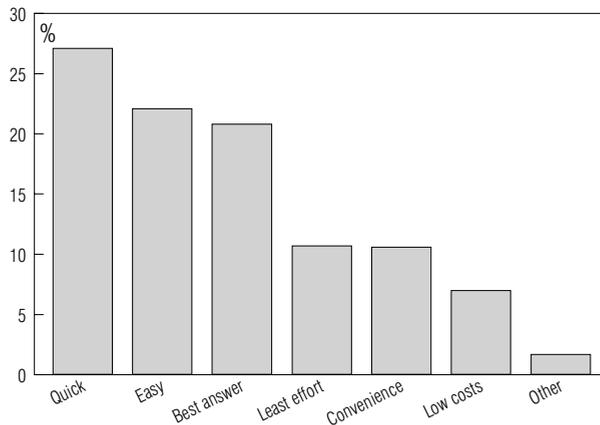
Besides looking at the actual number of times a medium was chosen, it is also interesting to see at what ratio media are finally chosen in relation to

the number of times a medium was mentioned as a possible choice. If a medium is actually chosen when it is mentioned as a possible medium it could mean that those media are the most accessible or that people choose these media because they think chance that the answer will be given is high. In Figure 5-11 the results are presented. In Appendix B.3.3, Table B-16, the exact numbers are presented.

Both telephone and 'other' score very high. The high score for 'other' can be explained as follows: if people think of another medium than the list provides, it is likely that they will choose this solution. With regard to telephone, it can be said that it often is a quick way to find information and simple to access. Other media that score high are books and reference guides, personal computer, WWW, newspapers and magazines and face-to-face experts. Again CD-i and videotex show up in the end of the row.

Generally, the reasons for choosing a medium are: quick, easy and obtaining a correct answer. Noteworthy is that low effort, convenience and low costs are not evaluated as very important. Figure 5-12 shows these conclusions. Note that, even though it can be concluded that low costs are no reason to choose a medium, it can not be concluded that high costs are not a reason not to choose a medium.

Figure 5-12 Reasons for choosing a medium



The reasons for choosing a medium do generally not differ much among several media. Exceptions are visiting and calling an expert. For these media obtaining the best answer is the most important reason. Quick and easy are less important in relation to contacting an expert. Another exception is asking a friend. This is done out of convenience, it is the easiest way to obtain information. Moreover, it is possible to conclude that there is little differentiation among the reasons to choose a medium among the cases. In Appendix B.4.3, Table B-18 provides an overview in which the reasons for choosing each medium is summarised.

5.3.2 Effects of differences between needs on media choice

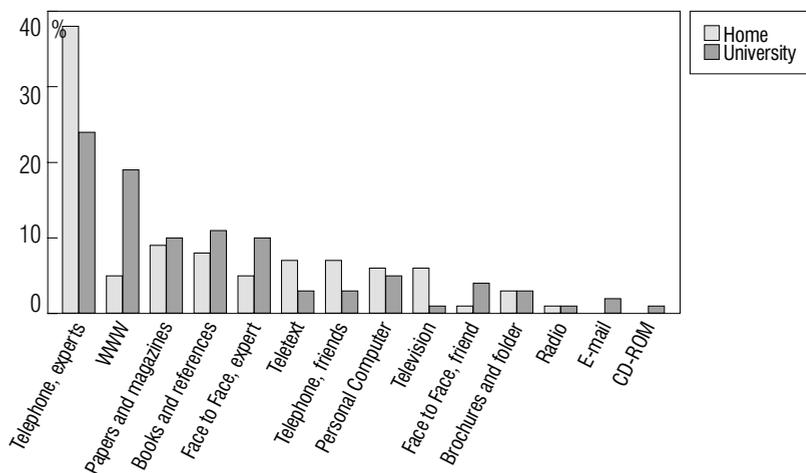
Before the analysis is continued the following remark has to be made. The cases that were presented in the questionnaire do not represent the information needs that emerge in the daily lives of students. Though all cases could emerge on a daily bases, they will probably not occur in the proportions they were presented in the questionnaire. This problem is less significant than it might occur at first sight. The research focus is not how often students choose medium x or medium y. The research focus is on what influences media choice. The analysis tries to find an answer to the question how the characteristics of the cases explain media choice. The question how often students use certain media is less important.

In order to see the effect of several factors such as context and topicality on media choice it is necessary to look at media choices grouped by type. The difference between several groups can be proven statistically. However, chi-square tests are not very helpful. Because the number of cases is relatively large, a significant effect will almost always be found. Therefore, a more intuitive approach towards the description of effects is used. For each of the four dimensions (i.e. context, uniqueness, interactivity and topicality) a bar chart with media choices is made. The results are presented in Figure 5-13 through Figure 5-16.

Context

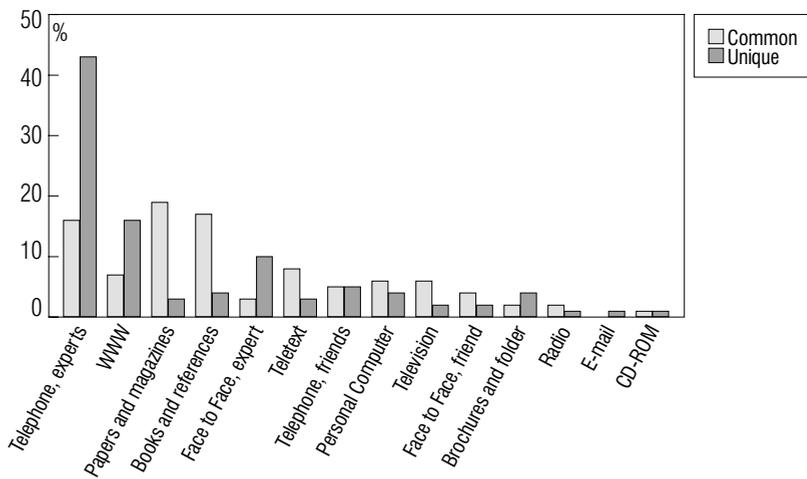
Figure 5-13 shows the differences in media choice for context. In the figure it becomes clear that the biggest difference in media choice for a situation at home or at the university can be found in the choice for the telephone or for WWW.

Figure 5-13 Effect of context on media choice



At home most people choose to use the telephone (38 percent at home versus 24 percent at the university), at the university more people choose WWW (nineteen percent at the university versus five percent at home). Other media that are mostly used at home are: television, teletext and the telephone for calling friends. Also, the personal computer scores slightly more at home than at the university. CD-ROM, e-mail, books and reference guides, newspapers and magazines and face-to-face contact are more important media at the university. In a later section, this result will be related to physical access to media.

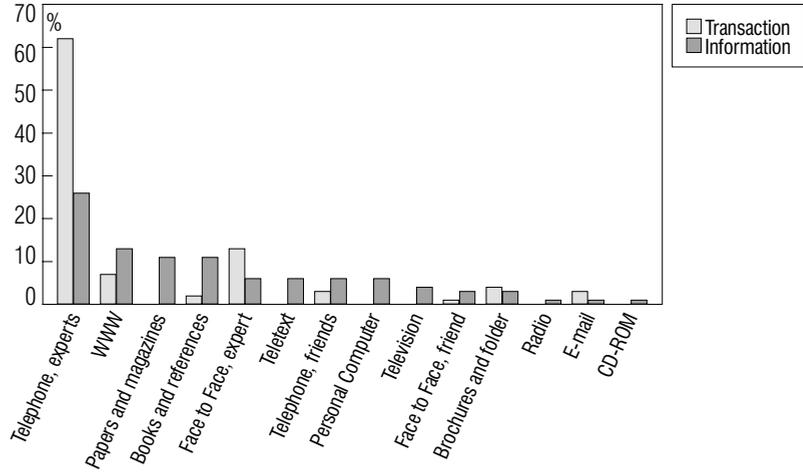
Figure 5-14 Effect of uniqueness on media choice



Uniqueness

Information needs with a unique character are mostly solved with either a telephone call to an expert (43 percent for unique versus sixteen percent for common needs) or WWW (sixteen percent unique versus seven percent common). On the other hand, common needs are mostly solved using books and reference guides (seventeen percent common versus four percent unique) or newspapers and magazines (nineteen percent common, versus three percent unique). Other media that are used for common needs are television and teletext. Figure 5-14 shows an overview.

Figure 5-15 Effect of interaction on media choice



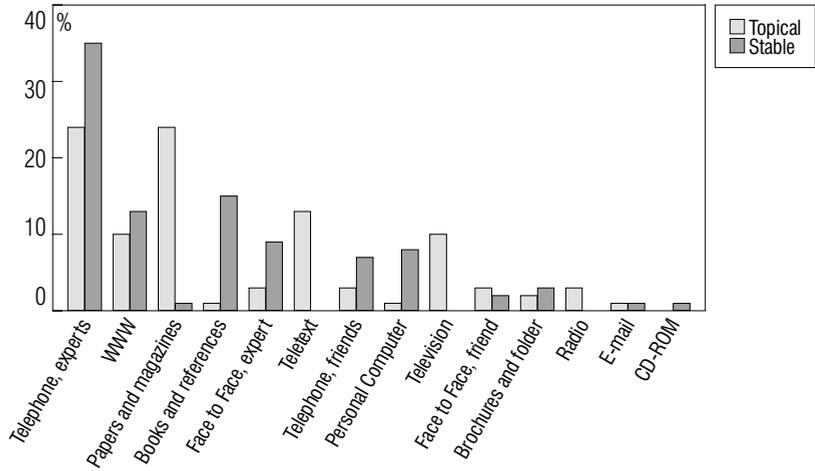
Interactivity

If an information need involves an explicit need for communication or transaction, rather than an information need that only involves the retrieval of information, the telephone gains a lot of users (62 percent for transaction versus 26 percent for information). Also face-to-face contact is a good means of performing transaction or communication (thirteen percent transaction versus six percent information). For needs that only involve information retrieval choice is much more spread over all other media. See also Figure 5-15.

Topicality

Television (ten percent topical versus zero percent stable), teletext (thirteen percent topical versus zero percent stable) and newspapers and magazines (24 percent topical versus one percent stable) are *the* media for finding topical information. Conversely, books and reference guides (fifteen percent stable versus one percent topical) and calling an expert (35 percent stable versus 24 percent topical) are the most important media for information needs of a stable character. See also Figure 5-16.

Figure 5-16 Effect of topicality on media choice

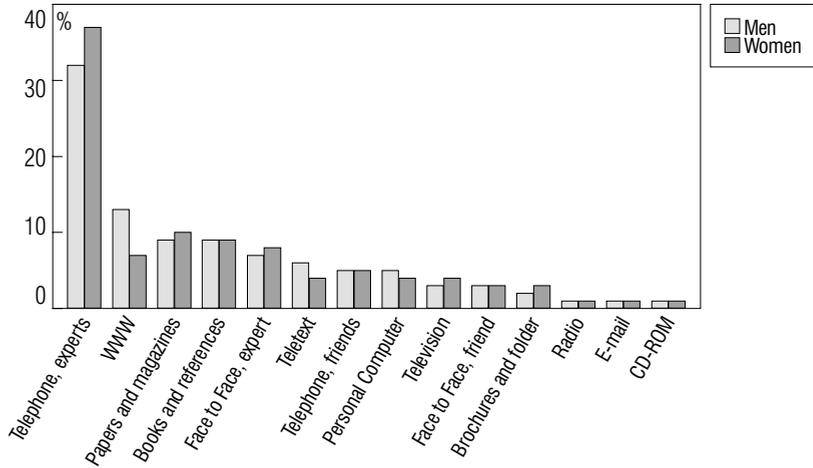


5.3.3 The effect of differences between users on media choice

As can be concluded from the theoretical section, differences between media choices can not only be explained from differences between needs, also differences between users can account for different media choices. In this section the attention is on the effect of differences between users on media choice. The differences that will be taken into account are: sex, frequency of media use, experience and attitude.

From Figure 5-17 it can be concluded that there are no dramatic differences in media choice between men and women. An explanation for this is that the sample of respondents consists of a relatively homogenous group of people, compared to, for example, a sample from the whole Dutch population.

Figure 5-17 Effect of sex on media choice



With regard to the theoretical background that was sketched earlier, it can be said that structural factors do not differ between men and women in this sample.

Besides sex the frequency of media use, level of experience and evaluation could be explaining factors of media choice. Figure 5-18 shows the relative number of times a medium was chosen in relation to the way in which a respondent characterised him or herself. From the figure the following conclusions can be drawn (see also Appendix B.3.4, Table B-20, B-21 and B-22).

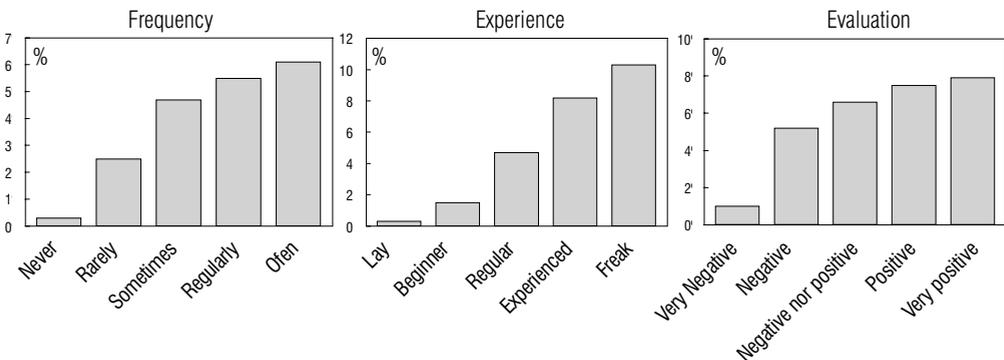


Figure 5-18 Effects of differences in level of media use on media choice

Frequency of media use, experience and evaluation all correlate with media choice. All correlations are positive. The more often a medium is used, the more experience, the more positive the evaluation, the more a medium is chosen. The only exception to this observation is the relation between frequency of telephone use and media choice. Most students in the sample

stated they rarely or sometimes use the telephone in order to call an expert. However, this medium was chosen relatively often. This disturbs the general results so dramatically, that a relation can not be shown on the overall level. Therefore, telephone was left out in this part of the analysis.

5.3.4 Logistic regression

In the previous sections the attention was mostly on one, two and sometimes three variables. This section focuses on all variables that were distinguished in section 4.5. Media choice is explained on the basis of a number of predictor variables. Four variables relate to the need for information (topicality, context, uniqueness and interaction) and four variables are related to the individual user (sex, frequency of media use, experience with media use and overall evaluation of a medium). Logistic regression is comparable to normal least square regression. It offers the possibility of using a binary dependent variable. In this research this binary dependent variable is media choice: a medium is chosen, or it is not. For a detailed description of logistic regression see Appendix B.1.4. Before the actual analysis and interpretation of results are presented some remarks with regard to the way in which the data was analysed have to be made.

First of all, in the analysis, only those people that have physical access to a medium in the context in which a case was presented were included, because a choice for a medium that is not physically accessible is not possible. Consequently, the number of respondents and cases in the analysis of each medium varies. See also Appendix B.4.1, Table B.4-1.

Secondly, multilevel analysis was used only when a significant difference was found between the value of $-2 \log$ -likelihood with or without the multilevel procedure. This was the case for telephone, expert, WWW, face-to-face, expert and friends and for personal computer. For all other media no significant difference for multilevel or straight forward logistic regression was found. See Appendix B.4.1, Table B.4-2.

Thirdly, Videotex and CD-i were left out of the analysis. In the of total 5000 cases that were presented (500 respondent, ten cases each) both media were chosen only once. Consequently, it was not possible to perform meaningful analysis for these two media.

Fourth, not all predictor variables were used for all media. For face-to-face communication with experts or friends, for example, 'experience' can not be measured as this is an unanswerable question. Possible variation that would be found is due to random error rather than structural differences between people on how much experience they have with talking to other people or experts. Other variables that were not included in the analysis were those variables that did not vary. For example nobody used Teletext to solve a stable information need. Nor did anybody use Teletext to perform

communication or transactions. Teletext was only used for case with a topical nature and cases that only required information retrieval. Including these variables does not lead to meaningful results. Consequently, these variables were left out of the statistical analysis. However, this type of result was used in the interpretation of the data. Other media for which variables were excluded for the same reason are: newspapers and magazines, television and radio.

Fifth, the explanatory power of all models is depicted in Appendix B.4.1, Table B.4-3. For logistic regression it is not possible to compute the amount of explained variance. However, it is possible to compute the relative improvement of the prediction (based on the difference between the initial and final -2 log-likelihood, also called pseudo R). The theoretical model explains choice best for telephone, expert, newspapers and magazines, books and reference guides. Here the contribution to the prediction is 28 percent and higher. The contribution of the predictor variables for a second group lies around twenty percent. This group consists of choice for personal computer, CD-ROM and radio. Then there is a group of media for which the predictor variables contribute around ten percent. These media are WWW, e-mail and face-to-face, expert. The remaining media are telephone and face-to-face, friends, Teletext, television, radio, brochures and folders. This low score is partly due to the fact that some of the important variables were excluded from the analysis (such as and topicality and interaction for Teletext and television).

The interpretation of the coefficients is based on the significance of relations between predictor variables and media choice. A significant relation shows that the value of a predictor influences media choice. If no significant relation is found, the predictor variable does not help to predict whether a medium will be chosen or not. If a significant relation is found, the direction of the coefficient (positive or negative) says something about the way in which a predictor influences media choice. Table 5-2 summarises the way in which the coefficients should be interpreted.

Table 5-2 Interpretation of coefficients of the predictors in relation to media choice

	Coefficient Negative	Coefficient Positive
Topicality	Stable	Topical
Context	Home	University
Uniqueness	Common	Unique
Interaction	Communication or Transaction	Information
Sex	Men	Women
Frequency	If a someone uses a medium less often, it is more likely that he or she will choose that medium	If a someone uses a medium more often, it is more likely that he or she will choose that medium
Experience	If a someone has less experience with a certain medium, it is more likely that he or she will choose that medium	If a someone has more experience with a certain medium, it is more likely that he or she will choose that medium
Evaluation	If a someone evaluates a medium less positive, it is more likely that he or she will choose that medium	If a someone evaluates a medium more positive, it is more likely that he or she will choose that medium

In this research, only the direction was taken into account. The strength of the relationship is not taken into account. This is done because in logistic regression the strength of the relation depends on the value of the predictor. The results will now be described for each predictor separately. The results in numbers can be found in Appendix B.4.2, Table B.4-4 through B.4-17 and Appendix B.4.3, Table B.4-18a through B.4-18d.

Predictors related to the need for information

Topicality refers to the degree to which information changes. The levels within topicality are high or low, or, in other words: topical or stable. The results of logistic regression are depicted in Table 5-3.

Table 5-3 Topicality

Value	Media
Stable	WWW, books and reference guides, face-to-face, expert, telephone, friends, personal computer, brochures and folders and CD-ROM
Topical	Teletext, television, newspapers and magazines and radio
Not significant	Telephone, expert, face-to-face, friends, and e-mail.

Context refers to the place in which a need for information is set, in this research, at home or at a university. The results are summarised in Table 5-4.

Table 5-4 Context

Value	Media
Home	Telephone, expert and friends, personal computer and television
University	WWW, newspapers and magazines, books and reference guides, face-to-face, expert and friends, e-mail and CD-ROM
Not significant	Teletext, brochures and folders and radio

Uniqueness is also divided in two levels: common and unique. Uniqueness primarily refers to the question whether information is commonly available or is hard to get. The results of analysis are shown in Table 5-5.

Table 5-5 Uniqueness

Value	Media
Unique	Telephone, expert and friends, WWW, face-to-face, expert, and e-mail
Common	Newspapers and magazines, books and reference guides, Teletext, personal computer, television, face-to-face, friends, radio and CD-ROM
Not significant	Brochures and folders

Interaction refers to the question whether solely information is needed or whether also transaction or communication is part of the need. The results are depicted in Table 5-6.

Table 5-6 Interaction

Value	Media
Information	WWW, newspapers and magazines, books and reference guides, Teletext, telephone, friends, personal computer, television, radio and CD-ROM.
Communication and/or transaction	Telephone, expert and e-mail
Not significant	Face-to-face, expert and friends, brochures and folders and

In order to say something about the relation between information need and media choice the patterns in which significant relations were found, are shown in Figure 5-19.

In the figure the four lines symbolise the predictor variables (topicality, context, uniqueness and interaction). One end relates to a significant relationship in the direction of respectively: stable, home, common and communication/transaction. The other end of the line relates to a significant relationship in the direction of respectively: topical, university, unique and information. A dot in the middle of a line symbolises a relation that is not significant.

Media that have similar patterns are capable of solving the same kind of information needs. For example radio and newspapers and magazines resemble each other very much in the sense that they are both suited to solve a topical information need, of a common nature. The only difference is that newspapers are mostly used at the university whereas context does

not matter for radio. Also, CD-ROMs, Reference and face-to-face, friends strongly relate.

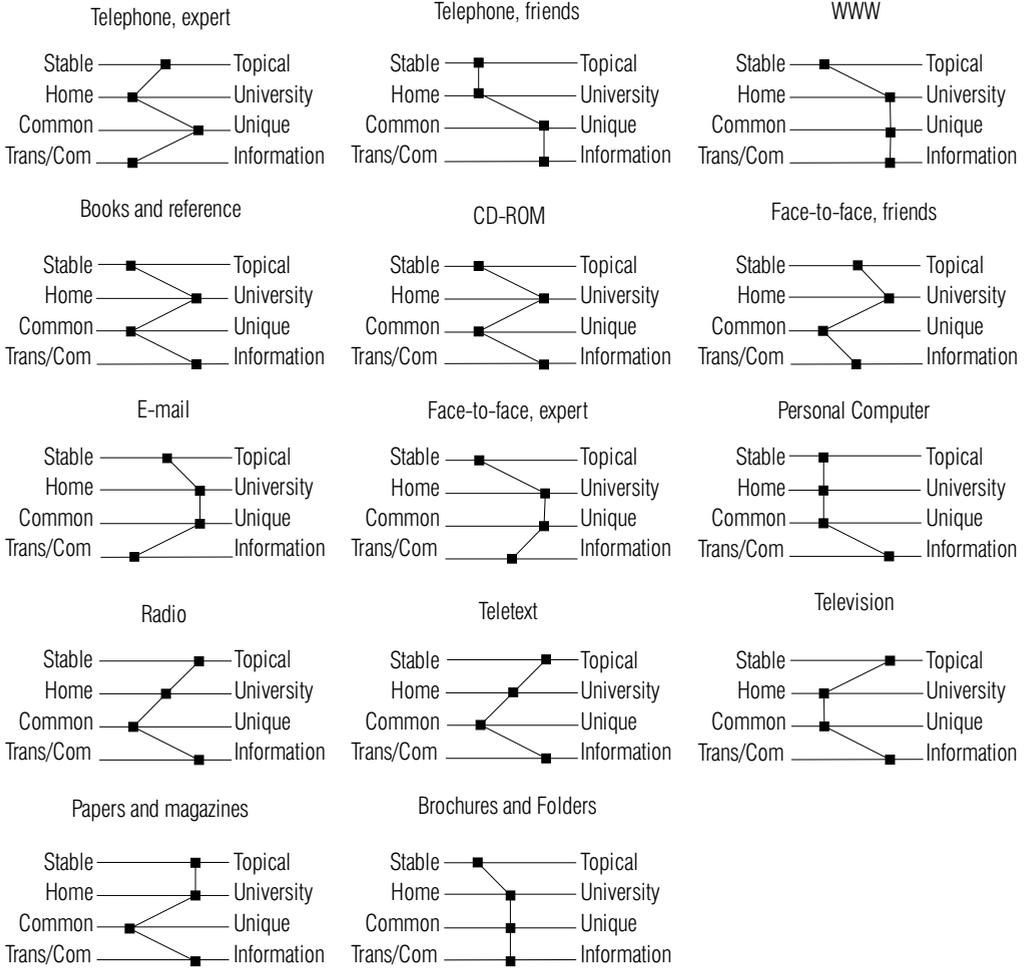


Figure 5-19 Media patterns

Note that a small difference in a pattern can cause totally different possibilities to use a medium. For example, the only difference between PC and Television is their suitability to convey topical information. Consequently, the kind of information that can be found with these two media is very different.

Predictors related to the individual user

Sex

In the theoretical section it was hypothesised that men and women have different patterns of media choice. These are the results of analysis:

- women: telephone and face-to-face and expert;

- *men*: none and
- *not significant*: WWW, newspapers and magazines, books and reference guides, Teletext, telephone and face-to-face, friends, personal computer, television, brochures and folders, radio, e-mail and CD-ROM.

Only two media show a significant relation with sex. In both cases it concerns women that tend to choose talking to an expert either face-to-face or on telephone more often than men. All other media do not show a different pattern of media choice for men or women.

Frequency of media use

Another hypothesis is related to frequency of media use. The hypothesis was that it is more likely that media are chosen that respondents use regularly or often, rather than media that are used never or little. The results of logistic regression are:

- *positive*: WWW, face-to-face, expert and Teletext;
- *negative*: None and
- *not significant*: telephone, expert, newspapers and magazines, books and reference guides, telephone, friends, personal computer, television, face-to-face, friends, brochures and folders, radio, e-mail and CD-ROM.

Only three media show a significant and positive relation with frequency of media use. For all other media no significant relation between frequency of media use and media choice was found. Noteworthy is that although the relations were not found to be significant, almost all relations were positive.

Experience

Much in the same way frequency of media use was hypothesised, there was an hypothesis on experience with media. It is more likely that media are chosen for which respondents are experienced of freaks than media for which people are lay or beginner. Here are the results:

- *positive*: WWW and Teletext;
- *negative*: none;
- *not significant*: telephone, expert, newspapers and magazines, books and reference guides, telephone, friends, personal computer, television, brochures and folders, radio, e-mail and CD-ROM and
- *not in analysis*: face-to-face, expert, face-to-face and friends.

Also for experience only two significant relations were found. Again both relations are positive and again of those relations that were not significant the vast majority was positive.

Overall evaluation

The last predictor variable in this research is overall evaluation of media. It was hypothesised that it is more likely that media are chosen that respondents evaluate as positive than media that are evaluated as negative. The results of analysis are:

- *positive*: television;
- *negative*: none and

- *not significant*: telephone, expert, WWW, newspapers and magazines, books and reference guides, face-to-face, expert, Teletext, telephone, friends, personal computer, face-to-face, friends, brochures and folders, radio, e-mail and CD-ROM .

For the relation between overall evaluation of media and media choice the same conclusion as the previous two predictors: almost all relations are positive but only medium (television) shows a significant relation.

Summarising, the results of logistic regression, it is possible to say that, in general differences between information needs explain much more of the media choices than do differences between users.

The flow chart that is presented in Figure 5-20 relates all differences between needs and uses to media choices that have been made by respondents. By answering the questions that are posed in the flow chart, it is possible to find out what medium is best suited to answer a question in the eyes of respondents.

5.4 Conclusion

In this section the overall results of the research will be presented. The conclusions are divided into three parts: the research itself, the results of the research (both theoretical and practical) and some limitations of the research.

5.4.1 The research

The goal of this research was to determine in what way need for information is related to media choice, while taking differences between users into account. Differences between needs were defined in terms of differences in topicality, context, uniqueness and interaction. Differences between users were seen in terms of (physical) accessibility, frequency of media use, experience with media use and overall evaluation of media. In order to find an answer to these questions a user's perspective was maintained.

Policy capturing was used as a research method. Although not all policy capturing procedures were embedded in the research, the general idea of the method was very useful. The combination of both qualitative and quantitative elements offered the opportunity to answer the research questions.

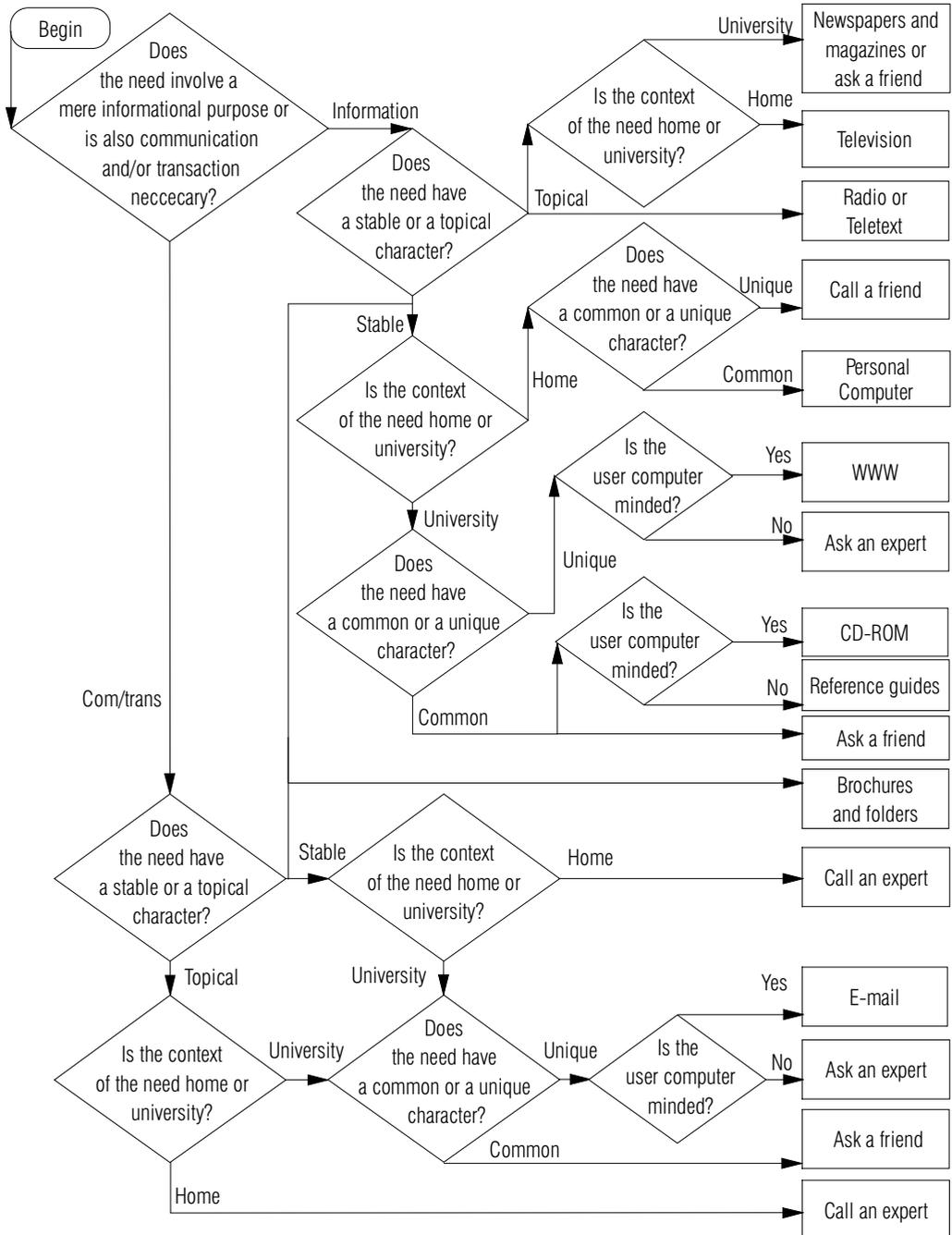


Figure 5-20 Flow chart of media choice

The survey sample was drawn from the population of students from Dutch universities. Students from more than ten different universities participated in the research. The sample proved to be sufficiently

representative.

Several methods of data analysis, ranging from simple frequencies to advanced methods, such as multilevel logistic regression, were used.

The results of the research are promising. A large number of significant relations has been found. In the next section the most important results in relation to the theoretical background are summarised.

5.4.2 Summary of results

The results of the research show that at home students have access to most of the traditional media. Also that computers, including Internet connection and CD-ROM are widely spread among students. At the university computers and telephone are the only two media that are widely available.

Traditional media, such as radio and television, are frequently used among students. Also, students quite often use computers. Other new media, such as WWW and e-mail are used on a regular basis, but not as much as computers or traditional media.

Roughly the same conclusion can be drawn for the level of experience. The traditional media are well known by students. Students are less familiar with new media such as computers, followed by CD-ROM, e-mail and WWW. Still, most students state that they are regular or experienced users of these media.

With regard to the evaluation of media it is possible to say that the overall evaluation of all media was very positive. None of the media was evaluated very negatively. Yet, most positive was the evaluation for talking to friends, either on the phone or face-to-face.

Cluster analysis on functions of the media resulted in six clusters: news media, traditional media, information media, chat media, work and play media and media that were not used at all.

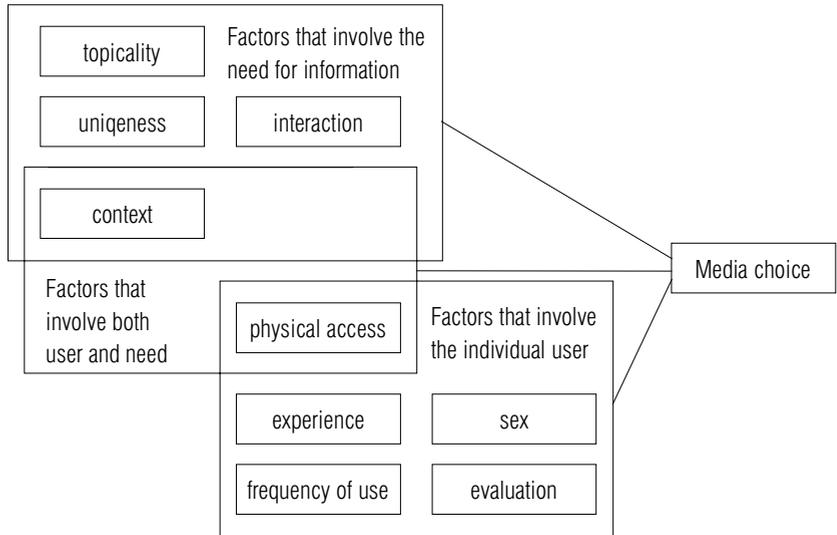
Finally, the dependent variable of the research: media choice. In more than one-third of the cases calling an expert was chosen to get an answer to a question. The telephone is very popular among students. It can be used for almost any purpose. WWW is a good second. The most important reason to choose one medium over another was simplicity. A second reason is the speed with which an answer can be obtained and the third reason regarded the chance of getting a correct answer. Low costs are no reason for choosing a medium.

Hypotheses testing

The central question in this research is, how can differences between media choices be explained from differences between users and differences

between information needs. In Figure 5-21 the model as it was used in this research is presented once more.

Figure 5-21 Model of media choice



Now the hypotheses that were constructed in the section 4.5 will be discussed.

Table 5-7 Hypothesis 1

Number	Hypothesis
Hypothesis 1	Men and women have different patterns of media choice.

There were no substantial differences between media choice of men and women. The hypotheses that there is a difference between men and women should therefore be rejected. The fact that hardly any differences between men and women were found could relate to the fact that the sample - that was representative with regard to sex - consisted of a relatively homogenous group of people. If a sample from the Dutch population was taken, rather than a sample of students, structural differences might have been found. However, differences due to definitions of male and female domains should also have been found in this research, but were not.

Table 5-8 Hypothesis
2-4

Number	Hypothesis
Hypothesis 2	It is more likely that media are chosen that respondents use regularly or often than media that are used never or little.
Hypothesis 3	It is more likely that media are chosen for which respondents are experienced or freaks than media for which people are lay or beginner.
Hypothesis 4	It is more likely that media are chosen that respondents evaluate as positive than media that are evaluated as negative.

For the hypotheses 2 to 4 only a few significant relations were found in the logistic regression. However, almost all relations between these predictors and media choice were positive. Consequently, it is not possible to adopt these hypotheses directly but research results do point in the direction of the hypotheses. At least it is possible to say that the research results do not contradict the hypotheses that were posed. The relative homogeneity of the sample might explain the inability to show a large number of significant relations. Further research might elaborate on the relation between (user) context characteristics and media choice.

Table 5-9 Hypothesis
5-8a

Number	Hypothesis
Hypothesis 5	For information needs with a topical character more often on-line media will be chosen; for information needs with a stable character, more often off-line media will be chosen.
Hypothesis 6	For a unique need for information media will be chosen that offer a wide variety of subjects; for common information more often is chosen for media that offer a limited number of subjects which are needed on a daily basis.
Hypothesis 7	For an information need that involves transaction and/or communication, more often an interactive medium will be chosen. For information needs that only require information retrieval more non-interactive media will be chosen.
Hypothesis 8a	Physical access is a necessary but insufficient condition for media choice.

The next four hypotheses relate to the effect of differences between information needs and media choices. For all four hypotheses many significant relations between predictors and choices were found. This confirms the idea of task medium fit. Also, when the research results are viewed from the media perspective, different patterns of possible needs that can be solved with certain media, can be seen. This again supports the idea of task medium fit.

However, the simple richness and task complexity scales are inadequate ways of describing the differences in choices for information services. The criteria that were found in the Q-sort research proved to be better at characterising information needs. It has to be said that even these criteria are still of a high level of abstraction. For each predictor only two values were used, whereas, for example, topicality could also be placed on an

ordinal scale or context could besides home and university also be defined in terms of 'on the road', 'in a pub', 'at a friend's house' etcetera.

The last hypothesis relates to the effect of physical accessibility on media choice.

Table 5-10 Hypothesis 8b

Number	Hypothesis
Hypothesis 8b	Different contexts lead to different media choices.

This hypothesis is strongly supported by the research results.

Summarising, the theoretical background that was developed is supported well by the empirical data. Although, the results could not prove all theoretical notions directly (especially those notions that related to (user) context characteristics), results did not contradict the theoretical framework that was built in Chapter 4.

Conclusions - Matching media

This chapter contains the overall conclusions. A summary of the results will be presented and the research questions will be answered. Moreover, the attention is on the limitations, the practical implications and possibilities for further research.

6.1 Technology versus the user

This work began with a question: 'When does the train from Amsterdam to Enschede leave?' A number of ways to answer this question were enumerated. Some alternatives use new information and communication technologies. The research presented in the previous chapters is aimed at the use of these technologies from a user perspective. Technology is merely perceived as a way to get an answer to a question. In other words, the technology is not a goal in itself. Technology can only help to obtain a goal (i.e. an answer to a question). In order to draw conclusions about what technology is used for what goals, the information need was introduced as a central concept.

Over the past decades, information and communication technology developed rapidly. The 'digital revolution' changes society dramatically. It is hard to imagine the society nowadays without information and communication technology. However, the introduction of new information and communication technologies is not without problems. There are many examples of innovations that are not successful.

Often, information and communication technology is developed without consulting the intended users. Although in the past decade users have been invited to give their opinion, their participation in the design

process is mostly limited to two or three expert sessions or to technical field experiments. Users are presented with a certain technology to see what they do and do not do. In many cases the technology that is to be used is already decided upon. Users can only influence what the user-interface should look like. The question whether the technology in itself is useful or whether other (non) technical solutions should be chosen is not an issue at stake. In general, there is too little knowledge about why, how and when new information and communication technologies fit in the behaviour of users.

Examples that were used in Chapter 1 were Videotex and CD-i. Videotex offered the possibility to consult many on-line information services. However, the menu driven interface turned out to be too complicated for the public, the services that were offered were too limited and did not fit into the behaviour of users. Consequently Videotex was only accessible for the true dabbler. CD-i uses state-of-the-art technology and is easy to use. However, the product was not successful on the consumer market. It was not clear what need for entertainment or information in the home context is fulfilled by CD-i.

The user perspective

The aim of this research is to contribute to a – user oriented – way of thinking about new information and communication technology developments and to improve the chances of success of these innovations.

In contrast to the technological approach that has been used over a long period of time, the user perspective starts with user information needs and tries to find out what role technology plays in relation to fulfilling that need. Alternative ways to obtain information are compared. Based on this insight it is possible to design new technologies that do meet user needs and can be successful.

Section 6.4 of this chapter contains two contrasting examples of new ways to obtain information. In the first case technology is introduced for the sake of technology (WebTV). In the other case the information need is the driving force (SCOOT). Based on the research results, the chances for success or failure of these media are discussed.

Finally, the following remark has to be made. The importance of the development of new technology or research on, for example, user interfaces is not denied. This type of research is necessary for the development of new information and communication technology. The argument that is made here is that a user perspective has to be maintained if the goal of research is to explain the *use* of information and communication technology. The optimisation of technology is another research area.

6.1.1 Research goal and approach

Many innovations are introduced in the field of information and communication technologies. Many of these innovations fail to be a success. This research intends to contribute to a more successful introduction of new media by putting the user perspective in the first place and not the technology itself.

The goal of this research is to obtain insight into the process of communication for media that provide electronic information from a user perspective.

More specifically, this research aims at identifying what media are used for what purpose in which situation. Based on this insight it should be possible to improve the match between supply and demand of information. A better match between supply and demand can contribute to a more successful introduction of a new medium. The objective is to determine what kind of media are used for what kind of needs. The research question is aimed at the match between information needs and media with which information can be obtained.

6.2 Summary of results

Both literature and empirical research have been done. The aim of the literature research was to develop a theoretical framework that explains media choice. Several theories and approaches were described and combined to a specific framework. Users, needs, tasks, media, matching, and choice are the central concepts. The empirical part of this research was aimed at a further exploration of the theory. For the preliminary research Q-methodology was used to find factors that are specifically important for the evaluation of media with which information can be found. The main part of the empirical research was based on the Policy capturing approach. In the study respondents were confronted with hypothetical information needs. The following sections will describe the results of the research that has been conducted.

6.2.1 The process of communication

The most important proposition in this research is that the users need for information should be placed in a central position. The question or need that people have is what motivates them to find an answer. The process of communication will serve as a starting point for the rest of the research.

The conceptualisation of the process model of communication is for a large part built upon the uses and gratifications approach. This approach - that was developed in the sixties and seventies - attempts to explain mass media use from the need of the user. Based on this idea, the process of communication for the retrieval of electronic information from a user perspective was developed.

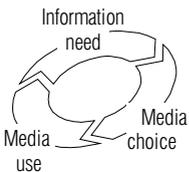


Figure 6-1 Process of communication

- The following phases in the communication process are distinguished:
- *need for information* consists of the process of perceiving a difference between an ideal state of knowledge and the actual state of knowledge;
 - *media choice* is the process of evaluation of alternative sources of information and choosing one and
 - *outcomes* is the process of evaluation of the results of interacting a medium.

When the three phases are related to each other, a recursive process model can be derived.

6.2.2 Information and communication technology

The first research question that is dealt with in Chapter 2 is:

Research question 1

How can media that provide electronic information be distinguished from other media and which (new) media are available in the Netherlands?

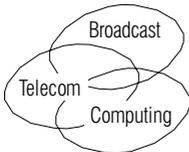


Figure 6-2 Convergence

It is very hard to distinguish 'new' media from media in general. There is no one viewpoint that can provide a clear-cut delineation of the research area. Instead, several perspectives were used to lighten the research area from different angles. The most important development is that of convergence between the areas of broadcast, telecom and computing. Convergence allows the emergence of new media. The second perspective was the layer model of telecommunications. This model shows that the media in this research use a network of some kind to link sender and receiver together. Finally, the traffic patterns of Bordewijk and Van Kaam were used to demonstrate the active role of the receiver.

The second part of Chapter 2 provided an overview of media with which electronic information can be obtained.

- *Telephone Service Numbers*: usually referred to as 0800 and 0900-services, stands for telephone based information and entertainment services.
- *Teletext*: a news medium that is accessible on most television sets in the Netherlands.
- *Off-line media* (CD-i and CD-ROM): stand alone media that operate either on TV or PC. Most titles concern reference guides and entertainment.

- *Videotex*: an interactive system that electronically delivers text, numbers and graphics via the telephone and PC or minitel terminal. Services concentrate on business to business market, entertainment, and telebanking.
 - *Internet*: a loose amalgam of thousands of computer networks reaching millions of people all over the world with information on any subject.
- Of these media Teletext and telephone service numbers have the most solid basis in the Netherlands. Most people can easily access the information provided by these media. Internet is the medium that has developed most strongly over the past few years. Interesting detail is that Teletext (that is also available on the Internet) is the second most used Internet site in the Netherlands (Trendbox, 1998). Off-line media have found their own market niche and Videotex leads a somewhat languishing existence.

6.2.3 Influencing factors

Now the research domain is sketched, it is time to return to the process of communication. This model says something about the phases in the process of communication (information need - media choice - media use). However, the model says little about the way in which the process takes place.

Q-methodology was used in Chapter 3 to find the factors that influence the process of communication with regard to several media from which electronic information can be obtained. Accordingly, the research question of this part of the research is:

Research question 2

Which (clusters of) factors influence the process of communication?

Research approach

When a question (i.e. information need) emerges a user will evaluate several alternative sources of information that can provide the answer. The assumption is that people choose media based on a image they have of a medium rather than on the basis of the objective characteristics of a specific medium. The preliminary research was aimed at finding out what image people have of several new media.

Q-Methodology

Research, based on Q-methodology, has been conducted to find out which of the large number of variables that were found in the literature were most important. For each of the variables that were maintained in the literature an item was formulated that needed to be ordered on a scale. In total ninety Q-sorts (a complete ordering of the items) were collected for five media (telephone service numbers, Teletext, off-line media, Videotex and Internet). Respondents were users, providers of information and services and scientists in this research area. The data were collected using a computerised version of Q-methodology. The analysis of the data was

aimed at finding structure in the data. Factor analysis was used as a method to analyse the data.

The most important result of the Q-research is that media use can be explained by looking at the match between technology, task and (user) context characteristics. It is important not only to look at technology, task or the user separately: one has to look into the combination of all the three clusters to explain how media are evaluated.

The task - technology combination relates to the kind of questions that can be answered by using a certain medium. Several (sub)clusters are distinguished: topicality, interaction and uniqueness.

For the user - technology combination another set of (sub)clusters should be taken into account. Each of these clusters are an aspect of accessibility: physical, financial, cognitive and affective.

Q-methodology offered two sets of variables that influence media choice: characteristics of the task and characteristics of the (user) context, both in coherence with technology. The third research question was:

Results

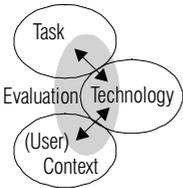


Figure 6-3 Evaluation of new media

Research question 3

How do task and (user) context influence media choice?

This questions was answered by doing both literature research and empirical research. The following two sections will present the results of this research.

6.2.4 Theoretical background

Information need

In Chapter 4 In the uses and gratifications approach the user need is taken as a starting point for media use. An information need is mostly described as a gap between available and needed knowledge. Several theoretical notions describe the different kind of needs or place the information need in context. Also the importance of the subjective evaluation of tasks is stressed.

Decision making

There are several approaches towards choosing a medium. A much used model is the process model of decision making. Other models provide insight into different kinds of decisions or into the way in which a decision is made. The most important differences between the models can be described in terms of limited and extended problem solving and between the rational-economic model versus the administrative model.

Contingency: task - medium fit

Media richness and the social influence model of media use provide good starting points for media choice. The basic assumption in these theories is that a good task/medium fit is essential for effective communication. Media richness approaches this idea from a rational perspective whereas the social influence model states that task and media perceptions are subjective and socially constructed.

The resulting model

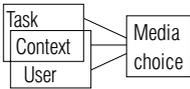


Figure 6-4 Research model

Together with the results of the preliminary research (Q-methodology), these theoretical insights resulted in a model that explains media choice.

Three clusters of factors that influence media choice are distinguished:

- *factors that relate to both the needs and user*: the context in which a need is set and the physical access to a medium a user has;
- *factors that relate to the need for information*: topicality, uniqueness and interactivity, and
- *factors that relate to differences between users*: frequency of media use, experience and evaluation of media.

These factors offer the main framework for the empirical part of this research project.

6.2.5 Policy capturing

In Chapter 5 the empirical research was presented. The goal of this part of the research was to determine in what way need for information is related to media choice, while taking differences between users into account.

Policy capturing uses a combination of experimental design and sample survey procedures. In simplest terms, policy capturing consist of providing individuals with contrived hypothetical situations or objects which are to be evaluated to some process being studied.

The hypothetical situations (or cases) of this research are information needs. The information needs are created by systematic variation on several variables. Each variable was divided in two values.

- *Topicality* refers to the degree to which information changes. The levels within topicality are high or low or, in other words: topical or stable.
- *Uniqueness* is also divided in two levels: common and unique. Uniqueness primarily refers to the question whether information is commonly available or is hard to get.
- *Interaction* refers to the question whether solely information is needed or whether also transaction or communication is part of the need. The levels therefore are information and communication and/or transaction.
- *Context* refers to the context in which a need for information is set, for example at home or at a university or some other place. The two levels in the research are home and university.

A specific combination of values characterises a particular case.

Respondents were asked to choose a medium that would solve a presented information need. Furthermore, the questionnaire consisted of questions on media use (physical access in context, experience, frequency of use and attitude) and some questions on socio-demographical variables.

The sample of respondents is taken from the population of students of Dutch universities. The final sample consists of 538 students from nine disciplines, more than forty subjects and more than ten different

Research method

Results

universities that are spread around the country. Multilevel logistic regression was used to explain the variance in media choice.

The first result of the analysis is that only media were chosen to which people had physical access in the context of the question. In other words, physical access is a necessary but insufficient condition for media choice and subsequently use.

Secondly, the results of multilevel logistic regression show that differences between information needs lead to differences in media choices. Moreover we can conclude that media choices do not depend on a single characteristic of the information need. All characteristics that were used in this research (topicality, uniqueness, interaction and context) contribute to the explanation of media choice. From Table 6-1 it can be concluded that there are no two media that have the same pattern of values on the four information need characteristics. This means that it is necessary to look at all characteristics of the information need to predict media choice.

Table 6-1 The relation between information need and media choice. A word indicates a significant relationship, and the 'direction' of the relationship. '-' means that no significant relation was found.

	Characteristics of the information need			
	Topicality	Uniqueness	Interaction	Context
Telephone, expert	-	unique	com/trans	home
WWW	stable	unique	information	university
Newspapers, magazines	topical	common	information	university
Books, reference guides	stable	common	information	university
Face-to-face, expert	stable	unique	-	university
Teletext	topical	common	information	-
Telephone, friends	stable	unique	information	home
Personal computer	stable	common	information	home
Television	topical	common	information	home
Face-to-face, friends	-	common	-	university
Brochures and folders	stable	-	-	-
Radio	topical	common	information	-
e-mail	-	unique	com/trans	university
CD-ROM	stable	common	information	university

Thirdly, analysis shows that there are many more significant relations for information needs than there are for differences between users. A comparison of Table 6-1 and Table 6-2 demonstrates this difference. Differences between information needs explain much more of the media choices than do differences between users. Although there were not many significant relations between differences between users and media choice, it has to be said that almost all relations (including the not-significant ones) were positive. This means that the chance that a medium is chosen

increases when a user states he uses a medium more often, is more experienced and/or has a more positive image of a medium.

Table 6-2 The relation between user characteristics and media choice. A word indicates a significant relationship, and the 'direction' of the relationship. '-' means that no significant relation was found.

	Characteristics of the user			
	Sex	Frequency	Experience	Attitude
Telephone, expert	women	-	-	-
WWW	-	positive	positive	-
Newspapers, magazines	-	-	-	-
Books, reference guides	-	-	-	-
Face-to-face, expert	women	positive	not measured	-
Teletext	-	positive	positive	-
Telephone, friends	-	-	-	-
Personal computer	-	-	-	-
Television	-	-	-	positive
Face-to-face, friends	-	-	not measured	-
Brochures and folders	-	-	-	-
Radio	-	-	-	-
e-mail	-	-	-	-
CD-ROM	-	-	-	-

6.2.6 Theory revisited

The question that is posed in this section is: How do the results of the empirical research relate to the theoretical framework that was sketched earlier.

The need for information as a starting point

Uses and gratifications approach was taken as a starting point. A question that was raised in Chapter 4 was whether a theory that is developed for the explanation of mass communication media, can also explain the use of new media. The empirical research confirms that the uses and gratifications is well suited to explain media use, even though there are differences between the traditional media and the media that are object of this research. Most new media indeed do not simply send information to a receiver. The receiver has to explicitly seek for information. This strongly supports the assumption of an active audience, a central concept of the uses and gratifications approach.

Support was also found for the theories that describe the relation between information need and media choice. However, this research paid much more attention to the content of the communication than most other gratification typologies. The 'traditional' typologies have a very general character, distinctions are for instance made between information and communication needs and surveillance. On a more specific level

information needs are classified according to the functionality of these needs (for example a need for new information or a need to confirm information already held). In this research the need was characterised on a more specific, more operational level. Issues like topicality, uniqueness, interactivity and context are basic characteristics of information need. This type of characterisation is not explored in earlier research.

Decision making

Although decision making is the central issue in this research, the process itself has gained relatively little attention in the empirical research itself. This is not without reason. Before the empirical research was started, the suspicion emerged that choosing a medium is a matter of limited problem solving. Through observation the suspicion was confirmed: people do not dwell long upon a medium choice. Without any doubt they chose a medium that would quickly and easily provide them with a good answer to the question.

Summarising: media choice is a matter of limited problem solving. Moreover, media choice is directed to a satisfying choice, rather than an optimal one.

Contingency: task - medium fit

With regard to the theoretical background of the match between task and medium several remarks can be made. First of all, the idea of task - medium fit is in line with the results of the research. Certain needs are related to certain media and other needs are related to other media.

However, the uni-dimensional richness scale that is used in media richness theory is not suited to explain the use of media in this research. Instead the characterisation topicality, uniqueness, interaction and context, was made. All these characteristics proved to be adequate predictors of media choice: significant relations with media choice were found. Moreover, media choices do not depend on a single characteristic of the information need: the characteristics of the need *in combination* influence media choice.

The social influence model of media choice also involves task and media experience and evaluation, situational factors and of course, social influence. In this research the context was taken into account as a situational factor. Context proved to be an important predictor of media choice. Also media experience was taken into account. Experience with media use was less important: there are many positive but not significant relationships.

6.3 Limitations of the research and further research

As any research project also this research has limitations. The limitations of this research are mainly caused by the empirical part. The Policy capturing study provided a number of new insights but also limitations.

Generalisation of the respondents

The respondents in this research are Dutch University students. Consequently, the respondents are not representative for the whole Dutch population and results cannot be generalised. However, the focus of this research is how *differences* between needs and *differences* between users influence media choice. The focus is *not* how often certain media were chosen. In other words, it is the *pattern* we are looking for, not the exact ratio in which media are chosen. In that respect this research is closer to an experimental design than to survey research.

If the questionnaire in this research had been presented to, for example, a sample of the whole Dutch population, it would have been likely to find a different proportion in media choices but the same patterns. The traditional mass media would probably be chosen more often than is the case in a population of students. The explanation for this is that the public at large has far less physical access to new media than university students.

Generalisation of the cases

In this research respondents were presented with cases that can emerge in daily life. However, the cases that were presented are not representative for all questions that emerge in daily life. For example, fifty percent of the cases that were presented had a unique character and fifty percent had a common character. It is likely that in daily life people have more common needs than unique needs. For example, a simple question such as: 'At what time does the train leave?' is more likely to emerge than a unique questions such as: 'What type of mortgage is most attractive for me?'

This problem of generalisation is comparable to the previous one. As far as differences between cases is concerned, the goal was not to find the exact proportions of media choices. The goal was to find *patterns*.

Characterisation of the cases

Despite the effort that was made in this research to characterise needs on a more detailed level than is generally done, the cases were characterised on a limited set of criteria that proved to be important in the Q-methodology research part. Four criteria characterised the need (topicality, uniqueness, interactivity and context) but it is likely that there are more characteristics of the information need. For example, the actual subject of the need could

influence media choice. Moreover, the characteristics that were used were only operationalised at two levels.

Especially the context in which a need emerges needs more attention. In this research only the difference between 'home' and 'university' was made. Not only can a need for information emerge in other places, such as in a pub, at a friends house or on the road. Also the exact place where a need emerges in for example the home situation can influence media choice. Questions that should be posed are: is the user near a computer; is the computer switched on; is there a network connection; or is the user near the telephone or television; are other people watching the television. All these issues could influence the choice for a medium. Not only at home, many different situations can emerge. Also in an organisational context many different information needs can rise.

Besides information needs, there can of course also be other reasons to use media, for example a need for entertainment or a need for escape.

Future developments

This research only offers an image of the world as it is today. New possibilities develop every day. The world of information and communication technology offers new possibilities that might meet other user needs. Moreover, the access to new information and communication technology may improve in the future. Despite these future developments this research offers some more fundamental insights. The results can be applied to new services. In the next section an attempt is made to apply the research results to two new technologies. In that section an effort is made to show the value of the approach for two new technologies: WebTV and SCOOT.

Opportunities for further research

The limitations of a research project also offer new research opportunities. In future research the attention should be on the following area's.

- The study of not only students but also other target groups such as lawyers, journalists, medical specialists, but also the public at large.
- The study of not only information needs that emerge on a daily basis but also more complex needs.
- A more detailed study of characteristics of both information needs and media. Especially the effect of context (for example the effect of alternative sources of information or the presence of others) needs more attention.
- The study of other needs than information needs (for example the need for entertainment or escape).

6.4 Discussion: Matching Media

This chapter began with the notion that most new services are developed from a suppliers perspective. The results of the research show that a user perspective can help to explain whether or not a medium is chosen and is used. As an example, these results are applied to two new media: WebTV and SCOOT, whereas WebTV is an example of a technology based approach and SCOOT is an example of a user need based approach.

This section will discuss how the conclusions of this research can be applied to new media. For each of the two media the following questions will be posed.

- Is the medium physically accessible in context?
- How do user characteristics (in terms of experience, frequency, and evaluation) relate to the medium?
- What information need (in terms of topicality, uniqueness, and interaction) is fulfilled with the medium?

The following sections will describe SCOOT and WebTV in terms of their degree of accessibility and the information need they fulfil and. From this description a conclusion with regard to the chances of success for each of the new media will be drawn.

6.4.1 A technology oriented approach: WebTV

The integration of television and PC is taking place in two ways. On the one hand a PC is getting more and more characteristics of a television (Webcasting). The other way around the television gets characteristics of a PC (WebTV). WebTV is the convergence of the World Wide Web with television. By means of a set-top box it is possible to browse Web pages. WebTV uses a television set as an output device but the signal is transported through a modem and a telephone line (Internet 16, 1998).

In order to evaluate the chances for success of WebTV a comparison with the possibilities and limitations of several other media is made. The results that were gathered for television, Teletext, WWW and e-mail will be used as a source of information for the evaluation of WebTV.

Physical accessibility and user characteristics of WebTV

Physical accessibility

Televisions (with Teletext) are widely available in the Netherlands but for WebTV an additional set-top-box is needed. In order to browse the web a subscription with a provider is also needed. Although the results of this research show that regular usage costs are not a reason for not choosing a medium, the decision to buy a set-top-box is one that is not taken easily. Consequently, physical access will be a problem.

Another problem lies in the use of WebTV during regular television programs. Regular 'zapping' can be very frustrating for other family members. Imagine the effect of wanting to browse the Internet while someone else wants to watch football.

User characteristics

Frequency of media use and experience are two user characteristics that confront WebTV with another problem. Teletext and WWW were two (of the few) media where a significant relation between choice and frequency and experience was found. People that have experience with the use of Teletext or WWW are more likely to choose these media. Paradoxical, WebTV is intended for people who do not have that experience and are thus not inclined to search information through the new media.

What information need does a WebTV meet?

Topicality

WebTV basically is an addition to the television set. Information needs that will be fulfilled with WebTV will consequently be related to watching the television. WebTV is for example likely to be used for the same purposes as the television itself is used: gathering news, background information and entertainment. On the other hand, the research results show that the needs that are fulfilled with WWW are of a stable nature. This contradiction will not contribute to the success of WebTV.

Moreover, the question is whether the need for news and entertainment is not already fulfilled with the basic television service and Teletext. Even though the looks of Teletext are not very slick, it does provide a quick and good answer to many questions. These were the important criteria for media choice. The provision of additional information is less relevant.

Uniqueness

Also with regard to uniqueness a problem emerges. Both television and Teletext are media that are used for common needs. On the other side, Internet and e-mail are media that are used for unique needs. Again there is a contradiction in the possibilities WebTV offers and the related needs.

Interaction

With regard to interaction a more positive image can be sketched. Television, Teletext and WWW are all used to solve information needs. E-mail is not only used for information but also for communication and transactions.

6.4.2 A user oriented approach: SCOOT

SCOOT offers a new approach to finding information. By calling a charge free phone number (0800-7007) SCOOT can give information (for example a telephone number) about companies and services. SCOOT is not only available by telephone, but also on Internet (Internet 17, 1998). In the Netherlands, SCOOT has a database with detailed information on more than 600.000 companies for more than 10.000 subjects. With this service it

is possible to find an Italian restaurant in Deventer, the nearest travel agency, or where to buy a gift voucher.

In order to evaluate the chances for success of SCOOT a comparison with the possibilities and limitations of telephone (calling an expert) and Internet is made. Again the research results will be used as a source of information.

Physical accessibility and user characteristics of SCOOT

Physical access

The only thing that is needed to consult SCOOT is a telephone. A telephone is easy to access. Almost everybody has immediate access to a telephone and also in public places (school, café, station) a telephone is often within reach. As the service is free of charge, costs are not important.

Besides the good physical access, SCOOT has another advantage. When a user calls SCOOT, he or she is connected to an operator. The operator translates the question of the user to a question that can be answered by the system. The experience of the operator helps to answer the question.

The Internet site of SCOOT has the same problems as a regular Internet site. Only those people that have the right equipment, an Internet subscription and the right experience can access the SCOOT website. Moreover, at the web-site there is no operator that helps to answer the question.

User characteristics

Using a telephone, for most people, is not a matter of experience or frequency of use. From a young age, people have been confronted with the telephone. The appliance is a natural element in the household or at the workplace. Picking up the telephone to get something done is as easy as can be. With regard to the SCOOT Internet site frequency of media use and experience do play a role. Only experienced people will choose this way to get an answer to the question they have.

What information need does SCOOT meet?

'I need a...' is the type of question that can be answered with SCOOT. Almost anything can be filled in for the dots. SCOOT offers directory information to almost any kind of subject. It does not offer the information or service itself, but offers information about the way to get to information or a service. Besides directory information, SCOOT offers seasonal information on for example Father's day, Christmas, Easter, Holidays, and the World Championship. SCOOT offers all kind of information about where to buy appropriate presents, clothing and so forth. This kind of need could be characterised as: stable, common and only information and not communication and/or transaction oriented. These characteristics will now be elaborated.

Topicality

The research results show that telephone is used for both topical and stable questions. This is in coherence with the need that is presented here.

The Internet is also used for issues of a stable nature. In conclusion, SCOOT offers information that matches what the medium is used for.

Uniqueness

The directory information that is offered by SCOOT is day-to-day information. There are many alternative sources where an answer to a question can be found (for example, the yellow pages book). Research results show that both telephone and Internet are used for unique needs. This seems to be a contradiction. The argument that can be made is that media with which unique needs can be solved also are capable of solving common needs. The other way around (as was the case for WebTV) does not work like that: a medium that solves common needs, cannot solve unique needs.

Interaction

The telephone is used for information and communication and transaction. WWW is only used for information. The questions that can be solved with SCOOT correspond with this.

6.4.3 Summary

The previous sections gave a description of two new media: SCOOT and WebTV. SCOOT was presented as a user based approach and WebTV as a technology based approach. WebTV is a new technology that is presented without a clear need that support the technology. SCOOT on the other hand offers simple answers to simple questions in a simple way.

In the previous questions, two questions were central: to what degree are these media accessible and what information does each medium fulfil.

SCOOT is the medium that has the best prospects, both in terms of fulfilment of an information need as well as in terms of accessibility. WebTV provides a less positive image. There is no clear-cut need for information that is fulfilled with this medium. Also the physical access is not very good. Time will learn how these positive respectively negative factors will influence success or failure of these new media. Based on the research, this exercise learns that SCOOT has better chances than WebTV.

6.5 In conclusion

The developments in information and communication technology have an enormous impact on society. New technologies that have emerged seem to offer many opportunities. Innovations that will be introduced in the future will offer many more possibilities. However, the development of innovations is a complex issue. Due to this complexity, much of the attention has gone out to the design of the systems itself. The usefulness of new technology within the daily lives of people is most of the time more or less neglected. Consequently, not all new technologies are successful.

This research hopes to contribute to the successful introduction of new technologies. By maintaining a user perspective it is possible to see how technology fits into the lives of people and how information and communication technology can fit into information needs. The main conclusion of the research is that media have to match user needs in order to be successful.

So if you are wondering at what time the train from Amsterdam to Enschede leaves, here's the answer: from six o'clock in the morning until ten o'clock in the evening, a direct train leaves every hour at :04. Furthermore, it is possible to leave every hour at :34, change trains in Amersfoort (Sporboekje, 1998).

Bibliography

- Arnbak, J. C., Cuilenburg, J. J. v., & Dommering, E. J. (1990). *Verbinding en ontvlechting in de communicatie: een studie naar toekomstig overheidsbeleid voor de openbare elektronische informatievoorziening*. Amsterdam: Cramwinckel.
- Atkin, D., & LaRose, R. (1994). A Metaanalysis of the Information Services Adoption Literature: Lessons to Be Learned from Cable and Telephony. In J. Hanson (Ed.), Vol. 2. *Advances in Telematics*, 91-110. Norwood: Ablex.
- Automatiseringsgids (1995). *Surfen met CD-i op Internet*. (15 September).
- Aumente, J. (1987). *New Electronic Pathways: videotex, teletext, and on-line databases*. Newbury Park: Sage.
- Baxter, J. L. (1993). *Behavioural Foundations of Economics*. Houndmills: Macmillan.
- Beach, L.R. & Mitchel, T.R. (1990). Image theory: A behavioural theory of image making in organizations. In Cummings, L. L. and Staw, B. M. (Eds.). *Research in organizational behaviour, an annual series of analytical essays and critical reviews*. Greenwich: JAI Press.
- Benbasat, I., & Lim, L. (1993). The Effect of Group, Task, Context, and Technology Variables on the Usefulness of Group Support Systems: A Meta-analysis of Experimental Studies. *Small Group Research*, 24(4), 430-462.
- Bergman, S., & Van Zoonen, L. (1996). *Fishing with false teeth, Women, Gender and Internet*. Paper Presented At 'Technocities. Culture And Political Economy Of The Digital Revolution', Coventry University, Coventry
- Bergman, S., Frissen, V., & Slaa, P. (1995). Gebruik en betekenis van de telefoon in het leven van alledag. In Rathenau Instituut (Ed.), *Toeval of Noodzaak: Geschiedenis van de overheidsbemoeienis met informatievoorziening*, 277-327. Amsterdam: Cramwinckel.
- Booij, L., E. van Bruggen & J. Baidenmann (1996). *Niet nix: ideeën voor de Patij van de Arbeid*. Balans, Amsterdam.
- Bordewijk, J. L., & Kaam, B. v. (1982). *Allocutie: Enkele gedachten over communicatievrijheid in een bekabeld land*. Baarn: Bosch & Keuning.
- Bornkamp, B., Eertink, H., Velthausz, D., & Wijngaert, L. v. d. (1995). *TeleUse, Office Automation in 2000*. Enschede: Telematica Research Centrum.
- Boumans, J. (1998). Elektronische informatiediensten en producten. In J. Hemels, A. Herpers, H. v. d. Pol, & H. Prins (Eds.), *Gids informatiestector 1997/1998*, 191-194. Den Haag: NBLC/Boekblad.

- Bouwman, H., & Neijens, P. (1991). Een meta-analyse van Videotex-literatuur: een aanzet tot een acceptatiemodel voor de consumentenmarkt. *Massacommunicatie* (2), 134-148.
- Bouwman, H., & Christoffersen, M. (1992). (Eds.). *Relaunching Videotex*. Dordrecht: Kluwer Academic.
- Bouwman, H., & Slaa, P. (1994). Netherlands: Between Sex and Information - Audiotex in transition. In M. Latzer, & G. Thomas (Eds.), *Cash Lines: The development and regulation of Audiotex in Europe and the United States* (51-68). Amsterdam: Spinhuis.
- Bouwman, H., Van Stralen, A., & Vlietman, M. (1997). *De Nederlandse telecommunicatie-sector in cijfers*. Apeldoorn: TNO-Studiecentrum voor Technologie en Beleid.
- Brown, S.R. (1980). *Political subjectivity: Applications of Q-methodology in political science*. New Haven, CT: Yale University Press.
- Bryk, A. S., & Raudenbush, S. W. (1992). *Hierarchical Linear Models: applications and data analysis methods*. Newbury Park: Sage.
- Bussel, W. v. (1993). *CD-i, een introductie*. Deventer: Kluwer.
- Cattell, R. B. (1966). The meaning and strategic use of factor analysis. In R. B. Cattell (Ed.), *Handbook of multivariate experimental psychology*. Chicago: Rand McNally.
- CBS. (1997). *Statistisch Jaarboek 1997*. Voorburg, Heerlen: Centraal Bureau voor de Statistiek.
- Chew, F. (1994). The relationship of information needs to issue relevance and media use. *Journalism Quarterly*, 71, 676-688.
- Cohen, B. C., & Center of International Studies. (1963). *The press and foreign policy*. Princeton: Princeton University Press.
- Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Management Science*, 32, 554-571.
- Daft, R. L., Lengel, R. H., & Trevino, L. (1987). Organizational information requirements, media richness and structural design. *MIS Quarterly*, 11, 355-366.
- Dervin, B., Jacobson, T. L., & Nilan, M. S. (1982). Measuring aspects of information seeking: A test of quantitative/qualitative methodology. In *Communication Yearbook* 5, 419-446. Newbury Park: Sage.
- Do (1995). *Assessment of information use via Internet*. Paper presented at 45th ICA Conference.
- Einhorn, H., J., & Hogarth, R., M. (1981). Behavioural decision theory: process of judgement and choice. *Annual Review of Psychology*, 32, 53-88.
- Engel, J., F., Blackwell, R., D., & Miniard, P., W. (1990). *Consumer Behaviour* (6 ed.). Chicago: Dryden.
- Fiske, J. B. (1989). *Introduction to communication studies*. London: Routledge.
- Fulk, J., Schmitz, J., & Steinfield, C. (1990). A Social Influence Model of Technology Use. In J. Fulk, & C. Steinfield (Eds.), *Organisations and Communication Technology*. Newbury Park, California: Sage.
- Galbraith, J.J. (1973). *Designing Complex Organizations*. Sage.
- Goldstein, H. (1995). *Multilevel Statistical Models* (2 ed.). London: Arnold.
- Groebel, J. (1997). New Media Developments. In *Trends in Communication (TIC)*, 1(1), 5-17.
- Grooff, D. d. (1980). *Teletekst en Viewdata: een exploratie in het domein van de telematiek*. Leuven: Centrum voor communicatiewetenschappen, Katholieke Universiteit Leuven.

- Harman, H. H. (1960). *Modern Factor Analysis*. Chicago: University Press.
- Hartkamp, F. W. (1993). Videotex op de kabel. *Informatie & Informatiebeleid*, 11(3), 40-47.
- Herpers, A.A. (1998). De Boekenmarkt. In J. Hemels, A. Herpers, H. v. d. Pol, & H. Prins (Eds.), *Gids informatiestector 1997/1998*, 106-107. Den Haag: NBLC/Boekblad.
- Hooff, B. v. d. (1997). *Incorporating Electronic Mail*. Amsterdam: Cramwinckel.
- IDC/EITO (1998). ICT for European Homes: Devices, Services and Applications. In EITO (Ed.), *European Information Technology Observatory, 1998*, 150-305. Frankfurt/Main: EITO.
- Internet 1 01-07-1998 <http://www.minez.nl>
- Internet 2 01-07-1998 <http://www.ol2000.nl>
- Internet 3 11-06-1998 <http://www.intelfax.co.uk/newdocs/faq.html>
- Internet 4 11-06-1998 <http://www.omroep.nl/cgi-bin/tt/nos/page>
- Internet 5 11-06-1998 http://www.bbc.co.uk/dab/non_flash/index.html
- Internet 6 22-06-1998 http://www.nipo.nl/infoshop/mconderz/comp96_u.htm
- Internet 7 20-07-1998 <http://www.dds.nl/dds/archief/entree.html>
- Internet 8 26-06-1998 <http://www.whatis.com/>
- Internet 9 23-10-1998 <http://www.altavista.com>
- Internet 10 23-10-1998 <http://www.yahoo.com>
- Internet 11 23-10-1998 <http://www.dhp.nl>
- Internet 12 18-06-1998 <http://www.nw.com/zone/WWW/top.html>
- Internet 13 18-06-1998 <http://www.nipo.nl/result/pers/intpen98.htm>
- Internet 14 26-06-1998 <http://saturn.worldonline.nl/today/wiwawa/11nov97.html#Headline4>
- Internet 15 18-06-1998 <http://www.pointcast.com/>
- Internet 16 18-06-1998 <http://www.philipsmagnavox.com/product/pf32.html>
- Internet 17 25-10-1998 <http://www.scoot.nl/>
- Jong & Veen, van der (1997) Internet. *Studieblad*. Den Haag: PTT Telecom.
- Katz, E., Blumler, J. G., & Gurevitch, M. (1974). Uses and Gratifications: a paradigm outlined. In J. G. Blumler, & E. Katz (Eds.), *The Uses of Mass Communications*. Beverly Hills: Sage.
- Kim, J. O., & Mueller, C. W. (1978a). *Factor analysis: Statistical methods and Practical Issues*. Beverly Hills: Sage.
- Kim, J. O., & Mueller, C. W. (1978b). *Introduction to factor analysis: what it is and how to do it*. Beverly Hills: Sage.
- Knippenberg, A. v., & Siero, F. (1980). *Multivariate analyse: beknoppte inleiding en toepassingen*. Deventer: VanLogum Slaterus.
- LaQuey, T., & Ryer, J. (1993). *The Internet Companion: a beginners guide to global networking*. Reading, Massachusetts: Addison Wesley.
- Lasswell, H.D. (1948). The structure and function of communication in society. In L. Bryson (ed.), *The communication of ideas*. New York: Harper & Bros.

- Latzer, M., & Thomas, G. (1994). Introduction: Audiotex - Structure and Development. In M. Latzer, & G. Thomas (Eds.), *Cash Lines: The development and regulation of Audiotex in Europe and the United States* (pp. 3-12). Amsterdam: Spinhuis.
- Levi, M. R., & Windahl, S. (1984). Audience activity and gratifications. A conceptual clarification and exploration. *Communication Research*, 11, 51-78.
- Light, R. J., & Pillemer, D. B. (1984). *Summing up: The science of reviewing literature*. Cambridge: Harvard.
- Longford, N. T. (1993). *VARCL : software for variance component analysis of data with nested random effects (maximum likelihood): manual*. Groningen: iec ProGAMMA.
- March, J.G. & Simon, H.A. (1958). *Organizations*. New York: Wiley.
- Martocchio, J., J., Webster, J., & Baker, C., R. (1993). Decision-making in management information systems research: the utility of policy capturing methodology. *Behaviour & Information technology*, 12(4), 238-248.
- Marwell, G., & Oliver, P. (1994). *The Critical Mass in Collective Action: A Micro-Social Theory*. Cambridge N.Y.: Cambridge University Press.
- McKeown, M. L., & Thomas, D. (1988). *Q-methodology*. Newbury Park: Sage.
- McQuail, D., Blumler, J., & Brown, J. (1972). The television audience, a revised perspective. In D. McQuail (Ed.), *Sociology of mass communications: selected readings*. Harmondsworth: Penguin.
- McQuail, D., & Windahl, S. (1981). *Communication models for the study of mass communications*. New York: Longman.
- Meijs, J. (1995). *Teletekst in 1994*. Hilversum: NOS, Afdeling Kijk- en Luisteronderzoek.
- Mulaik, S. A. (1972). *The foundations of factor analysis*. New Yourk: McGraw-Hill.
- Nelissen, P. W. M. (1991). *Het omgaan met kennis en de vraag naar voorlichting*. Nijmegen: Instituut voor Toegepaste Sociale Wetenschappen.
- Norusis, M., & Spss Inc. (1993). *SPSS for Windows, Professional Statistics* (Release 6.0 ed.). Chigago: SPSS.
- O'Sullivan, T., Hartley, J., Saunders, D., & Fiske, J. (1983). *Key Concepts in Communication*. London: Methuen.
- OCenW. (1996). *Hoger Onderwijs en Onderzoeksplan, 1996*. Zoetermeer: Ministerie van Onderwijs Cultuur en Wetenschappen.
- Osgood, C. E., Suci, G.J. & Tannenbaum, P.H. (1957). *The measurement of meaning*. Urbana: University Press.
- Overste, A. M. (1978). *TV als middel tot behoeftebevrediging*. *Masscommunicatie*, 6, 58-60.
- Palmgreen, P., Wenner, L. A., & Rosengren, K. E. (1985). Uses and gratifications research: The past ten years. In K. E. Rosengren, L. A. Wenner, & P. Palmgreen (Eds.), *Media gratifications research: current perspectives*. Beverly Hills, California.: Sage.
- Palmgreen, P., & Rayburn, J. D. (1985). An expectancy-value approach to media gratifications. In K. E. Rosengren, L. A. Wenner, & P. Palmgreen (Eds.), *Media Gratifications Research: Current Perspectives*. Beverly Hills: Sage.
- PTT Telecom. (1996a). *Altijd open voor de markt of De vele mogelijkheden an Servicenummers*. Den Haag: PTT Telecom.

- PTT Telecom. (1996a). *De faciliteiten van de Servicenummers: vijf hoofdgroepen met verschillende mogelijkheden*. Den Haag: PTT Telecom.
- PTT Telecom. (1996a). *Januari 1996 Telefoongids*. Den Haag: PTT Telecom.
- Rogers, E. M. (1983). *Diffusion of Innovations*. New York: The Free Press.
- Rosengren, K. E., Wenner, L. A., & Palmgreen, P. (1985). *Media gratifications research: current perspectives*. Beverly Hills, California.: Sage.
- Rossi, P. H., & Anderson, A. B. (1982). The Factorial Survey Approach: An Introduction. In P. H. Rossi, & S. L. Nock (Eds.), *Measuring Social Judgements* (pp. 15-67). Beverly Hills: Sage.
- Rossi, P. H., & Nock, L. (Eds.), (1982). *Measuring Social Judgements*. Beverly Hills: Sage.
- Rubin, A. M. (1984). Ritualized and Instrumental Television Viewing. *Journal of Communication*, 34(2), 67-77.
- Rubin, A. M. (1993). Audience activity and media use. *Communication monographs*, 60, 98-105.
- Schramm, W. (1954). How Communication works. In W. Schramm (Ed.). *The process and effects of Mass Communication*. Urbana: University Press.
- Segers, J. H. G. (1983). *Sociologische onderzoeksmethoden, Deel I (3 ed.)*. Assen: Van Gorcum.
- Sepstrup, P. (1977). *Consumption of mass communication: construction of a model on information consumption behaviour*, Institute for Markedokonomie.
- Severin, W. J., & Tankard, J. W. (1988). *Communication Theories (2 ed.)*. New York: Longman.
- Shannon, C. E., & Weaver, W. (1949). *The mathematical theory of communication*. University of Illinois: Urbana.
- Smits, J. M., & de Vries, J. (1993). Het lagenmodel: basis voor inrichting teletelecommunicatiemarkt. *Informatie & Informatiebeleid*, 11(3), 48-55.
- Spoorboekje (1998). *Spoorboekje 24 mei 1998 t/m 29 mei 1999*. Utrecht: Nederlandse Spoorwegen.
- Stappers, J. G., Reijnders, A. D., & Möller, W. A. J. (1990). *De werking van de massamedia: Een overzicht van inzichten (2 ed.)*. Amsterdam: Arbeiderspers.
- Telecombrief (1998). *Steeds meer huishoudens gebruiken pc en internet. (29/5)*, 174.
- Tichenor, P. J., Donohue, G. A., & Olien, C. N. (1970). Mass media flow and differential growth of knowledge. *Public Opinion Quarterly*, 34, 159-170.
- Trevino, L. K., Daft, R. L., & Lengel, R. H. (1990). Understanding Managers' Media Choices: A Symbolic Interactionist Perspective. In J. Fulk, & C. Steinfield (Eds.), *Organisations and Communication Technology* (pp. 71-94). Newbury Park, California: Sage.
- Ungerer, H., & Costello, N. (1988). *Telecommunicatie in Europa*. Brussel: Commissie van de Europese Gemeenschappen.
- Vissers, C.A., Pires, L.F. and Quartel, D.A.C.(1993). *Ontwerpen van telematica systemen*. Enschede: Universiteit Twente.
- Waples, D., Berelson, B., & Bradshaw, F. R. (1940). *What reading does to people : a summary of evidence on the social effects of reading and a statement of problems for research*. Chicago: The University of Chicago Press.

- Webster, J., & Trevino, L. K. (1995). Rational and Social Theories as Complementary Explanations of Communication Media Choices: Two Policy-capturing Studies. *Academy of Management Journal*, 38(6), 1544-1572.
- Weights, W., Widdershoven, G., Kok, G., & Tomlow, P. (1993). Patients' information seeking actions and physicians' responses in gynaecological consultations. *Qualitative Health Research*, 3, 398-429.
- Williams, F., Rice, R. E., & Rogers, E. M. (1988). *Research Methods and the New Media*. New York: The Free Press.
- Wilson, T. (1994). Information Needs and Uses: Fifty years of progress? In B. C. Vickery (Ed.), *Fifty years of progress, a journal of documentation review* (pp. 15-52). Glasgow:
- Windahl, S. (1981). Uses and gratifications at the cross-roads. In G. C. Wilhoit, & H. d. Bock (Eds.), *Mass Communication review yearbook 2* (pp. 174-185). Beverly Hills, CA: Sage.

Samenvatting - Matching Media

De relatie tussen informatiebehoefte en de keuze van (nieuwe) media

Hoe laat vertrekt de trein van Amsterdam naar Enschede? Wie een antwoord zoekt op deze vraag kan uit verschillende media kiezen:

- het spoorboekje;
- de telefoon: 0800-9292 (informatie openbaar vervoer);
- de reisplanner op een personal computer;
- de reisplanner op Internet;
- naar het station gaan en op de borden kijken of
- een bekende vragen.

Sommige van deze media zijn oud, andere gebruiken nieuwe informatie- en communicatietechnologie. Alle mogelijkheden hebben voor- en nadelen.

Sommige zijn snel, andere media zijn traag, sommige zijn makkelijk in het gebruik, andere zijn moeilijker, sommige zijn gratis, voor andere moet betaald worden, sommige geven een eenvoudig antwoord, andere geven aanvullende informatie.

Welk medium uiteindelijk wordt gekozen is afhankelijk van veel verschillende factoren, zoals de aard van de vraag, degene die de vraag stelt, de context waarin een vraag wordt gesteld en de media die toegankelijk zijn in die context. En wat gebeurt er wanneer de vraag een klein beetje verandert? Wat gebeurt er bijvoorbeeld wanneer de vragensteller hoort dat er een treinongeluk heeft plaatsgevonden?

Door technologische ontwikkelingen zijn in de afgelopen decennia verschillende nieuwe media ontstaan. Voorbeelden zijn Telefoon Service Nummers (0800/0900), Teletext, CD-ROM en CD-i, Videotex en Internet.

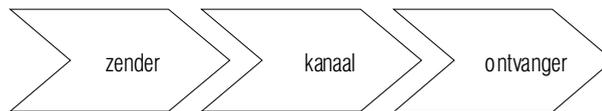
Veel van deze nieuwe media zijn meer ontstaan doordat nieuwe technologie het mogelijk maakte, dan doordat er een grote behoefte vanuit het publiek werd gevoeld. Sommige van deze nieuwe media zijn succesvol, andere niet. Met andere woorden: nieuwe media worden niet succesvol louter door hun bestaan. Om het succes van nieuwe media te verklaren is het dus belangrijk om de vragensteller en zijn of haar informatiebehoefte als uitgangspunt te nemen en niet de technologie als zodanig. Hieruit kan ook de doelstelling van het onderzoek worden afgeleid.

Het doel van het onderzoek is het verkrijgen van inzicht in het proces van communicatie voor nieuwe media vanuit een gebruikersperspectief teneinde bij te dragen aan de succesvolle introductie van nieuwe media.

Introductie – Het gebruikersperspectief

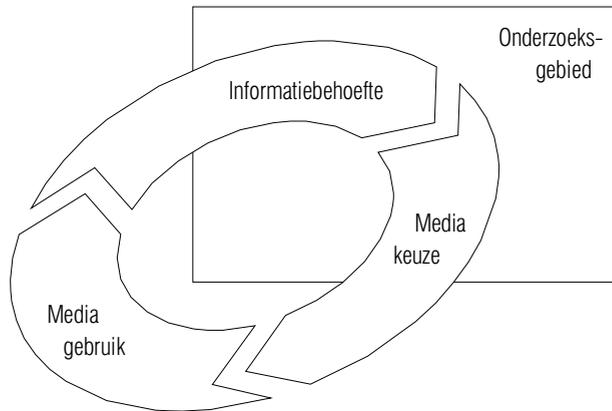
Traditioneel wordt binnen de communicatiewetenschap een model van communicatie gebruikt dat er uitziet zoals Figuur 1. Een zender stuurt informatie via een kanaal naar een ontvanger. Weliswaar zijn in de loop van de tijd allerlei elementen toegevoegd aan dit model, maar de zender bleef het uitgangspunt.

Figuur 1 Traditioneel model van communicatie



In dit onderzoek is gezocht naar een andere benadering. Niet de zender neemt een centrale plaats in, maar de ontvanger en zijn (informatie)behoefte staan centraal. Het onderstaande model (Figuur 2) geeft het proces van communicatie in drie fasen weer. Allereerst ontstaat een informatiebehoefte. Naar aanleiding van een bepaalde activiteit (zoals het nemen van de trein) ontstaat een behoefte aan informatie (hoe laat vertrekt de trein). Dan volgt een mediakeuze. Deze is gebaseerd op een goede *afstemming* tussen de informatiebehoefte en de mogelijkheden die een medium biedt. Mediagebruik leidt tot een bepaalde uitkomst: antwoord op de vraag (of een vermindering of verandering van de informatiebehoefte).

Figuur 2 Het proces van communicatie vanuit een gebruikers perspectief



In dit onderzoek wordt dieper ingegaan op de relatie tussen informatiebehoefte en mediakeuze. Het uitgangspunt van dit onderzoek is dat, willen nieuwe media succesvol zijn, er een goede 'match' moet bestaan tussen de vraag waarmee een gebruiker bij een medium komt en het antwoord dat een medium biedt.

Om de doelstelling van dit onderzoek te bereiken is een aantal deelvragen geformuleerd. De vragen richten zich op:

- hoe de media in dit onderzoek zich onderscheiden van media in het algemeen en welke media in Nederland worden aangeboden;
- welke factoren van invloed zijn op het communicatieproces en
- hoe die factoren van invloed zijn op het communicatieproces.

In de volgende paragrafen komen de verschillende deelvragen aan de orde.

Onderzoeksgebied – Afbakening en beschrijving van nieuwe media

De eerste deelvraag, die wordt beantwoord in hoofdstuk 2, dient ter afbakening van deze studie. De vraag richt zich daardoor met name op de aanbodskant.

Hoe kunnen media, waarmee elektronische informatie kan worden opgevraagd, worden onderscheiden van andere media en welke media waarmee elektronische informatie kan worden opgevraagd, worden aangeboden in Nederland?

De belangrijkste kracht achter de ontwikkeling van nieuwe media is convergentie. Al sinds de jaren vijftig zijn de gebieden van massamedia, telecommunicatie- en computertechnologie naar elkaar toegegroeid. Ook op het niveau van netwerken en diensten is convergentie een belangrijke kracht achter nieuwe ontwikkelingen. Deze ontwikkelingen zijn onder andere mogelijk geworden door digitalisering van informatie.

Ten aanzien van de afbakening van dit onderzoek moet het volgende nog worden opgemerkt. Het is niet mogelijk is om een eenduidige lijn te trekken die aangeeft waar de grens ligt tussen welke media wel en welke niet behoren tot dit onderzoek. Wel is het mogelijk om vanuit verschillende perspectieven (zoals de ontwikkeling in de tijd, het gebruik van netwerken en de aard van het medium) te kijken naar de verschillende media. Tezamen geven de verschillende perspectieven een beeld van het onderzoeksgebied. De media die centraal staan in dit onderzoek kenmerken zich doordat ze relatief nieuw zijn, gebruik maken van verschillende technologieën, de mogelijkheid bieden om elektronische informatie op te vragen en doordat ze interactief zijn. De vijf centrale media in dit onderzoek zijn:

- *Telefoon Service Nummers*: ook wel 0800/0900, telefonische informatie- en amusementsdiensten;
- *Teletext*: een (alfanumeriek) nieuwsmedium dat toegankelijk is via de meeste televisies in Nederland;
- *Off-line media (CD-i en CD-ROM)*: media die geen gebruik maken van een netwerk maar met behulp van een TV of PC informatie van CD-schijf rechtstreeks aan de gebruiker presenteren;
- *Videotex*: een interactief alfanumeriek systeem dat via telefoon en PC of minitel terminal informatie aan gebruikers levert. Diensten richten zich met name op de zakelijke markt, amusement en telebankieren en
- *Internet*: een netwerk van netwerken waarover met behulp van computers informatie kan worden uitgewisseld in de vorm van WWW of e-mail.

Van deze media hebben teletext en telefoon service nummers de meest solide basis in Nederland. De meeste mensen hebben gemakkelijk toegang tot deze media. Internet is het medium dat in de afgelopen jaren het sterkst is ontwikkeld. Een aardig detail is dat één van de meest geraadpleegde sites op Internet de pagina van NOS Teletekst is (Trendbox, 1998). Off-line media hebben hun eigen marktaandeel gevonden maar Videotex leidt een wat teruggetrokken bestaan in het geweld van de nieuwe media.

Nu een en ander is afgebakend en beschreven, keren we terug naar het communicatieproces.

Vooronderzoek – Technologie, taak en gebruikers (context)?

Hoewel convergentie wel het *ontstaan* van nieuwe mogelijkheden verklaart, kan het niet het *gebruik* van nieuwe media verklaren. Het succes van nieuwe media is afhankelijk van de gebruikers en hun behoeften. Alleen wanneer van media gebruikt wordt gemaakt, zijn ze succesvol. De volgende deelvraag, die behandeld wordt in hoofdstuk 3, gaat hier op in.

Welke factoren beïnvloeden het proces van communicatie voor media waarmee elektronische informatie kan worden opgevraagd?

Theorie

Wanneer een informatiebehoefte ontstaat zal een gebruiker verschillende alternatieven overwegen die een antwoord op de vraag kunnen geven. De aanname die hier wordt gemaakt is dat mensen eerder een subjectieve beoordeling maken van verschillende alternatieven dan dat zij objectieve criteria hanteren. Het vooronderzoek is erop gericht om te achterhalen op basis van welke aspecten die subjectieve afweging wordt gemaakt.

Methodologie

De methode die is gekozen om deze deelvraag te beantwoorden staat bekend onder de naam Q-methodologie. In het onderzoek wordt een groot aantal uitspraken over de vijf media in deze studie aan respondenten voorgelegd. De set van uitspraken is ontwikkeld op basis van verschillende meta-analyses. Uitspraken over verschillende aspecten van een medium moeten worden geordend op een schaal van 'zeer mee oneens' tot 'zeer mee eens'. De respondenten komen uit de volgende drie groepen: aanbieders van diensten en informatie, wetenschappelijk onderzoekers en gebruikers.

De data zijn geanalyseerd met behulp van factoranalyse. Hieruit kan worden afgeleid welke uitspraken bij elkaar clusteren. Deze clusters vormen de criteria op basis waarvan gebruikers nieuwe media beoordelen.

Resultaten

Het belangrijkste resultaat van dit deel van het onderzoek is dat de beoordeling van een medium kan worden verklaard vanuit de afstemming tussen de taak, de technologie en de gebruiker. Het is belangrijk om deze drie aspecten *in samenhang* te bekijken. Met name de samenhang tussen taak en technologie en de samenhang tussen gebruiker en technologie zijn belangrijk. Het taak - technologie cluster heeft betrekking op de vraag die met een medium kan worden beantwoord. Verschillende subclusters kunnen daarbij worden onderscheiden: veranderlijkheid, uniekheid, interactie en context. Voor het cluster gebruiker - technologie wordt ook een aantal subclusters onderscheiden. Elk van deze subclusters beschrijft een aspect van toegankelijkheid: fysiek, financieel, cognitief en affectief.

In het verdere onderzoek is de aandacht gericht op de vraag hoe deze subclusters samenhangen met mediakeuze.

Theorie – Informatiebehoefte en mediakeuze

De resultaten van het vooronderzoek geven aan dat er twee clusters van factoren van belang zijn bij de beoordeling van media: kenmerken van de taak en kenmerken van de gebruiker, beide in samenhang met de technologie. De onderzoeksvraag die daaruit volgt is:

Op welke manier beïnvloeden de gevonden factoren het proces van communicatie?

In hoofdstuk 4 is de 'Uses and Gratifications' benadering gebruikt als startpunt om mediagebruik te verklaren. In deze theorie wordt de behoefte

gezien als de verklaring voor mediagebruik. Een informatiebehoefte kan worden omschreven als een kloof ('gap') tussen de informatie die beschikbaar is en de informatie die nodig is voor het uitvoeren van een bepaalde activiteit.

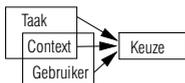
Het maken van keuzen

Er zijn verschillende benaderingen die het maken van keuze beschrijven, bijvoorbeeld het procesmodel. Andere modellen geven inzicht in de verschillende soorten beslissingen die er zijn of op welke manier een beslissing tot stand komt. Als de belangrijkste verschillen tussen de modellen zijn aan te merken: de verschillen tussen beperkte en uitgebreide beslissingen en de verschillen tussen rationeel-economisch en meer subjectief-emotionele beslissingen. In dit onderzoek gaat het om eenvoudige beslissingen die subjectief-emotioneel van aard zijn.

Contingentie:
afstemming tussen taak
en medium

Mediariktheid en het sociale beïnvloedingsmodel van mediakeuze bieden een goed uitgangspunt om de relatie te leggen tussen informatiebehoefte en mediakeuze. De basisaanname uit deze theorieën is dat er een goede afstemming ('match' of 'fit') moet bestaan wil communicatie effectief zijn. In de mediariktheidstheorie wordt deze aanname vanuit een rationeel perspectief uitgewerkt. Het sociale beïnvloedingsmodel van mediakeuze benadrukt dat het gaat om de perceptie van taak en medium en de invloed die komt vanuit de sociale omgeving.

Deze theoretische inzichten vormen samen met de resultaten van het vooronderzoek het model dat in dit onderzoek wordt getoetst. In het model gaat het om de verklaring van mediakeuze op basis van twee clusters van factoren: factoren die gerelateerd zijn aan de informatiebehoefte en factoren die relateren aan verschillen tussen gebruikers (zie Figuur 3). Factoren die gerelateerd zijn aan de informatiebehoefte zijn:



Figuur 3 Het
onderzoeksmodel

- *Veranderlijkheid*: hierbij gaat het erom of de benodigde informatie zeer veranderlijk (zoals nieuws) of juist stabiel (zoals een referentie naar een boek) van aard is.
- *Context*: in welke context heeft iemand een bepaalde informatiebehoefte? Bijvoorbeeld thuis, in het café, op het werk of op de universiteit.
- *Uniekheid*: is de benodigde informatie algemeen van aard of juist zeer specifiek? Gaat het bijvoorbeeld om een vraag die dagelijks voorkomt of is het een vraag die eenmalig wordt gesteld?
- *Informatie, transactie of communicatie*: hierbij gaat het om het verschil tussen een informatiebehoefte waarbij alleen informatie nodig is, of waarbij de gebruiker tevens een transactie wil afsluiten of met een ander wil communiceren.

Naast de informatiebehoefte speelt ook de gebruiker zelf een belangrijke rol. Over welke apparatuur beschikt een gebruiker? Hoeveel ervaring heeft hij of zij met een medium? Hoe vaak wordt een medium gebruikt? De antwoorden op deze vragen vormen samen het begrip toegankelijkheid. In

dit onderzoek is de toegankelijkheid van een medium gemeten vanuit verschillende perspectieven:

- *Fysieke toegankelijkheid* heeft betrekking op de vraag of een gebruiker beschikt over de juiste apparatuur om een medium te kunnen gebruiken. Zo is voor Internet een computer nodig, een modem en een Internetaansluiting.
- *Bij frequentie* gaat het om de vraag hoe vaak iemand een medium gebruikt. Is een medium onderdeel van de dagelijkse gewoontes of gebruikt iemand een medium alleen zo nu en dan.
- *Ervaring* hangt samen met frequentie. Hierbij gaat het om de vraag of iemand bekend is met alle mogelijkheden en beperkingen van een medium of alleen de basisbeginselen kent.
- *Houding* tenslotte, heeft te maken met de attitude die iemand ten aanzien van een medium heeft.

Ieder medium heeft voor iedere gebruiker een bepaalde graad van toegankelijkheid. Naarmate een medium toegankelijker is voor een gebruiker is het waarschijnlijker dat hij of zij dat medium zal kiezen wanneer hij of zij geconfronteerd wordt met een informatiebehoefte.

Empirie – Policy capturing

Om het hierboven beschreven model te toetsen wordt gebruik gemaakt van de zogenaamde ‘policy capturing’ methode. In de praktijk komt dit neer op het aan respondenten voorleggen van ‘cases’ die verschillen op de genoemde kenmerken. Een voorbeeld van zo'n case is:

Je wordt thuis gebeld door een vriend die vraagt of je zin hebt om vanavond naar de film te gaan. Hij weet alleen niet wat er draait. Hoe zoek je uit welke films er vanavond in de bioscoop draaien?

Voor deze case geldt dat het gaat om algemene (niet om unieke) informatie, de informatie is veranderlijk van aard, de context is thuis en het gaat alleen om een informatiebehoefte en niet om een communicatie- of transactiebehoefte.

Aan de respondenten (een steekproef van 538 studenten van verschillende universiteiten, faculteiten en studierichtingen) is gevraagd met welk medium ze een antwoord op bovenstaande vraag zouden zoeken. Daarnaast is nog een aantal andere cases, met andere kenmerken, aan de respondenten voorgelegd. Ook is aan de respondenten gevraagd over welke apparatuur zij beschikken, hoe vaak ze verschillende media gebruiken, hoeveel ervaring ze hebben en wat hun houding is ten aanzien van verschillende media.

In de analyse is gekeken of de mediakeuze die respondenten maken, kan worden verklaard uit de verschillen tussen cases en de verschillende mate van toegankelijkheid.

Resultaten

Met behulp van multilevel logistische regressie analyse zijn de bovengenoemde variabelen (verschillen tussen behoeftes en verschillen tussen gebruikers) gebruikt als predictoren van mediakeuze.

Een eerste resultaat van de analyse is dat alleen media worden gekozen die fysiek toegankelijk zijn in de context van de informatiebehoefte. Met andere woorden, fysieke toegankelijkheid is een noodzakelijke maar niet voldoende voorwaarde voor mediakeuze en -gebruik.

Een tweede conclusie is dat mediakeuze kan worden verklaard uit verschillen tussen informatiebehoeftes. Bovendien blijkt dat niet een enkel kenmerk van de informatiebehoefte mediakeuze verklaart maar dat de kenmerken *in samenhang* de mediakeuze bepalen. Uit Tabel 1 kan worden afgeleid dat bijna alle patronen van kenmerken verschillend zijn. Dat wil zeggen dat het noodzakelijk is om rekening te houden met alle kenmerken van de informatiebehoefte om mediakeuze te voorspellen.

Tabel 1 De relatie tussen informatiebehoefte en mediakeuze.

Een woord betekent dat een significante relatie is gevonden en duidt de richting van de relatie aan. Een '-' betekent dat geen significante relatie werd gevonden.

	Kenmerken van de informatiebehoefte			
	Veranderlijkheid	Uniekheid	Interactie	Context
Telefoon, expert	-	uniek	com/trans	thuis
WWW	stabiel	uniek	informatie	universiteit
Kranten en tijdschriften	veranderlijk	algemeen	informatie	universiteit
Boeken en naslagwerken	stabiel	algemeen	informatie	universiteit
Face-to-face, expert	stabiel	uniek	-	universiteit
Teletekst	veranderlijk	algemeen	informatie	-
Telefoon, vrienden	stabiel	uniek	informatie	thuis
Personal computer	stabiel	algemeen	informatie	thuis
Televisie	veranderlijk	algemeen	informatie	thuis
Face-to-face, bekenden	-	algemeen	-	universiteit
Brochures en folders	stabiel	-	-	-
Radio	veranderlijk	algemeen	informatie	-
e-mail	-	uniek	com/trans	universiteit
CD-ROM	stabiel	algemeen	informatie	universiteit

Een derde resultaat is dat er veel meer significante relaties zijn tussen de kenmerken van de informatiebehoefte en mediakeuze dan er zijn tussen kenmerken van gebruikers en mediakeuze. Een vergelijking van de Tabellen 1 en 2 maakt dit duidelijk.

Hoewel er weinig significante relaties gevonden zijn tussen kenmerken van de gebruiker en mediakeuze moet wel worden opgemerkt dat bijna alle relaties (inclusief de niet significante) positief van aard zijn. Dat wil zeggen, dat de kans dat een medium gekozen wordt toeneemt naarmate een

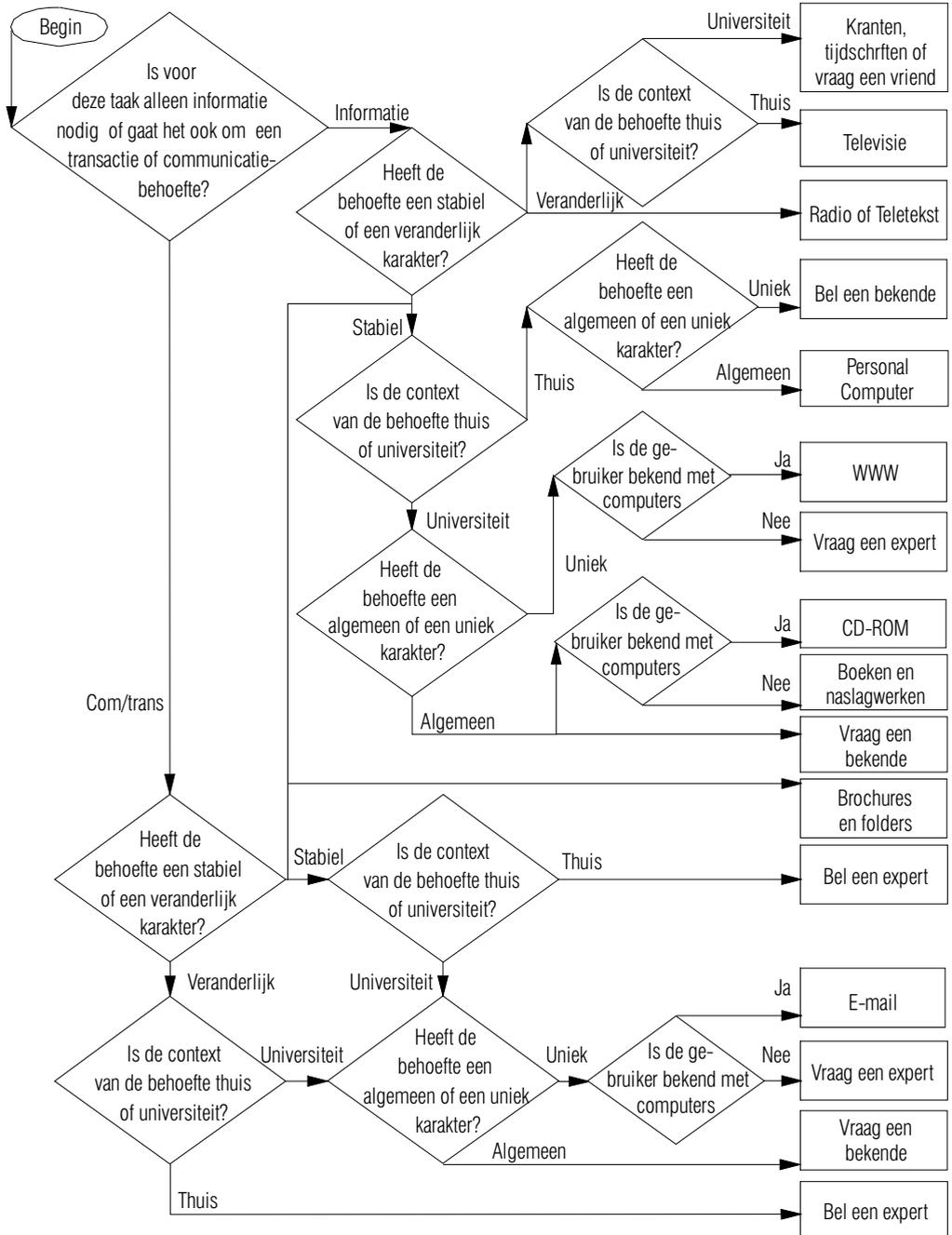
gebruiker in het algemeen vaker het medium gebruikt, meer ervaring heeft en een meer positieve houding heeft ten aanzien van het medium.

Tabel 2 De relatie tussen informatiebehoefte en mediakeuze.

Een woord betekent dat een significantie relatie is gevonden en duidt de richting van de relatie aan. Een '-' betekent dat geen significante relatie werd gevonden.

	Kenmerken van de gebruiker			
	Geslacht	Frequentie	Ervaring	Houding
Telefoon, expert	vrouwen	-	-	-
WWW	-	positief	positief	-
Kranten en tijdschriften	-	-	-	-
Boeken en naslagwerken	-	-	-	-
Face-to-face, expert	vrouwen	positief	niet gemeten	-
Teletekst	-	positief	positief	-
Telefoon, vrienden	-	-	-	-
Personal computer	-	-	-	-
Televisie	-	-	-	positief
Face-to-face, bekenden	-	-	niet gemeten	-
Brochures en folders	-	-	-	-
Radio	-	-	-	-
e-mail	-	-	-	-
CD-ROM	-	-	-	-

Op basis van de resultaten van deze analyse is het mogelijk gebleken om een stroomdiagram op te stellen zoals is weergegeven in Figuur 4. Door de vragen vanaf het beginpunt te beantwoorden is het mogelijk om te onderzoeken welk medium het meest geschikt is om te voorzien in een bepaalde informatiebehoefte. Andersom kan ook het medium als uitgangspunt worden gekozen. Dan kan worden nagegaan wat voor soort informatie via dat medium verspreid zou kunnen worden.



Figuur 4 Stroomdiagram van mediakeuze

Conclusie – Matching media

De ontwikkelingen in informatie- en communicatietechnologie hebben een grote invloed op de maatschappij. De nieuwe technologieën die zijn ontstaan lijken veel nieuwe mogelijkheden te bieden. Toekomstige technische ontwikkelingen zullen daaraan nog meer mogelijkheden toevoegen. De ontwikkeling van nieuwe technologie is zeer complex. Daardoor is tot nu toe hier de meeste aandacht naar uitgegaan. De bruikbaarheid van die technologie binnen een dagelijkse context is dientengevolge voor een groot deel buiten beschouwing gebleven. Dit heeft ertoe geleid dat veel technologie die wordt ontwikkeld in de praktijk niet blijkt te voldoen aan de wensen van gebruikers.

Dit onderzoek streeft ernaar een bijdrage te leveren aan de succesvolle introductie van nieuwe media. Door vanuit een gebruikersperspectief te kijken is het mogelijk om te zien hoe nieuwe technologie past binnen het dagelijks leven.

De belangrijkste conclusie van dit onderzoek is dat media moeten ‘matchen’ bij de behoefte van de gebruikers. Anders gezegd: het succes van een medium is afhankelijk van de mate waarin er sprake is van een juiste afstemming tussen de benodigde informatie en de mogelijkheden die een medium biedt. In de tweede plaats speelt de toegankelijkheid van een medium een rol.

Tot slot, mocht u zich nog steeds afvragen hoe laat de trein van Amsterdam naar Enschede vertrekt, dan is hier het antwoord: van zes uur ’s ochtends tot tien uur ’s avonds vertrekt er ieder uur om :04 een trein. Verder is het mogelijk om ieder uur om :34 te vetrekken, overstappen in Amersfoort (Spoorboekje, 1998).

Appendix

A

Appendix A

Q-methodology

A.1 Overview of items

Table A-1 Overview of items

Note that for Off-line media item 45 was changed in 'The information can be provided on-line'.

Nr	User and context related items	Nr	
1	Users of ... are mainly men	6	Users of ... have a lot of money available
2	Users of ... are mainly young people	7	Users of ... need a lot of experience
3	Users of ... like to work with computers	8	Users of ... have a high education
4	Users of ... have the time to themselves	43	There are little users of ...
5	Users of ... own a lot of modern equipment	44	Everybody has easy access to ...
Nr	Task related items	Nr	
9	... is suited for governmental information	18	... is suited for live issues
10	... is suited for financial information	19	... is suited to get a quick answer
11	... is suited for info on weather and traffic	20	... is suited for daily issues
12	... is suited for commercial purposes	21	... is suited for important issues
13	... is suited for news and sports	22	... is suited for browsing
14	... is suited for games	23	... is suited for many different issues
15	... is suited for pink services	24	... is suited for general issues
16	... is suited for RTV and cultural info	41	... is not suited for transactions
17	... is suited for simple questions	42	... is not suited for communication
Nr	Technology and service related items	Nr	
25	The information in ... is very extensive	35	... has a handy way of searching
26	The information in ... is nicely presented	36	... often crashes
27	The information in ... is very reliable	37	... provides enough help-information
28	The info in ... is nowhere else available	38	... is too slow
29	The information in ... is very expensive	39	... does not answer the question
30	The information in ... is very useful	40	With ... one can search relaxed
31	The info in ... is sometimes outdated	45	The info in ... can be provided off-line
32	The info in ... is sometimes wrong	46	The costs of purchase for ... are very high
33	... has a difficult way of searching	47	The is a lot of information in ...
34	... has a clear way of searching	48	... is an outdated system

A.2 Data gathering

The interviews from which the data was gathered were conducted using a computerised version of the Q-methodology. A tool was specially developed for this purpose.

Traditionally the 48 items would have been placed on 48 cards. The respondent will use those cards to order the 48 items on a games' board. This board looks like Figure 3-3. After the respondent has finished ordering the cards the interviewer has to take down the numbers that are placed on the back of a card. Experience tells that this is a time consuming procedure which does not contribute to the research reliability.

A computer program with which it is possible to collect Q-sorts from respondents was developed. The tool has been tested and proved to be effective and efficient.

The advantages of using a computer to gather the data are three-fold. In the first place, the interviewer does not have to take down the numbers of the cards, therefore, it is quicker to use a computer and no mistakes are made. Also, the additional interview, directed to find motivation for the way the Q-sort is made, can directly be recorded by the computer. Second, it is easier to handle: a laptop can be taken anywhere, whereas a games' board has to be put down on a table. Thirdly it is easier prepare a research project using virtual cards and a virtual board than real cards and a real board.

There is also a disadvantage connected to the use of this computer programme. Some of the respondents stated that they had less feeling with the items because of the 'virtual cards'. Most respondents however, did not complain about a lack of overview in the computer program.

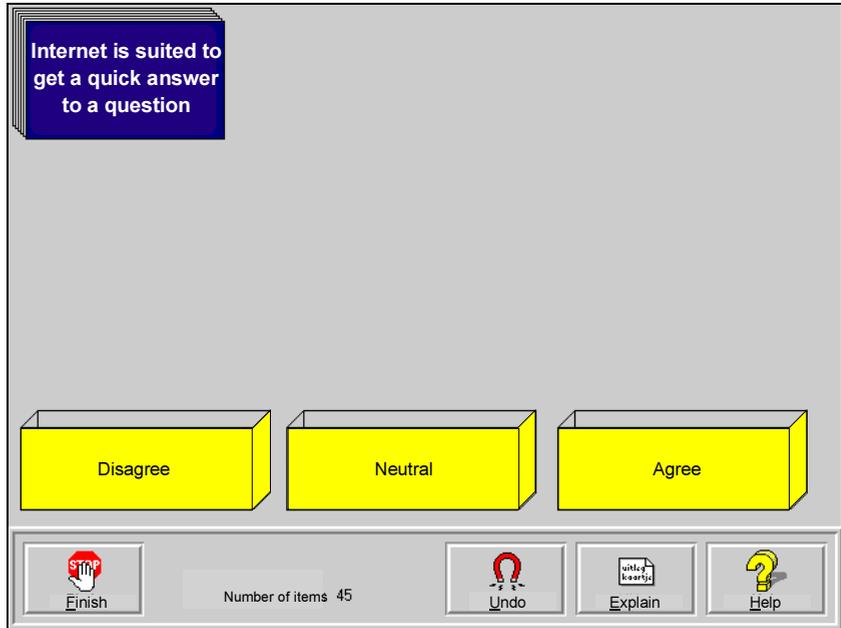
The interviews

The procedure of the interview can be divided in three steps: getting familiar with the cards, division of cards on a nine point scale and an additional interview.

The respondent gets to know the items by reading them and dividing them in three groups ('agree', 'neutral' and 'disagree'). In Figure A-1 the first screen of the programme is shown.

This is the screen where users can click and drag the cards from a pile from the upper left corner to one of the three boxes. All 48 cards are subsequently presented in a random order. Of course the user can go back a step to replace a card when a mistake has been made. Also there are buttons on the screen to get help on cards or on the working of the programme.

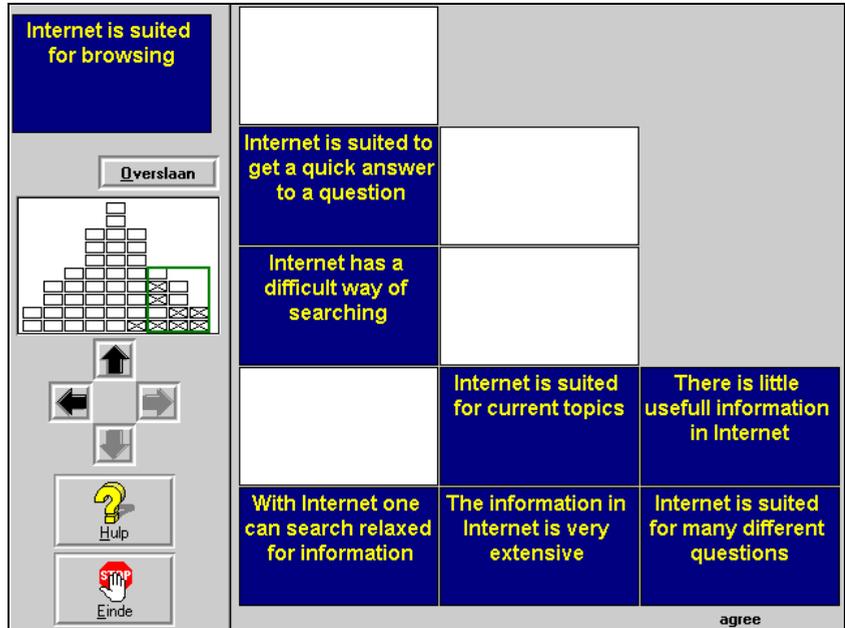
Figure A-1 Getting familiar with the cards



The second step is to divide the items on a 9-point scale. In order to do that first of all the right side of the board has to be filled with cards (see Figure A-2). Initially the cards from the box 'Agree' are shown (on a pile) in the upper left corner. The respondent has to click and drag a card and place it on a position where he or she thinks it is right. The respondent should use the principle: the more to the right the more he or she agrees to an item. Of course cards can be placed and replaced. This is for example necessary when the utmost right side is already full and the respondent gets a card of which he or she agrees even more with. Cards can be 'reshuffled' as often as a respondent thinks this is necessary. The height at which a card is placed does not make a difference. After the 'Agree' side has been finished the program switches to the 'Disagree' side. Finally, the cards in the middle need to be ordered.

When the computer programme was developed, a choice had to be made between the legibility of the cards (particularly character points) and the overview (the degree to which the whole board can be seen at once). Eventually, legibility was preferred over overview. Therefore the board can only be seen for a small part at once. To see another part of the board a respondent has to scroll. To provide the respondent with an idea about 'where he or she is' on the board on the left side of the board a small window was placed. On this window a square indicates where the respondent is on the board.

Figure A-2 The right (agree) side of the scale



Various methods were offered to scroll over the board:

- Scrolling by using the arrow keys on the key board;
- Scrolling by using the arrow keys on the screen;
- Scrolling by means of 'pushing' a card against a 'wall';
- Scrolling by clicking on the place to go on the overview window and
- Scrolling by dragging the square on the overview window.

In an additional interview the respondent can explain why he or she put certain items in the extremes. Also respondents can state whether or not they have missed certain items or had comments on either Q-methodology or the computer program. The interview part was also integrated in the computer programme. Respondents could type in their answer.

A.3 Statistical analysis

A.3.1 Conceptual foundation of factor analysis

Factor analysis is based on the assumption that few factors are responsible for most of the covariation among the observed variables. The objective of factor analysis is to represent a large set of variables in terms of a smaller number of hypothetical variables or factors. Thus, a factor is a hypothesised, unmeasured and underlying variable which is presumed to be the source of the covariation among the observed variables (Kim and Mueller, 1978a). Note that in this study Q-methodology is used. In this type of study the respondents are seen as the variables and the items are seen as the cases. The goal of the analysis in this study therefore is to cluster respondents into a few typical users of a certain medium. Factor analysis can be used for both exploratory and confirmatory study. In this study, factor analysis is used as a means of exploratory study. An unknown number of factors that explain latent relations between variables is the object of analysis. In order to perform factor analysis several steps have to be taken.

- *Computation of a correlation matrix*: in this initial step the correlations between all variables are computed. In this stage it is also possible to see whether the data is appropriate for factor analysis.
- *Extraction of factors*: in this phase the number of factors that adequately describe the data is computed.
- *Rotation*: this phase tries to transform the results of factor extraction in such a way that it is easier to interpret the results.
- *Computation of factor scores*: this final phase computes the scores for each item on a factor. From here it is possible to start interpreting the results.

A.3.2 Correlation matrix

The starting point for factor analysis is to compute the correlation matrix based on Pearson Correlation Coefficient (Pearsons r). In order to test the adequacy of the correlation matrix for factor analysis the Kaiser-Meyer-Olkin (KMO) test is applied. The test provides an index for comparing the magnitudes of the observed correlation coefficients to the magnitudes of the partial correlation coefficients (Norusis, 1993).

Equation A-1 KMO
measure of sampling
adequacy

$$KMO = \frac{\sum_{i \neq j} r_{ij}^2}{\sum_{i \neq j} r_{ij}^2 + \sum_{i \neq j} a_{ij}^2}$$

In this equation r_{ij}^2 stands for the correlation coefficient between i and j and a_{ij}^2 stands for the partial correlation between i and j . If the sum of the squared partial correlation coefficients between all pairs of variables is small when compared to the sum of the squared correlation coefficients, the KMO measure is close to 1. The meaning of the value of KMO test is: <0.60 miserable, $0.60-0.70$ mediocre, $0.70 - 0.80$ middling, $0.80 - 0.90$ meritorious, >0.90 marvellous (Norušis, 1993b).

A.3.3 Factor extraction

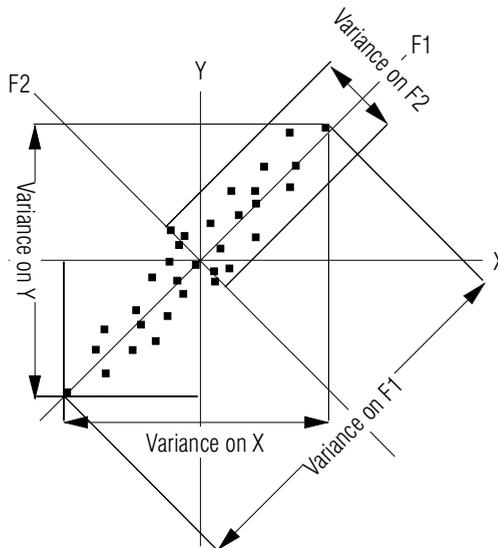
In the phase of factor extraction a given set of observed variables is transferred into another set of variables or factors. Factors are weighed linear combinations of the variables. The main differences between the old and the new set of variables are (Van Knippenberg and Siero, 1980):

- the variance is distributed differently over the factors, whereas the first factor explains most variance, the second factor the second most and so forth and
- the factors are not correlated to each other.

Consider an example in which two variables (X and Y) are correlated.

Together X and Y explain hundred percent of the variance, whereas X alone might explain fifty percent of the variance as does Y alone. See Figure A-3.

Figure A-3 The distribution of variance over variables and factors



If the first principal component (F1) is drawn, it might explain ninety percent of the variance. The second principal component (F2) is (by definition) placed perpendicular on the first principal component,

explaining the remaining ten percent of the variance. By drawing a principal component, what is gained, is that only one variable is needed to explain most of the variance.

The used method for factor extraction in this study is principal component analysis. Principal components are linear combinations of observed variables which are orthogonal to each other. Furthermore, the first principal component represents the largest amount of variance in the data, the second component represents the largest amount of variance in the residual variance (Kim and Mueller, 1978a). For a detailed description of how factor extraction is computed see Kim and Mueller (1978b).

Factor matrix

The result of the extraction of factors is a factor matrix. The factor matrix is a matrix of coefficients where the columns refer to common factors and the rows to the observed variables (i.e. respondents). Elements of the factor matrix represent regression weights for the common factors where an observed variable is assumed to be a linear combination of the factors (Kim and Mueller, 1978b). In other words, the factor matrix represents the correlations between the old variables with the new factors.

Communality

In this matrix of factor loadings also the communality (h^2) is introduced. Communality is the variance of an observed variable accounted for by common factors. In an orthogonal factor model, communality is the sum of the squared factor loadings. Communality of a variable is given by the sum of squares of the factor loadings (Harman, 1960). Communality is used to see if one or more variables that do not contribute to the factor model (i.e. have a very low communality) should not be included in the factor analysis.

Deciding the number of factors

In factor analysis, in principle, there are as many factors as there are variables. Together, all factors explain hundred percent of the variance. The goal of factor analysis however, is to reduce the number of factors needed to explain most of the variance. Furthermore, the first factor explains most variance, the second one the second most, and so forth. Knowing this it is necessary to draw a line between the factors that will be used for further analysis and factors that will not be used for further analysis and interpretation. The criteria to set such a line are (to say the least) vague. There is no one vast criterion that can be employed. In most literature it is recommended to combine several criteria to judge how many factors should be used for further analysis. In this study a combination of two criteria will be used: the eigenvalue > 1 criterion and the scree plot criterion. Note that the two criteria are not necessarily in conflict with each other.

Eigenvalue > 1

The eigenvalue > 1 is used as a criterion for determining the number of factors to extract (Kim and Mueller, 1978b). This means that only factors that contribute more than an original variable would do, are retained. Although this is a very clear-cut criterion it is also a very rigid criterion. The problem could for instance be that the eigenvalue of a factor is 1.1 and 0.9

for the following factor. If only the eigenvalue criterion would be used the first factor would be used and the second one would not be used for further analysis, although the difference in explained variance is minimal.

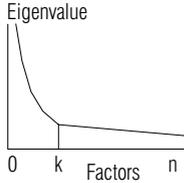


Figure A-4 Scree Plot

The scree-test is a rule-of-thumb criterion for determining the number of significant factors to retain; it is based on the graph of eigenvalues. Ideally the scree plot looks like Figure A-4. The plot starts out in a curvilinear fashion and then becomes linear. The name 'scree' is derived from the shape of the plot: it looks like the slopes of a mountain with a lot of debris at the foot of the mountain. The slopes are considered to represent the relevant factors and the scree (starting at k) represents the debris (Cattell, 1966). The idea is to only retain factors that actually belong to the 'mountain'. The scree should not be taken into account. The question now is: where does the mountain stop and where does the scree begin? Usually, the place where the curve bends most strongly is the point that is taken. For interpretation of the number of factors that are taken into account see Figure A-4 (TSN), Figure A-5 (Teletext), Figure A-6 (Off-line), Figure A-7 (Videotex) and Figure A-8 (Internet).

A.3.4 Rotation

In the phase of factor extraction the sole goal was to explain as much variance as possible in the first factor, as much as possible from the remaining variance for the second factor and so forth. This approach however, does not necessarily lead to a result which can be interpreted easily. It is highly possible that a variable loads high on the first factor but still loads high on the second factor too. The goal of rotation is to get a factor solution which is easier to interpret. The process of rotation results in a factor matrix in which (Knippenberg et al., 1980):

- some variables (i.e. respondents) load as high as possible on one factor, while their loading on other factors is as low as possible and
- the rest of the variables load as low as possible on that factor.

Note that, after rotation, the total amount of explained variance does not change. The variance is merely distributed differently over the separate factors. This also explains why first a certain number of factors is chosen and then the rotation is performed. Otherwise, the variance would again be distributed over all factors and nothing would have been gained.

The used method for rotation in this study is Varimax rotation. This is a method of orthogonal rotation which simplifies the factor structure by maximising the variance of a column of the pattern matrix (Kim and Mueller, 1978b). In orthogonal rotation methods the angle between two factors remains ninety degrees. To compute the direction and degree of rotation extensive knowledge of algebra is needed. For a further description see Mulaik (1972). The result of the rotation process is a factor

transformation matrix. This matrix is multiplied with the unrotated factor matrix, resulting in the rotated factor matrix.

A.3.5 Computation of factor scores

The last step in factor analysis is the computation of z-scores for each case (i.e. item). Up to now only the factor structure has been examined. Now, it is time to look at how factors are related to the cases (i.e. items) in the study. In other words, which items score extreme on which factors? This question can be answered by using Equation A-2. For item k , the score for the j th factor is computed as:

Equation A-2
Computation of factor
scores

$$\hat{F}_{jk} = \sum_{i=1}^p W_{ji} X_{ik}$$

In this equation, X_{ik} is the standardised value of the i th respondent for item k . W_{ji} is the factor score coefficient for the j th factor and the i th item. Now all that remains to be done is to interpret the most extreme scores. These are the cases (i.e. items) that characterise the dimension. Factor scores of extreme scoring items can be found in Appendix A.4.1 Table A-3, for Telephone Service Numbers, Table A-5 for Teletext, Table A-7 for off-line media, Table A-9 for Videotex and Table A-11 for Internet.

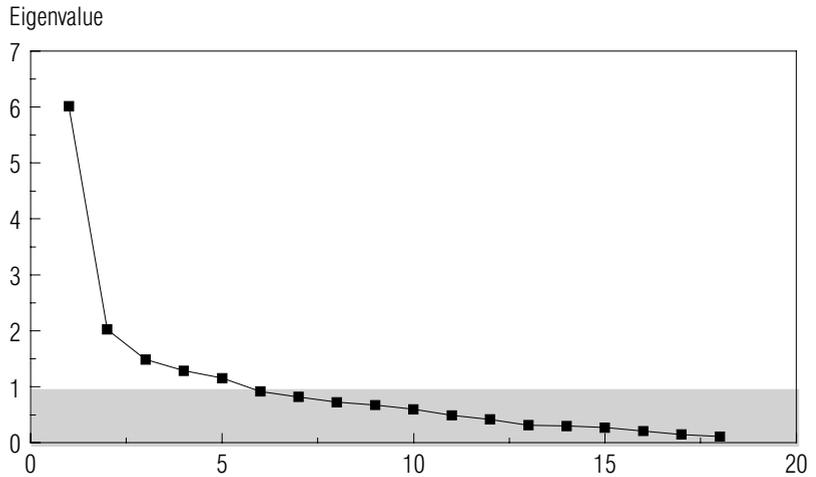
A.4 Factor Analysis

A.4.1 Telephone Service Numbers

Table A-2 Final statistics

	Communality	Eigenvalue	Pct of Var	Cum Pct
1	0.64642	6.01630	33.4	33.4
2	0.70008	2.02934	11.3	44.7
3	0.76542	1.49068	8.3	53.0
4	0.69971	1.28985	7.2	60.1
5	0.75370	1.15686	6.4	66.6

Figure A-4 Scree plot



The first two factors are used for further analysis. Together they explain 44 percent of the variance, a rather limited amount of explained variance. Although the factors 3 through 6 do have an Eigenvalue > 1 they are not included in further because their additional value is limited.

Table A-3 Extreme Z-scores

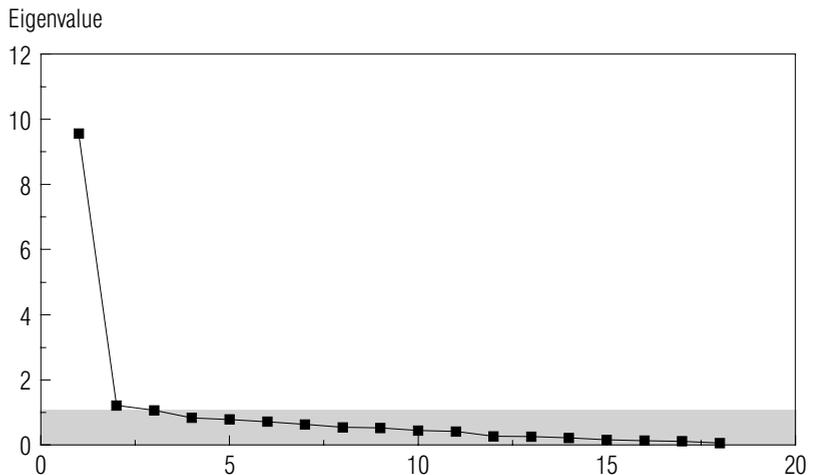
Nr	Item	Factor I	Factor II
7	Users of Audiotex need a lot of experience	-1.332	-1.773
8	Users of Audiotex have a high education	-0.235	-1.594
11	Audiotex is suited for info on weather and traffic	1.307	1.360
15	Audiotex is suited for pink services	1.323	0.227
17	Audiotex is suited for simple questions	1.198	1.421
18	Audiotex is suited for live issues	1.409	1.479
22	Audiotex is suited for browsing	-2.499	1.318
38	Audiotex is too slow	2.032	-1.889
40	With Audiotex one can search relaxed	-2.088	0.720
44	Everybody has easy access to Audiotex	2.824	-0.551
46	The costs of purchase for Audiotex are very high	-1.622	-0.640
48	Audiotex is an outdated system	0.804	-1.741

A.4.2 Teletext

Table A-4 Final statistics

	Communality	Eigenvalue	Pct of Var	Cum Pct
1	0.67648	9.55744	53.1	53.1
2	0.75463	1.21677	6.8	59.9
3	0.78943	1.06527	5.9	65.8

Figure A-5 Scree plot



Only the first factor is used for further analysis. This factor explains 53.1 percent of the total variance. Because the eigenvalue of the second and third factor is only a fraction over one, they will not be included.

Table A-5 Extreme
Z-scores

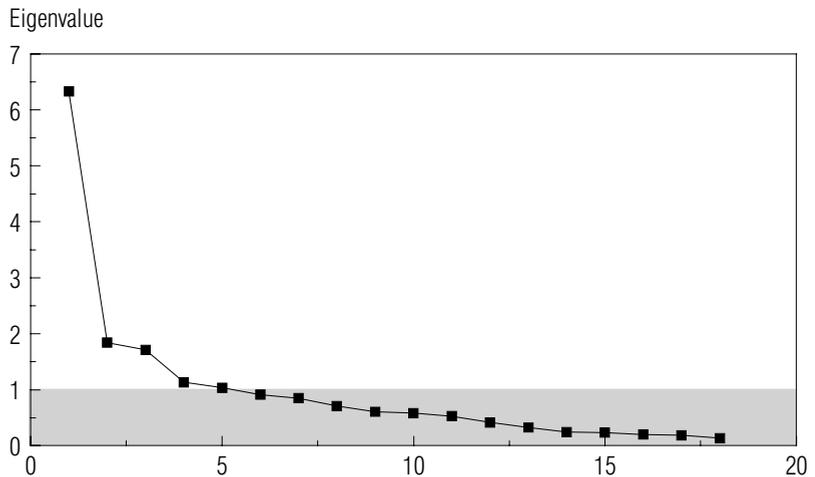
Nr	Item	Factor I
11	Teletext is suited for info on weather and traffic	1.822
13	Teletext is suited for news and sports	2.082
16	Teletext is suited for RTV and cultural information	1.412
29	The information in Teletext is very expensive	-2.050
41	Teletext is not suited for transactions	1.275
43	There are little users of Teletext	-1.467
45	The info in Teletext can j.a.w. be provided off-line	-1.746
46	The costs of purchase for Teletext are very high	-1.733

A.4.3 Off-line media

Table A-6 Final statistics

	Communality	Eigenvalue	Pct of Var	Cum Pct
1	0.85379	6.33286	35.2	35.2
2	0.78088	1.84543	10.3	45.4
3	0.73262	1.71348	9.5	55.0
4	0.76942	1.13224	6.3	61.2
5	0.63157	1.03805	5.8	67.0

Figure A-6 Scree plot



The first three factors are included in further analysis. The scree plot shows that these are the three factors that contribute significantly to the explained variance.

Table A-7 Extreme
Z-scores

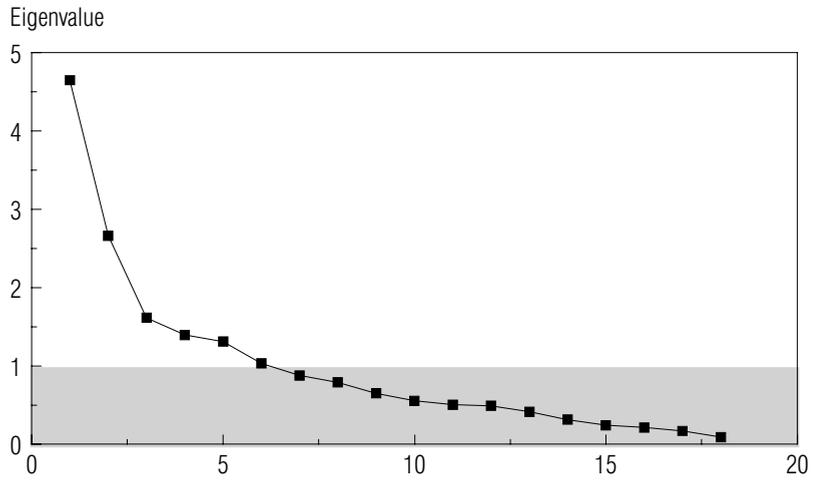
Nr	Item	Factor I	Factor II	Factor III
1	Users of Off-line media are mainly men	1.590	-1.962	0.846
3	Users of Off-line media like to work with computers	1.259	-0.158	-1.511
7	Users of Off-line media need a lot of experience	0.401	-0.684	-2.519
8	Users of Off-line media have a high education	-0.184	-1.577	1.025
11	Off-line media are suited for info on weather & traff	-2.372	-0.141	-1.013
13	Off-line media is suited for news and sports	-1.873	-0.050	-1.477
17	Off-line media is suited for simple questions	0.515	-0.070	1.269
18	Off-line media is suited for live issues	-1.469	0.121	-2.122
25	The information in Off-line media is very extensive	-0.242	1.608	-0.621
26	The info in Off-line media is nicely presented	-0.179	0.831	1.256
28	The info in Off-line media is nowhere else available	-1.681	-0.565	-0.777
29	The information in Off-line media is very expensive	-1.167	-1.273	1.729
31	The info in Off-line media is sometimes outdated	1.500	-0.301	0.753
35	Off-line media has a handy way of searching	-1.011	1.316	1.229
38	Off-line media is too slow	0.450	-1.934	0.481
40	with Off-line media one can search relaxed	1.473	1.289	-0.193
41	Off-line media is not suited for transactions	1.948	-0.508	-0.042
42	Off-line media is not suited for communication	2.427	-0.274	-1.781
43	There are little users of Off-line media	-1.125	0.474	1.732
47	The is a lot of information in Off-line media	0.580	1.872	0.381
48	Off-line media is an outdated system	-0.601	-2.158	0.598

A.4.4 Videotex

Table A-8 Final statistics

	Communality	Eigenvalue	Pct of var	Cum Pct
1	0.80820	4.64945	25.8	25.8
2	0.70778	2.66254	14.8	40.6
3	0.69566	1.61503	9.0	49.6
4	0.42749	1.39718	7.8	57.4
5	0.70383	1.31208	7.3	64.6
6	0.71515	1.03297	5.7	70.4

Figure A-7 Scree plot



Videotex was the hardest service to determine the number of relevant factors. Three factors have been chosen because this seems to provide an optimal choice between the number of factors needed and the amount of variance explained.

Table A-9 Extreme
Z-scores

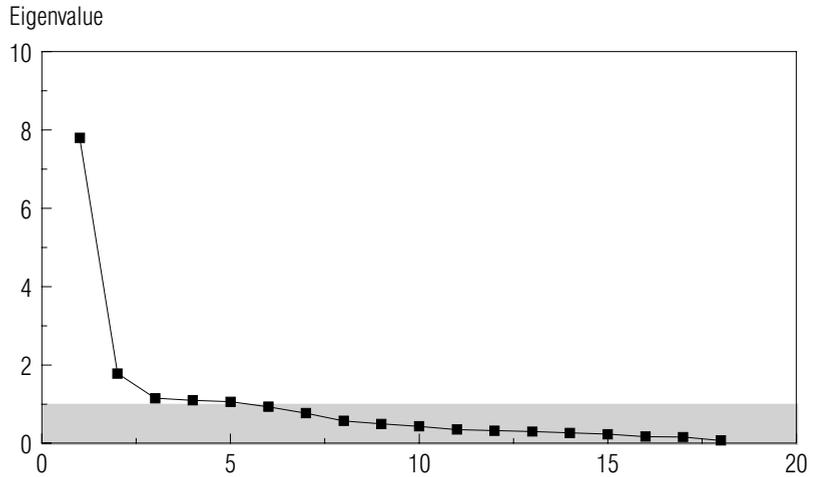
Nr	Item	Factor I	Factor II	Factor III
4	Users of Videotex have the time to themselves	0.694	-1.580	0.38173
6	Users of Videotex have a lot of money available	-0.102	-0.572	-1.30531
7	Users of Videotex need a lot of experience	1.538	-1.217	-1.29948
8	Users of Videotex have a high education	0.504	0.494	-1.70695
10	Videotex is suited for financial information	1.484	0.411	0.41401
13	Videotex is suited for news and sports	-0.795	0.814	1.54719
15	Videotex is suited for pink services	0.816	-2.074	0.59452
18	Videotex is suited for live issues	0.525	0.191	1.90026
23	Videotex is suited for many different issues	0.757	-0.199	1.55842
24	Videotex is suited for general issues	0.067	1.497	-1.05388
26	The information in Videotex is nicely presented	-2.676	-0.305	-0.73865
28	The info in Videotex is nowhere else available	-1.269	-1.697	-1.17504
34	Videotex has a clear way of searching	-1.962	1.724	-0.14022
35	Videotex has a handy way of searching	-1.830	1.064	-0.21739
36	Videotex often crashes	0.382	-1.538	-0.89415
38	Videotex is too slow	1.262	2.308	-0.31707
40	With Videotex one can search relaxed	-0.304	-0.144	1.44188
41	Videotex is not suited for transactions	-1.636	-0.500	-1.22826
43	There are little users of Videotex	1.308	1.451	-0.30291
45	The info in vtx can j.a.w. be provided Off-line	-0.946	1.044	-2.06161
46	The costs of purchase for Videotex are very high	1.372	-1.271	-1.62914
48	Videotex is an outdated system	1.508	1.349	-0.99458

A.4.5 Internet

Table A-10 Final
statistics

	Communality	Eigenvalue	Pct of var	Cum Pct
1	0.77898	7.80076	43.3	43.3
2	0.63574	1.78502	9.9	53.3
3	0.79656	1.15127	6.4	59.7
4	0.64736	1.09686	6.1	65.7
5	0.62942	1.06576	5.9	71.7

Figure A-8 Scree plot



For the Internet data two factors have been chosen because the scree plot shows the sharpest bend after the second factor.

Table A-11 Extreme Z-scores

Nr	Item	Factor I	Factor II
7	Users of Internet need a lot of experience	1.324	-1.361
12	Internet is suited for commercial purposes	0.783	-1.727
18	Internet is suited for live issues	0.316	1.495
19	Internet is suited to get a quick answer to a question	-0.773	2.194
22	Internet is suited for browsing	1.845	0.208
23	Internet is suited for many different issues	1.418	1.335
33	Internet has a difficult way of searching	1.946	-0.999
34	Internet has a clear way of searching	-1.807	0.771
35	Internet has a handy way of searching	-1.510	0.677
36	Internet often crashes	0.965	-1.580
42	Internet is not suited for communication	-1.725	-1.999
43	There are little users of Internet	0.098	-1.940
45	The info in Internet can j.a.w. be provided Off-line	-1.836	-0.536
47	There is a lot of information in Internet	1.170	1.792

A.5 Comparison of media

These tables provide an overview of the factor scores for all factors for all media. Only the items that scored extremely - either positive (i.e. agree) or negative (i.e. disagree) - are included. Items are clustered to task characteristics and (user) context characteristics.

Within task and (user) context characteristics, smaller clusters of items are distinguished. For task characteristics topicality, interaction and uniqueness are distinguished. For (user) context characteristics several forms of accessibility are distinguished: physical, financial, cognitive and affective accessibility.

Task - Medium combination	Medium Factor	Atx		TT		Off-line			Videotex			Internet	
		I	II	I	I	II	III	I	II	III	I	II	
11 ... is suited for info on weather and traffic		1.3	1.4	1.8	-2.4	-0.1	-1.0	0.4	0.9	1.2	-0.3	0.5	
13 ... is suited for news and sports		1.0	0.9	2.1	-1.9	0.0	-1.5	-0.8	0.8	1.5	0.9	0.3	
18 ... is suited for live issues		1.4	1.5	1.0	-1.5	0.1	-2.1	0.5	0.2	1.9	0.3	1.5	
45 The info in ... can be provided off-line		-0.4	-0.5	-1.7	-1.0	-1.0	0.5	-0.9	1.0	-2.1	-1.8	-5	

Task - Medium combination	Medium Factor	Atx		TT		Off-line			Videotex			Internet	
		I	II	I	I	II	III	I	II	III	I	II	
41 ... is not suited for transactions		-0.9	-1.1	1.3	1.9	-0.5	0.0	-1.6	-0.5	-1.2	-0.8	-0.3	
42 ... is not suited for communication		0.3	-1.0	1.2	2.4	-0.3	-1.8	-0.7	0.5	-1.0	-1.7	-2.0	

Task - Medium combination	Medium Factor	Atx		TT		Off-line			Videotex			Internet	
		I	II	I	I	II	III	I	II	III	I	II	
17 ... is suited for simple questions		1.2	1.4	1.1	0.5	-0.1	1.3	0.8	0.5	1.1	0.4	1.0	
22 ... is suited for browsing		-2.5	1.3	0.7	0.9	0.7	0.9	-1.4	1.1	0.0	1.8	0.2	
28 The info in ... is nowhere else available		-0.6	-1.1	-1.1	-1.7	-0.6	-0.8	-1.3	-1.7	-1.2	-1.4	-0.4	
40 with ... one can search relaxed		-2.1	0.7	1.2	1.5	1.3	-0.2	-0.3	-0.1	1.4	0.1	1.3	
47 The is a lot of information in ...		0.4	0.9	0.8	0.6	1.9	0.4	0.0	0.3	1.0	1.2	1.8	

Table A-12 Comparison
of services for task
characteristics

User - Medium combination		Medium	Atx		TT		Off-line			Videotex			Internet	
Physical accessibility		Factor	I	II	I	I	II	III	I	II	III	I	II	
43	There are little users of ...	-0.7	-0.8	-1.5	-1.1	0.5	1.7	1.3	1.5	-0.3	0.1	-1.9		
44	Everybody has easy access to ...	2.8	-0.6	1.3	-1.1	1.3	-0.9	-0.6	-1.1	0.4	-1.2	-0.3		

User - Medium combination		Medium	Atx		TT		Off-line			Videotex			Internet	
Financial accessibility		Factor	I	II	I	I	II	III	I	II	III	I	II	
6	Users of ... have a lot of money available	-1.0	-1.0	-1.2	-1.0	-0.1	0.6	-0.1	-0.6	-1.3	-0.5	-1.3		
29	The information in ... is very expensive	0.2	-0.6	-2.0	-1.2	-1.3	1.7	0.7	0.7	-0.8	-0.2	-1.1		
46	The costs of purchase for ... are very high	-1.6	-0.6	-1.7	-0.4	-1.4	0.9	1.4	-1.3	-1.6	0.1	-1.0		

User - Medium combination		Medium	Atx		TT		Off-line			Videotex			Internet	
Cognitive accessibility		Factor	I	II	I	I	II	III	I	II	III	I	II	
7	Users of ... need a lot of experience	-1.3	-1.8	-1.2	0.4	-0.7	-2.5	1.5	-1.2	-1.3	1.3	-1.4		
33	... has a difficult way of searching	0.6	-1.4	-0.6	0.2	-1.2	-1.1	0.9	-1.2	-0.6	1.9	-1.0		
35	... has a handy way of searching	-1.0	1.0	-0.1	-1.0	1.3	1.2	-1.8	1.1	-0.2	-1.5	0.7		

User - Medium combination		Medium	Atx		TT		Off-line			Videotex			Internet	
Affective accessibility		Factor	I	II	I	I	II	III	I	II	III	I	II	
36	... often crashes	-1.2	0.1	-0.5	-0.9	-1.4	0.4	0.4	-1.5	-0.9	1.0	-1.6		
38	... is too slow	2.0	-1.9	0.5	0.5	-1.9	0.5	1.3	2.3	-0.3	0.5	-1.0		
48	... is an outdated system	0.8	-1.7	-0.2	-0.6	-2.2	0.6	1.5	1.3	-1.0	-0.4	-0.8		

User - Medium combination		Medium	Atx		TT		Off-line			Videotex			Internet	
(user) context characteristics		Factor	I	II	I	I	II	III	I	II	III	I	II	
1	Users of ... are mainly men	0.1	-1.0	-0.6	1.6	-2.0	0.8	0.8	0.4	-1.0	1.2	-0.7		
8	Users of ... have a high education	-0.2	-1.6	-1.2	-0.2	-1.6	1.0	0.5	0.5	-1.7	0.9	0.2		

Table A-13 Comparison of services for (user) context characteristics

Appendix **B**

Appendix B
Policy capturing

B.1 Statistical analysis

Statistically, this research design is rather complicated. There are many independent (or predictor) variables and the dependent (or criterion) variable is of a nominal level. Several statistical methods to analyse the data were used. Each method provides partial insight into the data. Together these methods should provide a complete image. Three levels of analysis are distinguished: univariate, bivariate and multivariate.

B.1.1 Descriptive statistics: univariate analysis

A first step in obtaining insight into the data is to run frequencies. It is a very simple method to get some idea of what the data looks like. Also, some of the data entry and coding errors can be found that way.

The most powerful tool for descriptive statistics are simple bar charts and frequency tables. Insight in the distribution of observations can be obtained at a glance.

Statistics are not widely available for univariate analysis: measures of central tendency that can be used on nominal level is the modus, on the ordinal level the median and on the ratio and interval level mean can be used. As a measure of dispersion minimum, maximum and range can be used on the ordinal level. At ratio and interval level variance and standard deviation is used.

B.1.2 Hierarchical cluster analysis

Another technique that is used to describe the data is cluster analysis. Cluster analysis is a statistical technique that tries to identify homogenous groups or clusters. This technique will be used to identify which media cluster together based on the functions of the media. The two key concepts in cluster analysis are distances (or similarities) and the forming of clusters. These two concepts will now be discussed shortly.

Several techniques exist to measure distances and similarities between cases. In this research the squared Euclidean distance technique is used as a measure of distance. Here, the distance between two cases is the sum of the squared differences between the values of the cases. If all variables are measured on the same scale the squared Euclidean distance can be used without any objections. The squared Euclidean distance is a common method to measure distance for data on the interval level.

Besides several methods to measure distance, a choice also has to be made for a method of forming clusters. In this research hierarchical clustering is used. This means that once a cluster has been formed it cannot be taken apart anymore. The clustering technique which is used is called furthest neighbour or complete linkage. In this method the distance

between two clusters is taken to be the distance between their two closets points.

B.1.3 Measures of correlation: bivariate analysis

An important tool in analysis of correlation of nominal and ordinal data are (cross)tables. Measures that provide insight into the degree of correlation are Chi-square, Phi and Cramers' V on the nominal level and Lambda, Gamma and Tau b on the ordinal level.

B.1.4 Variance explained: multivariate analysis

Up to now only one or two variables at a time were analysed. Now, multivariate analysis is used to explain the variance in a dependent variable (media choice) while using several predictor variables. In this a method for data analysis that provides the opportunity to look at the effects that several variables have on media choice is presented. In Ordinary Least Square (OLS) regression analysis the following model is used:

Equation B-1

$$C = b_0 + b_1X_1 + b_2X_2 + \dots + b_kX_k$$

where C is the choice for a certain medium and X_1 through X_k predictors of C and b_1 through b_k are the regression coefficients that represent the weight that should be put on each of the predictors, b_0 is the constant in the equation. OLS regression is an obvious method of analysis if a dependent variable (such as media choice) is to be predicted from several independent variables (such as topicality, uniqueness etcetera). However, OLS regression cannot be used in this research. The reason is that C , choice, is not measured on a ratio or interval scale. In this research choice is binary: either a medium is chosen, or it is not. As was stated before, the question could have been 'To what degree do you find medium X suitable to answer this question'. However, this would still have led to a variable measured on the ordinal level.

Consequently, OLS regression can not be used. Instead, logistic regression will be used. This is a method of analysis which is very similar to OLS, but does allow a binary dependent variable. In logistic regression, basically the same type of model is used as in simple regression: a dependent variable is explained by several predictors. The difference however is that the dependent variable is binary. In this case the dependent variable is defined as: the respondent chooses medium X (1) or chooses one of the other media (0).

In logistic regression the probability for a certain value of the dependent variable is predicted, based on the predictor variables. When the probability is > 0.5 the prediction that medium X is chosen will be made. If the

probability is < 0.5 the prediction that another medium is chosen is made. In logistic regression, the probability that an event will occur is predicted from:

Equation B-2

$$\text{Prob (event)} = \frac{e^z}{1+e^z}$$

In Equation B-2, e is the base of the natural logarithm and $z = b_0 + b_1X_1 + b_2X_2 + b_kX_k$ where, X_1 through X_k are the predictor variables, b_0 is a constant and b_1 through b_k the weights that should be put on each of the predictors.

The parameters

The way in which the parameters are estimated is another difference between OLS regression and logistic regression. In OLS regression the parameters are computed, based on the least square method. In logistic regression, the maximum likelihood method is used. Maximum likelihood attempts to estimate the values of the parameters that would result in the highest likelihood of observing the data actually observed. The method requires an iterative algorithm to estimate the parameters. For a detailed description of this method see Menard (1995).

In logistic regression the parameters are estimated based on a measure called -2 Log Likelihood. This is a measure of how well the model fits the data. The smaller the value the better the fit. -2 Log Likelihood is the criterion for selecting parameters in the logistic model and is computed several times. The initial -2 Log Likelihood represents the fit of the model when only a constant is included. Then a predictor is added and again -2 Log Likelihood is estimated.

Goodness of fit

To see how well the estimated model fits your data, OLS regression uses R square as a measure of the goodness-of-fit of a linear model. It is the proportion of variation in the dependent variable explained by the regression model. It ranges in value from 0 to 1. Small values indicate that the model does not fit the data well. In comparison to OLS regressions R^2 a measure of the effect of adding predictors is needed. Of course R^2 can not be used. Instead pseudo R or likelihood ratio index (Equation B-3), is used. This measure indicates the accuracy with which the model approximates the observed data (Maddala, 1983).

Equation B-3

$$\text{PseudoR} = \frac{\text{Likelihood Ratio Index} = \frac{(\text{Initial} - 2\text{LL}) - (\text{Final} - 2\text{LL})}{(\text{Initial} - 2\text{LL})} = 1 - \frac{\text{Final} - 2\text{LL}}{\text{Initial} - 2\text{LL}}}$$

Interpretation of parameters

In order to test whether a parameter contributes significantly to the model the Wald statistic can be computed. The Wald statistic is the square of the ratio of the coefficient to its standard error. See Equation B-4.

Equation B-4

$$\text{Wald} = \left(\frac{b}{s.e.} \right)^2$$

For variables with one degree of freedom, the Wald statistic has a chi-square distribution so that the significance level can be found. The Wald statistic has one disadvantage. When the absolute value of the regression coefficient becomes large, the estimated standard error is too large. This produces a Wald statistic that is too small and fails to reject the null hypotheses, when in fact, it should. This is a error of type β (H_1 is true but H_0 is maintained). Before interpreting the results of statistical analysis, this should be checked (Norusis, 1997).

Based on the Wald statistic it is possible to compute how much a variable contributes to the model. The following statistic is used:

Equation B-5

$$R = \pm \sqrt{\frac{(\text{Wald statistic} - 2k)}{-2 \text{ Initial Log Likelihood}}}$$

In this equation k is the number of degrees of freedom for the variable. The larger the value of R the more a variable contributes to the model. A positive value indicates that as the variable increases in value, so does the likelihood of the event occurring. If R is negative, the opposite is true.

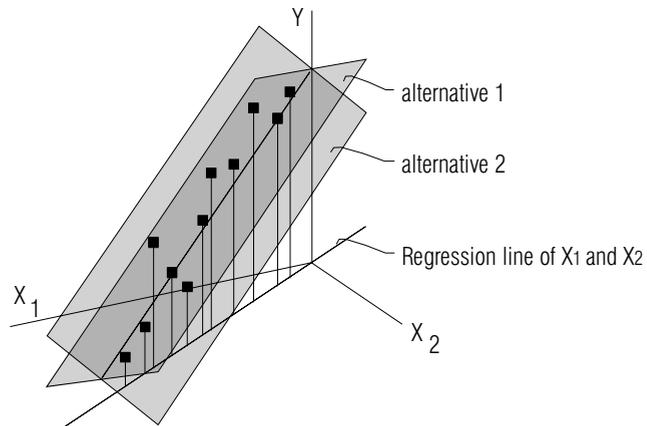
Further interpretation of the parameters regards the direction of the correlation. A positive parameter indicates a positive relation: higher values of the independent variable lead to higher values of the dependent variable, in this case, an increased probability for a medium to be chosen. The other way around: a negative parameter indicates that a higher value of the independent variable leads to a decreased probability for a medium to be chosen.

The last step in interpretation of the parameters is to look at the value of the parameter. For logistic regression this is not as straightforward as is the case with OLS regression. In OLS regression a change of one unit in the independent variable X_k indicates a change of b_k units for the dependent variable. The same inference is not true for logistic regression. The change in the dependent variable is different, for different values of the independent variable. The only possibility to say something about the size of the effect is by actually computing the probability for one or more combinations of values of independent variables. This will not be done in this research. The number of possible combinations of values of predictor variables is so large that interpretation would become a drudgery and too complicated for meaningful results. The interpretation is limited to a qualification in terms of a positive or negative relationship and the contribution of a variable to the model.

Multicollinearity

A problem in both linear and logistic regression is multicollinearity. Multicollinearity emerges when two (or more) prediction variables strongly correlate. To illustrate this, consider the fictional data in the Figure B-1. In this picture, X_1 and X_2 correlate perfectly: All cases are on the regression line of X_1 and X_2 . If a plane following $Y = b_0 + b_1X_1 + b_2X_2$ has to be drawn, no solution can be found: the coefficients are not uniquely defined or in other words, there is an infinite number of equally well solutions for b_1 and b_2 (Fox, 1991, p. 11). In Figure B-1 alternative 1 is just as good as alternative 2 or any other plane.

Figure B-1 The problem of multicollinearity



Consequently, it is not possible to give a solution when X_1 and X_2 are correlated perfectly. In a way, the problem gets worse when the relation between X_1 and X_2 is very strong (but not perfect). The coefficients can be computed, but they become unstable. Small changes in the data can cause can change the value of coefficients substantially. One exceptional case can cause the plane (and thus the coefficients) to change substantially.

Multicollinearity can easily be detected by running correlations among the predictor variables. When correlation is very strong (for example $R > 0.95$) one has to be careful. This makes multicollinearity a rather marginal problem: an R of 0.95 hardly ever emerges in social sciences. Even if it does, the solution is quite simple: As X_1 and X_2 seem to measure the same thing (-almost- perfect correlation) one of the two predictors can be omitted from analysis.

Outlying and influential data

Outlying data may mean that a relation is not found, even though it is present or a relation is found where it should not be. Two measures are

used as diagnostics for outlying and influential data. In B-2 several examples of outlying and influential data are provided.

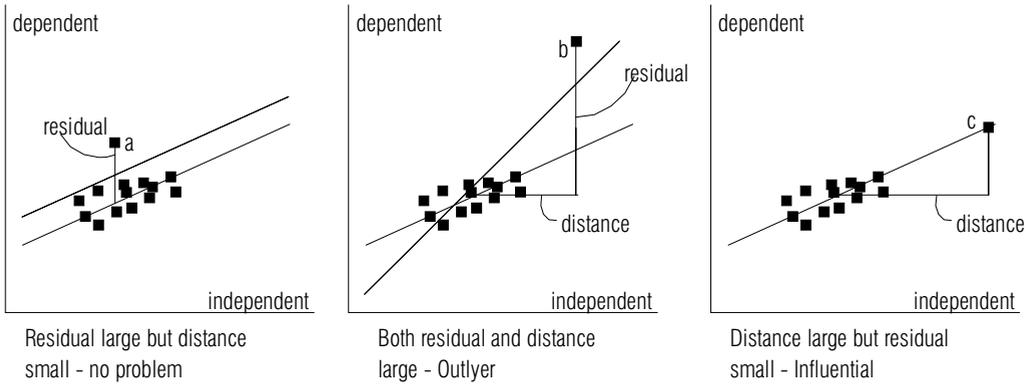


Figure B-2 Outlying and influential data

Point a represents a case that has a large residual. The score on the independent variable is not exceptional but in combination with the score on the dependent variable, this case is exceptional. The consequences for the fit of the model are limited. Only the constant is increased a little bit. Case b shows a case that is a true outlier. Both the value of the independent and dependent variable is exceptional. The consequence is that the parameters change drastically. Case c is a leverage point. It also has exceptional values but now the values are in line with the rest of the data. The case has no special influence on the parameters. In order to measure residual Cooks D is used. It measures how much the residuals of all cases would change if a particular case were excluded from the calculation of the regression coefficients. A large Cook's D indicates that excluding a case from computation of the regression statistics, changes the coefficients substantially. The relative influence of each observation of the model's fit is the leverage value. By plotting Cooks D and leverage against case number outlying and influential data can be found. This will be done in analysis.

Multilevel data

In social sciences, data often show a hierarchy or clustered structure. In organisational studies for example, a researcher might investigate how workplace characteristics, such as centralisation of decision making, influence worker productivity within a specific workplace. Both workers and firms are units in the analysis; variables are measured on both levels. Such data has a hierarchical structure with individual workers nested within firms (Bryk and Raudenbush, 1992).

In this research two levels can also be distinguished. Because each respondent chose media for ten different information needs a hierarchical structure emerges. On the first and lowest level, choices depend on

characteristics of the need, such as context and topicality. On the second and highest level choices depend on characteristics of the respondent, such as experience with a medium and sex. Within one respondent the probability for certain media to be chosen over others is higher than if all cases were independent from each other (Goldstein, 1995).

The solution to this problem is to perform logistic regression while correcting for the effects of the two levels. In order to explain how this correction takes place, consider the simple regression equation in Equation B-6.

Equation B-6
$$Y_i = b_0 + b_1 X_i + e_i$$

In this equation b_0 is the intercept, b_1 is the slope and e_i is the residual. In this research X_i would characterise the information need. However, the choice for a certain medium not only depends on the need for information, but also on differences between users on the second level. To describe simultaneously the relationship between need and choice for several respondents, the regression equation can be written as Equation B-7.

Equation B-7
$$Y_{ij} = b_{0j} + b_{1j} X_{ij} + e_{ij}$$

In this equation i refers to the level of information need and j to the level of the respondents. In this model, for each value of j a separate equation can be made. If there were only two or three respondents it would be possible to compute the slopes for each equation. However, over 500 respondents took part in this research. Hence, over 500 parameters would have to be estimated. Consequently, another solution is needed. In order to develop a genuine two level model b_{0j} and b_{1j} are replaced by Equation B-8.

Equation B-8
$$b_{0j} = b_0 + u_{0j} \text{ and } b_{1j} = b_1 + u_{1j}$$

Here, b_0 and b_1 are the average parameters and u_{0j} and u_{1j} are random variables with parameters for each of the levels the respondent variable (Goldstein, 1995). Software called VARCL (VARiance Component analysis by maximum Likelihood) can be used. This software is written by Longman in the beginning of the nineties (Longford, 1993). This software can perform multilevel analysis for data with a binary dependent variable. VARCL employs the Fisher scoring algorithm for multilevel logistic analysis. Although the program allows up to nine levels of nesting, in this research only two levels are used: that of the information need and that of the respondent.

B.2 Research design

The following three tables contain information about the cases that are used in this research. Table B-1 contains a short description of all cases and their characteristics. Table B-2 contains all cases as they were presented to respondents. Table B-3 contains an overview of similarities between cases.

Topicality and Interaction	Uniqueness and context			
	unique home	unique university	general university	general home
topical trans/com	-	-	-	-
stable trans/com	1a. Order brochure on scholarship from home 1b. Talk to expert on scholarship	2a. Order brochure on scholarship from university 2b. Talk to expert from big company on internship	-	-
stable info	3a. Your grandmother wants to know train departure for difficult question from home 3b. Find picture of old aeroplane for nephew from home 3c. Need general information on scholarship 3d. Telephone number of friend who has moved away	4a. Find book which is not available at own university 4b. Find picture of old airline from university 4c. Find information on big company's for internship 4d. Difficult question on train departure from university	5a. Find book while at university 5b. Find translation of word 5c. Find telephone number of friend while at university	6a. Grandma wants to know easy train question from home 6b. Find telephone number of friend while at home 6c. Find recipe for dinner
topical info	7a. Train departure while at home and cable broken 7b. Find information on terrorist attack while family on holiday there	8a. Train departure while at university and cable broken 8b. Track down news on revolutionary new invention	9a. Find weather while at university 9b. Follow news on revolutionary breakthrough 9c. Find out what movies are on in the cinema while at university	10a. Find out what movies are on in the cinema while at university 10b. Find weather while at home 10c. Follow news in general while at home

Table B-1 Overview of cases and their characteristics

Table B-2a
Overview of
all cases

number	case
1	<p>a Je hebt besloten om van studie te switchen. Je bent bang dat e.e.a. nogal gevolgen heeft voor je StudieFinanciering. Je weet dat er op dit gebied een brochure wordt uitgegeven door StudieFinanciering. Hoe bestel je die brochure?</p> <p>b Je krijgt een brief thuis van StudieFinanciering waarin een aantal wijzigingen staat ten aanzien van de tempobeurs. Het is je niet helemaal duidelijk wat dat voor jou betekent. Hoe krijg je een expert van StudieFinanciering te spreken die je één en ander kan uitleggen?</p>
2	<p>a In de kantine van de universiteit vertel je je studiegenoten over je besluit om van studie te switchen. Zij zeggen dat daar nogal wat gevolgen heeft voor je StudieFinanciering en dat daar een brochure over bestaat. Hoe bestel je die brochure?</p> <p>b Je bent toe aan een stage. Er zijn drie mogelijkheden: Shell, Unilever en Philips. Je zou graag eens met iemand van dat bedrijf spreken. Bijvoorbeeld over hoeveel mensen er werken, wat de omzet is, welke divisies er zijn, enzovoort. Stel, je bent op de universiteit. Welk medium kies je?</p>
3	<p>a Je oma belt om te zeggen dat ze het plan heeft om bij jou langs te komen. Ze will graag met de trein komen en ze heeft aan jou gevraagd of je uit kunt zoeken welke trein ze moet nemen. Ze will zo min mogelijk overstappen en als ze dan toch moet overstappen, will ze minstens tien minuten de tijd hebben om over te stappen. Hoe kom jij erachter welke trein ze moet nemen?</p> <p>b Je neefje is binnenkort jarig. Hij is dol op alles wat met vliegtuigen te maken heeft. Hij spaart plaatjes van vliegtuigen: Super Sabre F26, Tiger Moth, Shukov 25, Starfighter F114, noem maar op. In zijn collectie ontbreekt nog één plaatje: een Antonov AN-2. Jij will hem voor zijn verjaardag wel dat ene mooie plaatje geven. Gesteld dat je thuis bent, op welke manier ga je dat plaatje zoeken?</p> <p>c Je krijgt een brief thuis van StudieFinanciering waarin een aantal wijzigingen staat ten aanzien van de tempobeurs. Het is je niet helemaal duidelijk wat dat voor jou betekent. Hoe kom je aan algemene aanvullende informatie?</p> <p>d Je bent thuis en je will een vriend bellen om te vragen of hij vanavond mee uit gaat. Alleen, je weet zijn number niet omdat hij een paar weken gelden is verhuisd. Hoe zoek je het number op?</p>
4	<p>a In een wetenschappelijk artikel heb je een referentie gezien naar een boek dat er heel interessant uitziet. In de bibliotheek van jouw eigen universiteit hebben ze het helaas niet. Hoe kom je aan informatie waar je dat boek toch zou kunnen krijgen?</p> <p>b Je neefje is binnenkort jarig. Hij is dol op alles wat met vliegtuigen te maken heeft. Hij spaart plaatjes van vliegtuigen: Super Sabre F26, Tiger Moth, Shukov 25, Starfighter F114, noem maar op. In zijn collectie ontbreekt nog één plaatje: een Antonov AN-2. Jij will hem voor zijn verjaardag wel dat ene mooie plaatje geven. Gesteld dat je op de universiteit bent, op welke manier ga je dat plaatje zoeken?</p> <p>c Je bent toe aan een stage. Er zijn drie mogelijkheden: Shell, Unilever en Philips. Om je alvast een beetje te oriënteren ga je op zoek naar informatie over die bedrijven. Bijvoorbeeld over hoeveel mensen er werken, wat de omzet is, welke divisies er zijn, enzovoort. Stel, je bent op de universiteit. Welk medium kies je?</p> <p>d Je gaat binnenkort met een studiegenoot met de fiets op vakantie. Om alvast een eind op weg te zijn besluiten jullie tot Parijs met de trein te gaan. Jullie willen lekker vroeg op weg dus als het kan de eerste trein. Bovendien will je weten wat dat allemaal kost als je ook een fiets mee moet nemen. Gesteld dat je op de universiteit bent, welk medium kies je om antwoord te krijgen op je vragen.</p>

Table B-2b
Overview of
all cases

5	a	Terwijl je zit te studeren op de universiteit kom je in een artikel een verwijzing tegen naar een boek dat er interessant uitziet. Hoe kom je aan informatie waar je dat boek zou kunnen krijgen?
	b	Je bent op de universiteit een werkstuk aan het schrijven in het Engels. Je zoekt een woord in het engels waarvoor je zo gauw geen vertaling weet. Op welke manier zoek je een antwoord?
	c	Je bent op de universiteit en je wilt een vriend bellen om te vragen of hij vanavond mee gaat naar de bioscoop. Je weet zijn nummer alleen niet uit je hoofd. Hoe kom je aan het juiste telefoon nummer?
6	a	Je oma belt om te zeggen dat ze het plan heeft om voor de eerste keer bij jou langs te komen. Ze wilt graag met de trein komen en ze heeft aan jou gevraagd of je uit kan zoeken welke trein ze moet nemen. Hoe kom jij erachter welke trein ze moet nemen?
	b	Je bent thuis en je wilt een vriend bellen om te vragen of hij vanavond mee uit gaat. Je weet zijn nummer alleen niet uit je hoofd. Hoe zoek je het nummer op?
	c	Je bent thuis en zoekt een recept voor het avondeten. Op welke manier doe je dat?
7	a	Je wordt gebeld door een vriendin. Ze heeft een kaartje over voor een concert dat vanavond wordt gegeven en ze nodigt je uit om te komen. Omdat je niets beters te doen hebt en het een goede band is, besluit je per trein af te reizen naar de andere kant van het land. Helaas hoor je net op de radio dat er een bovenleiding gebroken is op het traject waar jij langs moet. Hoe kom je erachter of je het nog haalt om er voor 20.00 uur te zijn?
	b	Je hebt gehoord dat er in Ierland een bomaanslag is gepleegd. De berichtgeving is onduidelijk over wat er aan de hand is. Je maakt je zorgen want een familielid van je is daar op dit moment. Je wilt precies weten wat er aan de hand is. Gesteld dat je thuis bent, welk medium gebruik je daarvoor?
8	a	Je volgt een vak aan een andere universiteit. Je hebt met een paar medestudenten afgesproken in de kantine van jullie eigen universiteit en staan op het punt van vertrek. Op dat moment hoor je dat er een bovenleiding gebroken is. Hoe kom je erachter dat op jullie traject is?
	b	Aan de andere kant van de wereld is een grote doorbraak geboekt op jouw vakgebied. Hoe volg jij, terwijl je op de universiteit bent dit nieuws?
9	a	Opgelucht wandel je de tentamenzaal uit: je tentamens zijn voorbij! De rest van de week heb je vrij en je hebt zin om eens lekker uit te waaien op het strand. Alleen het weer ziet er onbestendig uit. Je vraagt je af wat voor weer het vanmiddag wordt. Op welke manier zoek je een antwoord op deze vraag wanneer je nog op de universiteit bent.
	b	Er is een grote doorbraak geboekt op jouw vakgebied. Zelfs het grote publiek wordt geïnformeerd over deze zaak. Hoe volg jij, terwijl je op de universiteit bent dit nieuws?
	c	In de pauze van een college bedenken jullie dat het leuk is om vanavond naar de bioscoop te gaan. Jullie weten alleen niet wat er vanavond allemaal draait. Hoe komen jullie daarachter?
10	a	Je wordt thuis gebeld door een vriend en die vraagt of je zin hebt om vanavond naar de film te gaan. Hij weet alleen niet wat er draait. Hoe zoek je uit welke films er vanavond in de bioscoop draaien?
	b	Je tentamen week is voorbij! Het is elf uur en je hebt net een bakje koffie voor jezelf gezet. De rest van de week heb je vrij, dus kan je doen wat je wilt. Je besluit om eens lekker uit te waaien op het strand. Alleen het weer ziet er onbestendig uit. Je vraagt je af wat voor weer het vanmiddag wordt. Op welke manier zoek je een antwoord op deze vraag?
	c	Je bent thuis en wilt het nieuws volgen. Welk medium gebruik je daarvoor?

	1		2		3		4			5			6			7		8		9		10						
	a	b	a	b	a	b	c	d	a	b	c	d	a	b	c	a	b	c	a	b	a	b	a	b	c	a	b	c
1 a	-	s	c	c	i	i	i	i																				
b	s	-	c	c	i	i	l	i																				
2 a	c	c	-	s					i	i	i	i																
b	c	c	s	-					i	i	l	i																
3 a	i	i			-	s	s	s	c	c	c	c		u	u	u	t	t										
b	i	i			s	-	s	s	c	c	c	c		u	u	u	t	t										
c	i	l			s	s	-	s	c	c	c	c		u	u	u	t	t										
d	i	i			s	s	s	-	c	c	c	c		u	u	u	t	t										
4 a			i	i	c	c	c	c	-	s	s	s	u	u	u								t	t				
b			i	i	c	c	c	c	s	-	s	s	u	u	u								t	t				
c			i	i	c	c	c	c	s	s	-	s	u	u	u								t	t				
d			i	i	c	c	c	c	s	s	s	-	u	u	u								t	t				
5 a									u	u	u	u	-	s	s	c	c	c					t	t	t			
b									u	u	u	u	s	-	s	c	c	c					t	t	t			
c									u	u	u	u	s	s	-	c	c	c					t	t	t			
6 a			u	u	u	u	u	u					c	c	c	-	s	s							t	t	t	
b			u	u	u	u	u	u					c	c	c	s	-	s							t	t	t	
c			u	u	u	u	u	u					c	c	c	s	s	-							t	t	t	
7 a			t	t	t	t	t	t											-	s	c	c			u	u	u	
b			t	t	t	t	t	t											s	-	c	c			u	u	u	
8 a									t	t	t	t							c	c	-	s	u	u	u			
b									t	t	t	t							c	c	s	-	u	u	u			
9 a													t	t	t				u	u	-	s	s	c	c	c		
b													t	t	t				u	u	s	-	s	c	c	c		
c													t	t	t				u	u	s	s	-	c	c	c		
10 a																t	t	t	u	u			c	c	c	-	s	s
b																t	t	t	u	u			c	c	c	s	-	s
c																t	t	t	u	u			c	c	c	s	s	-

Legend:

- s = same characteristics, other case
- c = same characteristics but context, also other case
- i = same characteristics but interaction, also other case
- t = same characteristics but topicality, also other case
- u = same characteristics but uniqueness, also other case
- grey = same case

Table B-3 Overview of similarities between cases

B.3 Descriptive statistics

B.3.1 (user) context characteristics

Table B.3-1 Distribution of students by sex

Sex	Frequency	Percent	Valid percent	Cumulative percent
Male	292	54.3	54.8	54.8
Female	241	44.8	45.2	100.0
Total	533	99.1	100.0	
Missing	5	0.9		
Total	538	100.0		

Table B.3-2 Distribution of students by age

Age	Frequency	Percent	Valid percent	Cumulative percent
17	1	0.2	0.2	0.2
18	82	15.2	15.4	15.6
19	93	17.3	17.5	33.1
20	68	12.6	12.8	45.9
21	78	14.5	14.7	60.5
22	60	11.2	11.3	71.8
23	57	10.6	10.7	82.5
24	37	6.9	7.0	89.5
25	29	5.4	5.5	94.9
26	13	2.4	2.4	97.4
27	6	1.1	1.1	98.5
28	4	0.7	0.8	99.2
29	1	0.2	0.2	99.4
31	1	0.2	0.2	99.6
60	1	0.2	0.2	99.8
63	1	0.2	0.2	100.0
Total	532	98.9	100.0	
Missing	6	1.1		
Total	538	100.0		

Table B.3-3 Distribution of students by study compared to population values

Study	Population*		Percent at 3 σ .	Sample	
	Frequency	Percent		Frequency	Percent
Language/culture	27,340	15.4	11.4 - 19.4	95	17.0
Technical	25,099	14.1	10.3 - 18.0	94	16.8
Behaviour/society	32,892	18.5	14.2 - 22.8	83	14.8
Law	27,735	15.6	11.6 - 19.7	75	13.4
Health	18,162	10.2	6.9 - 13.6	63	11.3
Economy	27,300	15.4	11.4 - 19.4	53	9.5
Nature	13,490	7.6	4.6 - 10.5	50	8.9
Agriculture	4,834	2.7	0.9 - 4.5	15	2.7
Education	768	0.4	0 - 1.2	4	0.7
Missing				6	
Total	177,620	100.0		538	100.0

*Source: CBS (1996)

Table B.3-4 Distribution of students by year of study

Year	Frequency	Percent	Valid percent	Cumulative percent
1	220	40.9	41.4	41.4
2	109	20.3	20.5	61.8
3	88	16.4	16.5	78.4
4	86	16.0	16.2	94.5
5	18	3.3	3.4	97.9
6	11	2.0	2.1	100.0
Total	532	98.9	100.0	
Missing	6	1.1		
Total	538	100.0		

Table B.3-5 Statistics for age and year

Statistics	N		Mean	Std. Dev.	Variance	
	Valid	Missing				
	Statistic	Statistic	Statistic	Std. Error	Statistic	
Age	532	6	21.2	0.15	3.48	12.1
Year	532	6	2.3	5.81E-02	1.34	1.8

Table B.3-6 Distribution of students by university

University	Frequency	Percent	Valid percent	Cumulative percent
University of Twente	127	23.6	23.7	23.7
Erasmus University Rotterdam	110	20.4	20.5	44.2
Utrecht University	92	17.1	17.2	61.4
University of Amsterdam	69	12.8	12.9	74.3
Tilburg University	61	11.3	11.4	85.6
Wageningen Agriculture University	47	8.7	8.8	94.4
Free University Amsterdam	17	3.2	3.2	97.6
Nijmegen University	3	0.5	0.6	98.2
Leiden University	1	0.2	0.2	98.4
Other	9	1.7	1.7	100.0
Total	536		100.0	
Missing	2	0.4		
Total	538	100.0		

B.3.2 Media usage

Table B.3-7 Physical access to media

Medium	Frequencies		Percentages		Missing
	Home	University	Home	University	
Radio	533	63	99	12	0
CD-audio	514	43	96	8	2
Television	526	132	98	25	0
Teletext	374	65	71	12	13
VCR	355	140	68	27	15
CD-i	27	27	6	6	59
PC	469	506	87	94	0
Game computer	153	29	31	6	43
CD-ROM	254	218	49	42	20
Internet	178	516	33	97	4
Videotex	35	22	7	5	63
Telephone	531	439	99	82	0
Fax	156	176	30	34	23
Answering machine	164	30	33	6	37

Table B.3-8 Frequency of media use

N=538 #	Never	Rarely	Some- times	Regular	Often	Missing
Radio	3	31	42	104	331	27
Television	0	6	30	87	388	27
Teletext	63	99	134	124	115	3
Cable News	158	199	103	56	18	4
CD-i	474	36	18	2	1	7
Personal Computer	1	6	69	182	277	3
CD-ROM	175	86	101	101	70	5
Videotex	498	18	5	2	3	12
E-mail	69	58	104	150	153	4
World Wide Web	63	83	138	135	106	13
Reference	1	11	35	145	342	4
Brochures and folders	8	47	196	179	103	5
Newspapers, magazines	0	7	43	171	313	4
Telephone, friends	0	4	32	164	335	3
Telephone, expert	65	224	189	42	12	6
Face-to-face, friends	1	3	16	108	407	3
Face-to-face expert	20	106	193	142	71	6

Table B.3-9 Experience with media

N=538 #	Lay	Beginner	Regular	Experience d	Freak	Missing
Radio	1	3	143	302	65	24
Television	0	0	105	316	92	25
Teletext	14	36	224	217	46	1
Cable News	87	92	252	94	12	1
CD-i	300	153	65	14	2	4
PC	4	33	211	204	86	0
CD-ROM	120	111	143	106	57	1
Videotex	431	65	25	8	3	6
E-mail	54	86	190	141	67	2
WWW	65	118	186	105	62	0
Reference	1	4	89	311	133	0
Brochures and folders	2	18	220	244	54	0
Newspapers, magazines	1	5	124	308	99	1
Telephone	0	1	67	302	168	0

Table B.3-10
Agglomeration Schedule

Stage	Cluster Combined		Coefficients	First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	4	16	10,566	0	0	15
2	7	12	14,741	0	0	11
3	8	13	25,263	0	0	9
4	11	15	32,440	0	0	10
5	10	17	34,913	0	0	7
6	2	14	59,600	0	0	8
7	5	10	108,447	0	5	11
8	2	3	122,816	6	0	12
9	6	8	124,203	0	3	14
10	9	11	130,710	0	4	13
11	5	7	163,895	7	2	12
12	2	5	234,132	8	11	15
13	1	9	267,715	0	10	14
14	1	6	419,924	13	9	16
15	2	4	439,728	12	1	16
16	1	2	724,961	14	15	0

Table B.3-11 Dendrogram
of media clusters

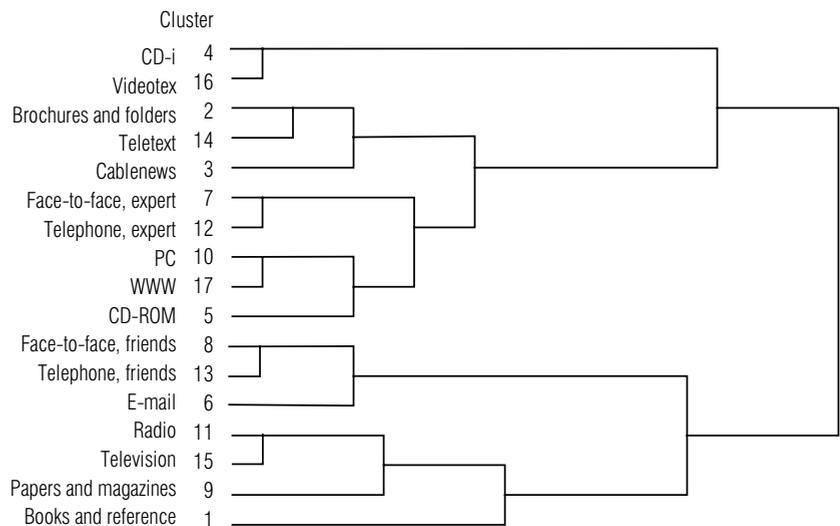


Table B.3-12
Frequencies of functions
after clustering

#	cd-i and videotex	experts, face to face and telephone	e-mail, friends, face to face and telephone	tv, radio, books newspaper	pc, cd-rom and www	Teletext, Brochures and Cable news
News	29	316	366	1527	423	942
Entertainment	90	44	817	1727	903	237
Identification	8	104	426	918	184	120
Reference	94	572	169	816	875	606
Communication	10	382	980	111	415	29
Transaction	16	344	182	36	133	80
Other / nothing	865	155	37	58	442	326

Table B.3-13 Evaluation
of media

N=538 #	Very Negative	Negative	Negative nor positive	Positive	Very Positive	Don't know	Missing
Radio	0	4	106	288	111	1	28
Television	0	8	76	295	131	0	28
Teletext	2	31	155	282	46	16	6
Cable News	46	98	226	67	9	83	9
CD-i	25	53	129	49	7	258	17
PC	1	9	49	270	204	2	3
CD-ROM	6	13	120	196	95	99	9
Videotex	27	38	95	7	4	340	27
E-mail	4	11	59	272	156	31	5
WWW	5	36	88	243	121	40	5
Reference	2	4	55	277	196	1	3
News and m'zines	1	0	45	321	165	0	6
Brochures, folders	7	30	236	216	40	5	4
Telephone, experts	2	38	177	220	59	38	4
Telephone, friends	0	0	31	242	261	1	3
F-t-f, friends	0	10	153	245	102	23	5
F-t-f, expert	0	0	13	161	355	6	3

B.3.3 Cases

Table B.3-14 Overall frequencies possible choice

	Frequency	Percent	Cumulative
Radio	831	5.1	5.1
Television	886	5.4	10.5
Teletext	1022	6.3	16.8
CD-i	22	0.1	16.9
Personal Computer	653	4.0	20.9
CD-ROM	214	1.3	22.2
Videotex	36	0.2	22.4
E-mail	592	3.6	26.1
WWW	1,672	10.2	36.3
Books and references	1,235	7.6	43.9
Brochures and folders	914	5.6	49.5
Papers and magazines	1,484	9.1	58.5
Telephone, friends	1,391	8.5	67.1
Telephone, experts	3,008	18.4	85.5
Face to Face, friends	980	6.0	91.5
Face to Face, experts	1,145	7.0	98.5
Other	247	1.5	100.0
Total	16,332	100.0	

Table B.3-15 Overall frequencies final choice

	Frequency	Percent	Valid Percent	Cumulative %
Radio	62	1.2	1.2	1.2
Television	191	3.6	3.7	4.9
Teletext	275	5.1	5.3	10.2
CD-i	1	.0	.0	10.2
Personal Computer	228	4.2	4.4	14.6
CD-ROM	39	0.7	0.8	15.3
Videotex	1	0.0	0.0	15.4
E-mail	58	1.1	1.1	16.5
WWW	559	10.4	10.8	27.2
Books and references	472	8.8	9.1	36.3
Brochures and folders	131	2.4	2.5	38.9
Papers and magazines	485	9.0	9.3	48.2
Telephone, friends	257	4.8	5.0	53.1
Telephone, experts	1,765	32.8	34.0	87.2
Face to Face, friends	135	2.5	2.6	89.8
Face to Face, experts	381	7.1	7.3	97.1
Other	151	2.8	2.9	100.0
Total	5,191	96.5	100.0	
Total missing	189	3.5		
Total	5,380	100.0		

Table B.3-16 Ratio possible and chosen media

%	Ratio		Ratio
Radio	7.5	Books and references	38.2
Television	21.5	Brochures and folders	14.3
Teletext	26.9	Papers and magazines	32.7
CD-i	4.6	Telephone, friends	18.5
Personal Computer	34.9	Telephone, experts	58.7
CD-ROM	18.2	Face to Face, friends	13.8
Videotex	2.8	Face to Face, experts	33.3
E-mail	9.8	Other	61.1
WWW	33.4		

Table B.3-17 a
Frequencies of final
choice by case

type # variant	1		2		3			4			5				
	A	B	A	B	A	B	C	D	A	B	C	D	A	B	C
Radio	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Television	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Teletext	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
CD-i	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PC	1	0	0	1	49	0	0	0	23	2	2	5	52	13	0
CD-ROM	0	0	1	0	1	1	0	0	8	2	1	0	15	2	1
Videotex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E-mail	2	3	2	27	0	3	0	0	4	0	0	0	0	0	3
WWW	12	7	19	34	10	35	1	7	34	62	59	20	18	4	9
Reference	1	1	2	13	4	11	1	10	7	17	24	2	11	150	31
Broch, folders	13	9	6	9	1	5	20	0	0	2	19	5	0	0	2
News, m'zines	0	0	1	3	0	11	0	1	0	0	6	0	1	0	0
Teleph, friends	5	7	4	11	1	8		55	1	9	0	0	1	2	42
Teleph, experts	194	200	177	74	66	17	82	53	15	10	6	80	11	0	76
F to F, friends	2	1	2	8	1	1	6	1	3	3	1	1	5	3	12
F to F, experts	17	35	32	54	1	37	10	0	34	18	12	5	38	1	2
Other	3	3	20	14	2	4	1	2	7	3	1	2	13	4	2
Total	250	266	267	248	137	133	121	129	136	128	131	120	165	179	180

Table B.3-17b
Frequencies of final
choice by case

type # variant	6			7		8		9		10			Total	
	A	B	C	A	B	A	B	A	B	C	A	B		C
Radio	0	0	0	1	10	8	3	6	8	0	0	14	11	62
Television	0	0	0	0	47	0	17	6	16	0	0	14	91	191
Teletext	0	0	3	21	50	45	1	27	3	3	5	97	19	275
CD-i	0	0	0	0	0	0	1	0	0	0	0	0	0	1
PC	61	3	0	14	0	1	0	0	1	0	0	0	0	228
CD-ROM	1	3	0	0	0	0	2	1	0	0	0	0	0	39
Videotex	1	0	0	0	0	0	0	0	0	0	0	0	0	1
E-mail	0	0	0	0	1	0	9	2	0	1	1	0	0	58
WWW	5	9	4	2	6	5	110	33	33	6	8	5	2	559
Reference	8	61	105	1	1	0	5	1	3		1	1	0	472
Broch, folders	2	2	7	1	0	0	2	0	2	21	3	0	0	131
News, m'zines	0	0	16		6	0	65	30	64	91	126	24	40	485
Teleph, friends	1	21	22	1	43	3	4	4	4	4	3	1	0	257
Teleph, experts	78	53	1	197	89	163	3	37	1	36	33	12	1	1765
F to F, friends	1	1	16	1	2	7	9	24	19	2	2	1	0	135
F to F, experts	3	1	1	11	3	33	12	1	14	5	1	0	0	381
Other	7	18	13	1	4	3	5	3	5	2	4	5	0	151
Total	168	172	188	251	262	268	248	175	173	171	187	174	164	5,191

Table B.3-18
Percentages reasons for
choosing medium

#	quick	easy	best answer	least effort	conve- nience	low costs	other
Radio	23	25	12	17	11	11	2
Television	21	26	9	17	17	8	1
Teletext	33	22	12	14	6	11	1
CD-i	0	0	100	0	0	0	0
Personal Computer	30	23	14	11	11	11	1
CD-ROM	34	26	16	4	11	7	1
Videotex	0	100	0	0	0	0	0
E-mail	31	22	17	7	8	13	1
WWW	28	19	17	9	11	13	3
Reference	21	26	19	10	12	9	1
Brochures, folders	16	30	22	10	6	12	3
Newspap, magazines	22	31	18	14	3	11	2
Telephone, friends	26	20	18	10	20	4	2
Telephone, experts	34	21	27	10	6	2	1
Face to Face, friends	20	21	10	12	26	7	3
Face to Face, experts	17	16	37	7	15	7	2
Other	23	22	18	12	10	12	4

Table B.3-19 Degree of motivation

	Frequency	Percent	Valid Percent	Cumulative Percent
Very much	953	17.7	18.1	18.1
Much	2,478	46.1	47.1	65.3
Neither much nor little	1,362	25.3	25.9	91.2
Little	347	6.4	6.6	97.8
Very little	118	2.2	2.2	100.0
Total	5,258	97.7	100.0	
Missing	122	2.3		
Total	5,380	100.0		

B.3.4 Level of media use and media choice

Table B.3-20 Effect of frequency of media use on media choice

	Chose other medium	Medium chosen	Total	Percent
Never	14,201	45	14,246	0.3
Rarely	7,379	193	7,572	2.5
Sometimes	12,303	607	12,910	4.7
Regularly	17,342	1,009	18,351	5.5
Often	28,558	1,860	30,418	6.1
	79,783	2,748	82,531	

Table B.3-21 Effect of experience with media on media choice

	Chose other medium	Medium chosen	Total	Percent
Lay	9,897	33	9,930	0.3
Beginner	6,247	93	6,340	1.5
Regular	17,720	870	18,590	4.7
Experienced	26,434	2,366	28,800	8.2
Freak	9,885	1,135	11,020	10.3
	70,183	4,497	74,680	

Table B.3-22 Effect of evaluation of media on media choice

	Chose other medium	Medium chosen	Total	Percent
Very Negative	812	8	820	1.0
Negative	2,612	138	2,640	5.2
Neg nor pos	13,309	901	13,620	6.6
Positive	29,611	2,169	29,060	7.5
Very positive	14,820	1,140	14,400	7.9
	61,164	4,356	65,520	

B.4 Logistic regression

B.4.1 General information and model fit

In Table B.4-1 the number of respondents and the number of cases are shown per medium. This information was part of the input for multilevel logistic regression analysis.

Table B.4-1 Number of respondents and cases in the regression model

Medium	number of	
	respondents	cases
Telephone, expert	524	4,760
WWW	511	3,385
newspapers and magazines	525	5,236
books and reference guides	528	5,280
face-to-face, expert	524	5,240
Teletext	383	2,151
telephone, friends	527	4,780
personal computer	525	4,795
television	492	3,085
face-to-face, friends	529	5,290
brochures and folders	526	5,260
radio	499	2,800
e-mail	518	3,430
CD-ROM	370	2,314

In Table B.4-2 the usefulness of multilevel logistic regression is shown. If the difference between the initial and final deviance for the empty model is not significant, it is not useful to perform multilevel logistic regression. The table shows that the difference is significant for five media: Telephone, expert, WWW, Face-to-face, expert, Personal Computer and Face-to-face, friends. For these media multilevel logistic regression (using VARCL3) was used. For all other media multilevel regression was not useful. For these media SPSS was used.

Table B.4-2 Usefulness of multilevel logistic regression

Medium	Deviance in the empty model		Significance (df=1)
	initial	final	
telephone. Expert	6,068.36	4,495.09	sig.
WWW	2,900.48	2,851.71	sig.
Newspapers and magazines	3,190.15	3,190.15	n.s.
books and reference guides	3,170.67	3,170.67	n.s.
face-to-face, expert	2,705.49	2,689.59	sig.
Teletext	1,270.77	1,270.70	n.s.
telephone. Friends	1,874.18	1,872.32	n.s.
personal computer	1,749.11	1,744.88	sig.
Television	1,270.07	1,270.07	n.s.
face-to-face, friends	1,235.04	1,230.12	sig.
Brochures and folders	1,211.49	1,211.00	n.s.
radio	402.27	397.48	sig.
e-mail	530.50	530.16	n.s.
CD-ROM	346.04	345.26	n.s.

Table B.4-3 Explaining power of the model

Medium	-2 Log Likelihood		Pseudo R
	initial	final	
telephone. Expert	6,068.36	4,263.15	29.75
WWW	2,900.48	2,527.66	12.85
newspapers and magazines	3180.93	2252.44	29.10
books and reference guides	3,170.67	2,234.77	29.52
face-to-face, expert	2,705.49	2,466.06	8.85
Teletext	1270.77	1203.40	5.30
telephone, friends	1,874.18	1,783.34	4.85
personal computer	1,749.11	1,444.87	17.39
television	1270.07	1190.61	6.26
face-to-face, friends	1,235.04	1,162.07	5.91
brochures and folders	1,211.49	1,188.10	1.93
radio	402.27	381.84	5.08
e-mail	530.50	470.58	11.30
CD-ROM	346.04	274.18	20.77

B.4.2 Regression models

For some of the models, some of the predictor variables were not included in the research. This is indicated with n.a. (not available). For the models that did not use multilevel regression the actual level of significance level is provided. For the models that did use multilevel regression, an indication of significance at five percent is given. See also section 4.3.

Table B.4-4 Logistic regression model for telephone, experts

Telephone, expert	B	S.E.	Wald	Sig	R
Topicality	0.03	0.09	0.11	-	-0.02
Context	-0.32	0.09	12.64	Sign	0.04
Uniqueness	0.23	0.11	4.37	Sign	0.02
Interaction	-0.79	0.12	43.34	Sign	0.08
Sex	0.41	0.14	8.58	Sign	0.03
Frequency	0.01	0.08	0.02	-	-0.02
Experience	0.18	0.11	2.68	-	0.01
Evaluation	0.08	0.07	1.31	-	-0.01

Table B.4-5 Logistic regression model for WWW

WWW	B	S.E.	Wald	Sig	R
Topicality	-0.30	0.11	7.44	Sign	0.04
Context	1.02	0.14	53.08	Sign	0.13
Uniqueness	1.20	0.12	100.00	Sign	0.18
Interaction	1.28	0.16	64.00	Sign	0.15
Sex	-0.02	0.14	0.02	-	-0.03
Frequency	0.33	0.08	17.02	Sign	0.07
Experience	0.34	0.08	18.06	Sign	0.07
Evaluation	0.01	0.07	0.02	-	-0.03

Table B.4-6 Logistic regression model for newspapers and magazines

Papers and magazines	B	S.E.	Wald	Sig	R
Topicality	3.04	0.18	0.10	0.00	0.29
Context	0.20	0.11	3.38	0.07	0.02
Uniqueness	-1.86	0.13	0.20	0.00	-0.26
Interaction	n.a.	n.a.	n.a.	n.a.	n.a.
Sex	0.17	0.11	2.37	0.12	0.01
Frequency	0.11	0.09	1.69	0.19	0.00
Experience	-0.06	0.09	0.51	0.48	0.00
Evaluation	0.11	0.10	1.26	0.26	0.00

Table B.4-7 Logistic regression model for books and reference guides

Books and reference	B	S.E.	Wald	Sig	R
Topicality	-3.88	0.28	186.56	0.00	-0.24
Context	0.33	0.11	9.18	0.00	0.05
Uniqueness	-1.85	0.13	197.07	0.00	-0.25
Interaction	1.62	0.27	35.76	0.00	0.10
Sex	0.03	0.11	0.08	0.78	0.00
Frequency	-0.02	0.08	0.08	0.78	0.00
Experience	0.14	0.09	2.16	0.14	0.01
Evaluation	0.02	0.09	0.08	0.78	0.00

Table B.4-8 Logistic regression model for face-to-face. experts

Face-to-face. expert	B	S.E.	Wald	Sig	R
Topicality	-0.76	0.14	29.47	Sign	0.10
Context	0.88	0.12	53.78	Sign	0.14
Uniqueness	1.08	0.15	51.84	Sign	0.14
Interaction	-0.20	0.13	2.37	-	0.01
Sex	0.27	0.13	4.31	Sign	0.03
Frequency	0.11	0.06	3.36	-	0.02
Experience	n.a.	n.a.	n.a.	n.a.	n.a.
Evaluation	-0.07	0.08	0.77	-	-0.02

Table B.4-9 Logistic regression model for Teletext

Teletext	B	S.E.	Wald	Sig	R
Topicality	n.a.	n.a.	n.a.	n.a.	n.a.
Context	-0.37	0.26	2.10	0.14	-0.01
Uniqueness	-0.88	0.16	31.32	0.00	-0.15
Interaction	n.a.	n.a.	n.a.	n.a.	n.a.
Sex	-0.08	0.17	0.21	0.65	0.00
Frequency	0.30	0.09	10.42	0.00	0.08
Experience	0.33	0.13	6.32	0.01	0.06
Evaluation	-0.06	0.13	0.21	0.64	0.00

Table B.4-10 Logistic regression model for telephone. friends

Telephone, friends	B	S.E.	Wald	Sig	R
Topicality	-0.96	0.16	38.18	0.00	-0.14
Context	-0.65	0.15	20.26	0.00	-0.10
Uniqueness	0.25	0.14	2.92	0.09	0.02
Interaction	1.37	0.24	33.42	0.00	0.13
Sex	0.00	0.14	0.00	0.99	0.00
Frequency	0.14	0.12	1.42	0.23	0.00
Experience	0.16	0.11	2.03	0.15	0.00
Evaluation	0.08	0.12	0.49	0.48	0.00

Table B.4-11 Logistic regression model for Personal Computer

Personal Computer	B	S.E.	Wald	Sig	R
Topicality	-2.69	0.27	99.26	Sign	0.24
Context	-0.33	0.15	4.84	Sign	0.04
Uniqueness	-0.30	0.15	4.00	Sign	0.03
Interaction	3.86	0.72	28.74	Sign	0.12
Sex	0.05	0.17	0.09	-	-0.03
Frequency	0.13	0.13	1.00	-	-0.02
Experience	0.18	0.11	2.68	-	0.02
Evaluation	0.12	0.13	0.85	-	-0.03

Table B.4-12 Logistic regression model for television

Television	B	S.E.	Wald	Sig	R
Topicality	n.a.	n.a.	n.a.	n.a.	n.a.
Context	-0.94	0.27	12.11	0.00	-0.09
Uniqueness	-1.23	0.17	50.36	0.00	-0.20
Interaction	n.a.	n.a.	n.a.	n.a.	n.a.
Sex	0.19	0.17	1.38	0.24	0.00
Frequency	0.27	0.18	2.28	0.13	0.01
Experience	-0.20	0.14	1.96	0.16	0.00
Evaluation	0.27	0.14	4.02	0.05	0.04

Table B.4-13 Logistic regression model for face-to-face. friend

Face-to-face, friend	B	S.E.	Wald	Sig	R
Topicality	0.19	0.19	1.00	-	-0.03
Context	1.05	0.20	27.56	Sign	0.14
Uniqueness	-0.91	0.20	20.70	Sign	0.12
Interaction	0.20	0.34	0.35	-	-0.04
Sex	-0.10	0.19	0.28	-	-0.04
Frequency	0.32	0.20	2.56	-	0.02
Experience	n.a.	n.a.	n.a.	n.a.	n.a.
Evaluation	0.06	0.18	0.11	-	-0.04

Table B.4-14 Logistic regression model for brochures and folders

Brochures and folders	B	S.E.	Wald	Sig	R
Topicality	-0.83	0.23	13.39	0.00	-0.10
Context	0.11	0.18	0.39	0.53	0.00
Uniqueness	0.35	0.21	2.77	0.10	0.03
Interaction	0.09	0.23	0.14	0.71	0.00
Sex	-0.01	0.18	0.00	0.96	0.00
Frequency	0.11	0.11	0.94	0.33	0.00
Experience	0.01	0.14	0.00	0.96	0.00
Evaluation	0.05	0.12	0.18	0.68	0.00

Table B.4-15 Logistic regression model for Radio

Radio	B	S.E.	Wald	Sig	R
Topicality	n.a.	n.a.	n.a.	n.a.	n.a.
Context	-0.03	0.54	0.03	-	0.00
Uniqueness	-1.20	0.35	11.59	Sign.	-0.15
Interaction	n.a.	n.a.	n.a.	n.a.	n.a.
Sex	-0.23	0.36	0.49	-	0.00
Frequency	0.31	0.27	1.62	-	0.00
Experience	-0.18	0.30	0.45	-	0.00
Evaluation	0.15	0.29	0.43	-	0.00

Table B.4-16 Logistic regression model for E-mail

E-mail	B	S.E.	Wald	Sig	R
Topicality	0.20	0.45	0.20	0.65	0.00
Context	1.25	0.48	6.70	0.01	0.09
Uniqueness	1.11	0.52	4.57	0.03	0.07
Interaction	-1.57	0.40	15.08	0.00	-0.16
Sex	0.40	0.31	1.74	0.19	0.00
Frequency	0.02	0.18	0.01	0.92	0.00
Experience	0.29	0.21	1.99	0.16	0.00
Evaluation	0.02	0.20	0.01	0.92	0.00

Table B.4-17 Logistic regression model for CD-ROM

CD-ROM	B	S.E.	Wald	Sig	R
Topicality	-2.75	0.73	14.00	0.00	-0.19
Context	2.31	0.55	17.54	0.00	0.21
Uniqueness	-0.83	0.39	4.50	0.03	-0.08
Interaction	2.25	1.05	4.55	0.03	0.09
Sex	0.39	0.40	0.96	0.33	0.00
Frequency	-0.15	0.23	0.46	0.50	0.00
Experience	0.43	0.26	2.66	0.10	0.04
Evaluation	0.04	0.17	0.06	0.80	0.00

B.4.3 Summary of Logistic models

Table B.4-18a a Telephone expert, WWW, Newspapers and magazines and books ad reference guides

	telephone, expert	WWW	newspaper, magazines	books and reference
topicality	-	stable	topical	stable
context	home	university	university	university
uniqueness	unique	unique	common	common
interaction	trans/com	information	information	information
sex	women	-	-	-
frequency	-	positive	-	-
experience	-	positive	-	-
evaluation	-	-	-	-

Table B.4-18b Face-to-face expert, Teletext, telephone, friends and PC

	face-to-face, experts	Teletext	telephone, friends	pc
topicality	stable	topical	stable	stable
context	university	-	home	home
uniqueness	unique	common	unique	common
interaction	-	information	information	information
sex	women	-	-	-
frequency	positive	positive	-	-
experience	n.a.	positive	-	-
evaluation	-	-	-	-

Table B.4-18c TV, face-to-face, friends, brochures and folders and radio

	tv	face-to-face, friends	brochures, folders	radio
topicality	topical	-	stable	topical
context	home	university	-	-
uniqueness	common	common	-	common
interaction	information	-	-	information
sex	-	-	-	-
frequency	-	-	-	-
experience	-	n.a.	-	-
evaluation	positive	-	-	-

Table B.4-18d e-mail and CD-ROM

	e-mail	CD-ROM
topicality	-	stable
context	university	university
uniqueness	unique	common
interaction	trans/com	information
sex	-	-
frequency	-	-
Experience	-	-
Evaluation	-	-