



## Cross-Media Under Surveillance

A Thesis by:

Louise Barkhuus

Mikkel Cauchi

Kevin Cook McLean

Rebecca Pruzan

Advisors :

Peter Sestoft

Peter Olaf Looms

The IT University of Copenhagen, June 2001

# TABLE OF CONTENTS

---

<b>TABLE OF CONTENTS .....</b>	<b>2</b>
<b>1 INTRODUCTION.....</b>	<b>4</b>
1.1 DELIMITATION.....	6
1.2 GENERAL TERMINOLOGY .....	6
<b>2 METHODOLOGY.....</b>	<b>8</b>
2.1 WORKING PROCESS.....	8
2.2 THEORETICAL APPROACH .....	8
2.3 A QUANTITATIVE APPROACH.....	9
2.4 A QUALITATIVE APPROACH.....	11
<b>3 ECHELON A TEST CASE .....</b>	<b>12</b>
3.1 THE ECHELON CONCEPT.....	12
3.2 SUMMARY .....	13
3.3 THE TELEVISION CONCEPT.....	14
3.4 THE WEB CONCEPT .....	15
3.5 A SCENARIO.....	19
<b>4 TARGET GROUP CONSIDERATIONS .....</b>	<b>23</b>
4.1 PARTICIPANT TARGET GROUP: EARLY ADOPTION OF CROSS-MEDIA.....	24
4.2 THE ECHELON TARGET GROUP .....	32
<b>5 MEDIA LANDSCAPE.....</b>	<b>33</b>
5.1 PRESENT MEDIA DISTRIBUTION AND USAGE IN DENMARK .....	33
5.2 MEDIA FORECAST 2001-2005.....	43
5.3 ECHELON'S USE OF MEDIA IN THE FUTURE .....	48
<b>6 MEDIA ANALYSIS.....</b>	<b>50</b>
6.1 TYPES OF INTERACTION.....	51
6.2 REGISTRATION + CONSULTATION = PARTICIPATION? .....	54
6.3 WILLINGNESS TO LEAN FORWARD.....	57
6.4 BENEFITS OF INTERACTIVITY AND PARTICIPATION.....	59
6.5 THE ELEMENTS OF SUCCESSFUL TELEVISION: A THEORETICAL APPROACH .....	64
6.6 LOYALTY AND COMMUNITY.....	68
6.7 COMMUNITY GIVING RISE TO LOYALTY.....	75
<b>7 MACROECONOMIC IMPLICATIONS FOR ECHELON .....</b>	<b>78</b>
7.1 THE PUBLIC SERVICE CHANNELS: DR AND TV2.....	78
7.2 THE COMMERCIAL CHANNEL: TV3.....	84
7.3 INCENTIVES AND CONSEQUENCES FOR ECHELON .....	85
7.4 THE BROADCASTER AND THE BENEFITS OF ECHELON .....	92
<b>8 CHOICE OF TECHNOLOGY .....</b>	<b>93</b>

8.1	BACK-END TECHNOLOGIES .....	93
8.2	XML .....	97
8.3	FRONT-END TECHNOLOGY .....	98
8.4	BENEFITS OF THE TECHNOLOGIES AT HAND .....	100
<b>9</b>	<b>IMPLEMENTATION OF THE WEB GAME .....</b>	<b>101</b>
9.1	THE ECHELON USE CASES .....	102
9.2	SYSTEM ARCHITECTURE.....	103
9.3	THE DATA TIER.....	105
9.4	THE XML-INTERFACE.....	108
9.5	MIDDLE TIER DESIGN.....	109
9.6	FRONT-END DEVELOPMENT AND DESIGN .....	120
9.7	TEST OF THE SYSTEM .....	127
9.8	A WINNING COMBINATION .....	130
<b>10</b>	<b>CONCLUSION.....</b>	<b>131</b>
<b>11</b>	<b>BIBLIOGRAPHY .....</b>	<b>134</b>
11.1	REPORTS AND REGULATIONS .....	135
11.2	INTERVIEWS .....	136
11.3	ARTICLES .....	137
11.4	WWW.....	138

# 1 INTRODUCTION

---

The current technological revolution has both had a tremendous impact on traditional media and created exciting new media. We have seen the introduction of new interactive entertainment formats, and future technologies promise a rich array of new possibilities for the entertainment industry; on television, the Internet, and even with mobile devices such as smart phones and PDAs. This has given rise to much speculation over how tomorrow's media scene will look and what it will offer. Will we see entirely new, hyper-interactive cross-media formats? Will television begin to offer types of interactivity popular on the Internet, or broadcast traditional programs that only capitalize on the increased quality of digital video and sound?

The goal of this thesis is to provide a better understanding of the issues involved in and benefits that can be gained from offering television-oriented cross-media entertainment. Television is a successful and well-established medium, but nonetheless, with the introduction of new, more interactive media, broadcasters are witnessing a decline in viewers within specific age groups. One demographic where broadcasters have witnessed the most significant decline is in the younger segments of the population. Furthermore, within this same group, there has been an increase in time spent using other media. Is this an irreversible trend, or can the broadcaster work to recapture the interest of this group?

Although the television programs of the future may include interactivity to varying degrees, there already exists, in the technologies widely distributed amongst especially the young part of the population, the potential to create new and exciting participatory (interactive) television programs. In fact, these technologies give the fascinating possibility of developing an entirely new cross-media entertainment format. Initially, cross-media was widely understood to mean, "publish once, play anywhere", where, for example, users could access news from their TV, computer, or mobile phone. What intrigues us however, is the potential offered by cross-media technologies in creating a rich entertainment concept that capitalizes on the unique strengths of each medium: the television which is a superb medium for broadcasting visual content and vivid storytelling; the internet (which is itself becoming increasingly visual) that offers a degree of interactivity and user participation not seen in other media; and the mobile phone, which, with its tremendous market penetration and SMS technology, offers itself as a promising cross-media device to be utilized for mobile interactivity. It is exactly among the younger segments that exist a deep penetration of these three technologies. They are not only adept at using the Internet and mobile phone technologies, but use them on a daily basis.

As we are all students at the Design, Communication and Media department of the IT University of Copenhagen, we share a great interest in exploring new media. This thesis gives us the opportunity to learn about both the theoretical and practical issues in development and implementation of a cross-media entertainment format. By producing a testcase – Echelon – we will investigate the issues faced when developing a concept

which draws on the different media to offer the user an enhanced entertainment experience. With this thesis we have the following goals in mind:

- To explore the potential of creating new and exciting interactive formats by combining different media.
- To investigate the practical implementation of such a format using particular technologies: Flash Action Scripts, XML, java, http, dbms and SQL.
- To understand present media tendencies, media use and current technologies, in order to get a picture of the medialandscape of the future.

Since an important aspect of our education has been a focus on design, communication and media, this thesis is not structured like a traditional computer science project. This is reflected in the broad scope of our thesis where the focus has been equally divided between the technical, theoretical and practical issues of creating a cross-media concept.

The above considerations lead us to the following problem definition:

**What are the technical, theoretical and practical implications of the development and implementation of a cross-media entertainment format?**

The thesis will consist of the following:

- Chapter two: Presents our methodological considerations behind the thesis.
- Chapter three: Explains the ideas behind the Echelon concept.
- Chapter four: Defines the target group for Echelon and offers a discussion of the means by which new media and technologies are adopted.
- Chapter five: Gives an overview of the media tendencies and the access to relevant technologies within our target group.
- Chapter six: Discusses how different media formats influence the user's experience.
- Chapter seven: Considers the practical implications of implementing cross-media format in relation to both commercial and public service broadcasters.
- Chapter eight: Describes the rationale behind the choice of technology used in the implementation of the prototype.
- Chapter nine: Presents and explains the system design of the prototype.
- Chapter ten: Concludes the thesis and discusses to what extent the above goals have been realized.

## 1.1 Delimitation

The test case<sup>1</sup> developed for the purpose of this thesis has been developed with a specific launch date in mind in order to limit the scope of the thesis. The launch date has been set to September 2001, and therefore the test case has been developed for technologies that are available now. The test case should however be related to future technologies in that it should be possible to embrace new development. This means that although future technologies will be considered they will not be described in great detail. Although Digital TV (dTV) will be discussed for its relevance to the future of the test case, we will not utilize this technology and therefore the technical details of dTV and its numerous platforms will not be dwelled upon. Furthermore, all considerations will be limited to the Danish market and therefore mostly Danish data and statistics will be used and target group considerations are made on behalf of a Danish audience.

Because of the limited time for implementing the Web game, there was no formal usability testing done on the prototype. All aspects of the site have been designed with usability in mind, but as with any system, before completion several usability tests with representatives of the target group should be conducted.

## 1.2 General Terminology

In order to prevent misunderstandings in our use of vocabulary we will here offer brief descriptions of some of the central terms used through out this thesis. As the chapter Media Analysis will bring a deeper understanding of the terms Interactivity, Participation, Lean forward, Community, and Loyalty we will not include definitions of these key elements in this part of the thesis.

### 1.2.1 Media platforms

The term “platform” in information technology commonly denotes the combination of hardware and software features such as a computer running a specific type of operating system. As this thesis encompasses a range of information and communication devices we have chosen to define media platform as a given information or communication device, comprising operating system, application programming interface and software applications and peripherals with its associated communication infrastructure, on which a given medium or service is supplied. This definition is a natural extension of current usage within IT and is in line with discussions of the subject with our supervisors.

### 1.2.2 Concepts and Formats

The term ”concept” in this thesis is confined to the development phase of new media and services. In the course of the development process, we move from conceptual to

---

<sup>1</sup> For a description of the test case see chapter 3.

format development, a cross-media format being a fully mature concept, which can be used or sold to a third part for application in a new context.

### 1.2.3 dTV

Digital television (dTV) is the successor of analog TV and refers to the transmission of a broadcast digital signal represented as zeroes and ones. Digital representation of audio and video allows for the application of compression algorithms, enabling many more audio or digital channels to be encoded in the same frequency and at a higher quality than what is possible through analog transmission.

In addition to increasing the effective capacity of the frequency and the quality of audio and video dTV also allows for additional services over and above the television programs to be included in the broadcast signal. These typically include enhancements such as Electronic Programming Guides (EPGs), second generation digital text services and interactive elements relating to the programs themselves with or without the use of a return channel. Where a return channel is available, dTV also allows for the delivery of transactional services (Video On Demand (VOD), t-gambling, t-commerce and t-banking)<sup>2</sup>.

### 1.2.4 Cross-media

Cross-media involves two or more media (both new or existing) that are used in an integrated or coordinated fashion. The term is often used in relation to COPE<sup>3</sup> (Create Once Play Everywhere) where the same content is transmitted through different media drawing on the benefits of each individual medium. When we use the term through out this thesis it will mainly be in regards to creating an extra or enhanced experience for the user by combining the assets of different media rather than the COPE approach. It is thus the creation of a synergy, offering the user an enhanced experience where the playing together of the three media creates a whole that is greater than the sum of its parts.

---

<sup>2</sup> O'driscoll (2000).

<sup>3</sup> A term coined in the nineties in the public broadcasting system in the USA in connection with television and web production (Peter Looms, DR).

## 2 METHODOLOGY

---

### 2.1 Working Process

In the writing of this thesis we have attempted to maintain a broad focus that takes into account the wide range of issues involved in developing a cross-media entertainment format. Because the format as we define it is a radically new approach, there was not any real world example we could focus our research on or draw our experience from. As a result of this, we have developed a concept called Echelon, to function as a test case that would bring us closer to the problems of our thesis.

In our concept, we try to be radical, yet reasonable. That is to say we want to push the boundaries of interactive entertainment, but not beyond the point where the user is willing or, from a technology perspective, able to interact. By immersing ourselves in the concept development and technical implementation stages of a new kind of entertainment format we were able to uncover important issues and considerations that may have been overlooked from a purely theoretical approach. This has not, however, been at the expense of a theoretical approach. It has been our intention to tackle the problem from several different angles, and therefore we have drawn from a number of diverse yet relevant theories that we felt would give a deeper insight into some of the central issues with which we were working.

We use the test case both to get concrete answers to specific questions, particularly those of a technical nature, but also as a basis for our theoretical and practical discussions. Issues, such as interactivity, community and target group theory, have been thoroughly investigated from a theoretical approach. Moreover the present and future media landscape will be assessed in relation to the test case. Perhaps our most important consideration has been the user, or our target group, as the success of any entertainment format ultimately depends on the acceptance of the user. We have therefore tried to get a better understanding of both the potentials within the target group for participating with the proposed format, and the desire. Desire, however, is a difficult concept to measure. Therefore, we have approached this by analyzing the benefits, or joy that can be achieved from participating in such entertainment formats. Finally, to clarify the broader aspects involved from the perspective of the broadcaster, both commercial and public service, we have conducted a macroeconomic analysis of the market in which Echelon would be launched.

### 2.2 Theoretical Approach

It has been helpful to approach many of the issues we were confronted with from a theoretical perspective. Because the area in which we find ourselves is so new and yet unexplored, there is no single theory that is adequate to clarify all the issues. We have therefore chosen theories that we felt provided the best tools for working with the specific problems and issues, as they presented themselves. Many of the theories we work with have been developed with a different focus, and it has therefore been

necessary to expand on the theories in order meet our needs. E.M. Rogers, who is the principal figure in the development of *Diffusion of Innovation Theory*, proved a great help in understanding the process by which a new entertainment format, as a product, may be adopted by the target group. The springboard for our discussions on interactivity and participation is the theory of Jens F. Jensen and Jan L. Bordewijk and Ben van Kaam's views of traffic patterns in telecommunication services. In understanding how the community can play a role in the acceptance of and participation in media format, we turn to Jan van Dijk's definition of virtual and organic communities, and continue our analysis drawing from a number of other sources. In order to conduct the analysis of the potential broadcasters of Echelon we found it most effective to seek information directly from the experts in the field as no theoretical work would offer a better insight.

## 2.3 A Quantitative Approach

In an effort to achieve a comprehensive understanding of the media tendencies of our target group we have conducted a quantitative<sup>4</sup> survey with representatives of the target group. Results from this survey enable us to estimate the degree to which the target group has the willingness and ability to participate in a cross-media format. We have not drawn any scientific conclusions from our survey, but rather used it to give an indication of trends that exist within our target group. Whenever possible, in order to put the results of our survey in perspective, they are compared with official sources such as AC Nielsen AIM, Danmark's Statistics, Gallup (TV-Meter), TV2, DR, and National Telecom Agency. Furthermore, we have used the results of our survey to refine the Echelon concept in accordance with the needs and interests of the target group.

### 2.3.1 Choice of respondents

An important success parameter of the Echelon format is the viewer's willingness to interact with media in new ways, it was therefore essential to establish both the willingness and the capability of the users to interact with the cross-media concept. Though the format is not dependent upon participation from all the viewers, or even the majority of viewers, it is important that a small percentage is willing to participate. Therefore we selected our respondents from the group that is most likely to demonstrate this willingness, those that can be classified as *Innovators*<sup>5</sup> or *Early Adopters*<sup>6</sup>. We also, however, wanted to conduct the survey with a group who included members of the

---

<sup>4</sup> When talking about quantitative interviews we are primarily drawing on Lund (1986).

<sup>5</sup> By Innovators we are referring to 2.5 % of the population who are the first to adopt or experiment with new innovations, often mainly for its "new-ness" value. This group is characterised as having a high level of education (Rogers: 1983). For a further elaboration on adoption patterns see chapter 4: Target Group Considerations.

<sup>6</sup> By Early Adopters we are referring to the 13.5 % of the population who adopt new innovations at a very early stage. Like the Innovators they are characterised as having high level of education. (Rogers: 1983). For a further elaboration on adoption patterns see chapter 4: Target Group Considerations.

*Early Majority*<sup>7</sup> as this group is also very relevant to Echelon in that we expect a great percentage of the audience to belong to this group<sup>8</sup>. With this in mind, we limited our sample to students from *Metropolitan Skolen* (High School), *Frederiksberg Studenterkursus* (High School diploma course) and *Handelshøjskolen* (The Copenhagen Business School). total we conducted the survey with 173 students, divided between the three schools (with one fourth from the *Metropolitan Skolen*, one fourth from the *Frederiksberg Studenterkursus* and two fourths from the *Handelshøjskolen*).

The respondents were 58% male and 42% female with an average age of 22.2 within a range from 17 to 30. The survey was conducted at the schools of the respondents, as this was the best way to ensure a high response rate.

### 2.3.2 Questionnaire

The questionnaire<sup>9</sup> was developed from the guidelines described in *DDA Nyt 27*<sup>10</sup> by Erik Strange Nielsen. Our aim was to make the questions unambiguous, readily understandable and not subject to individual interpretation. To ensure the highest degree of instrumental reliability<sup>11</sup> we tested the questionnaire on different representatives of our target group prior to the actual test.

The primary function of the questionnaire was to discover the target group's access to media relevant to Echelon, as well as to determine their basic media tendencies and habits. The media included in the questionnaire were: Mobile phones, Internet (including computers) and Television.

### 2.3.3 Sources of error

As the survey was conducted at the schools of the respondents they might have felt a pressure to "give the right answer". Moreover, they were filling out the questionnaire together with their classmates, which might have influenced their responses. Furthermore, a number of the respondents replied that we could contact them for a further interview but then supplied us with non-existing e-mail addresses, which indicates

---

<sup>7</sup> By Early Majority we are referring to the 34% of a population who are willing to adopt new innovations before they have been adopted by the majority of the population. They are often open-minded and liberal in decision-making. (Rogers:1983) For a further elaboration on adoption patterns see chapter 4: Target Group Considerations.

<sup>8</sup> See chapter 4 Target Group Considerations for the differentiation between "Audience" and "Participant Target Group".

<sup>9</sup> See appendix II for a copy of our questionnaire.

<sup>10</sup> Nielsen (1983).

<sup>11</sup> According to Nielsen, Instrumental Reliability is the "effect" of the layout of the questionnaire. He stresses the importance of wording the questions in a manner, which does not lead to individual interpretation (1983:15).

that these respondents did not take the survey very seriously. Lastly, the difference between what people say they do and what they actually do could be significant. For example, when answering how many hours they spend on line, respondents must estimate something they may never have actually counted, or they may not admit that they chat, if it isn't accepted among their peers. The results as well as the questionnaire of the media habit survey are in appendix II - IV.

## **2.4 A Qualitative Approach**

### **2.4.1 Methodological concerns of the test**

We conducted a user test of the Echelon prototype for two reasons; to test the stability of the system under the strain of multiple users and to get feedback regarding the usability, game play and overall atmosphere. The test was designed such that the respondents were to spend approximately two hours interacting with each other in the Echelon Game. Thereafter they were to fill out a general questionnaire regarding their impression of Echelon and finally it was our intention to conduct qualitative interviews with a selection of respondents.

Due to unforeseen database problems (see chapter 9 Technical Issues of the User Test) the test performed with 25 participants was stopped after approximately 20 minutes, and therefore did not provide the user feedback we had anticipated. Because we have only drawn technical conclusions from the user test and not received any feedback on the usability, gameplay and overall atmosphere, it will not be discussed further here (see appendix for the results of a limited user test and the interview guide V-VI).

## 3 ECHELON A TEST CASE

---

A project the size of Echelon, if implemented in the real world, would demand a considerable economic investment on behalf of the broadcaster. For this reason, such a project would go through many stages of development and testing before the broadcaster could make the final decision as to whether or not it was a viable concept. It has been our goal in this thesis to take the project through some of the early stages of development. Therefore we have constructed a working prototype of the Echelon Web game, with a fully implemented back-end and front-end system. This prototype can be used for initial concept testing and thereafter expanded and enhanced to reflect the results of the testing.

The Echelon television program exists exclusively at the conceptual stage (implementation of a prototype for the program would be beyond the scope of this thesis and the technical focus of its authors). As with the Web game, further development would require several iterations of testing and revision in order to insure that the concept has the necessary qualities to become a successful television program. Throughout our development, we have taken pains to insure that there is unity and harmony of theme between the television program and the Web game. Therefore, major revisions in either format will likely necessitate changes in the other.

Below we will describe the Echelon television concept, as it exists at this stage and present the Web game prototype and its features. In the Media Analysis chapter we analyze the benefits of the interactive elements provided in the Echelon format and discuss the qualities of a successful television program in order to examine the strengths and weaknesses of the Echelon concept.

### 3.1 The Echelon Concept

The Echelon concept, at its core, is a spy story. Rather than just watching the plot unfold, however, the viewers are encouraged to participate, to become “agents” working to solve the mystery, and be characters in the actual program. Thus, Echelon becomes both a spy story, and an interactive multi-player game. The concept is inspired by the much talked about global surveillance system of the same name, and the style, events and activities will draw from the same themes found in such movies as *The Game*, *The Matrix*, and *Enemy of The State*. Echelon on both the Web and TV has an exciting atmosphere where each transaction is blanketed in suspicion and uncertainty. Players must interact to be successful, but interaction is a risk. One never knows if one is the cat or the mouse, or quite possibly both at once.

The content for both the Internet and the weekly television program is based on the same ongoing story and each medium will build on the events and drama that unfolds in the other. Though they share the same theme and story, the Echelon concept provides unique content and a different experience for both the Internet user and Television viewer. It is the intent that the users or viewers will be able to experience and enjoy either

medium independent of each other, but that simultaneous participation in both media will give the user a uniquely interactive and enjoyable experience.

## **3.2 Summary**

Before going into depth with the different elements of Echelon we will offer a brief summary of the format to help create an overview for the reader.

### **3.2.1 General Concept**

Viewers participate in an interactive Television program and Web site, vying to be contestants on the actual TV show where they compete to be the first to solve the mystery of Echelon and win DKK 500,000.

### **3.2.2 Teasers**

Several weeks before the start of the Web game television commercials will begin to advertise the new kind of interactive program. The commercials will be of a mysterious nature in order to arouse the curiosity of the viewers.

### **3.2.3 The Promo**

To kick off the entire Echelon game, a half an hour “action” movie in the style of a classic spy film such as *Mission Impossible* is broadcast. This film will serve to capture the viewers’ interest and present the mystery that the participants must solve through out the series. At the end of the broadcast, eight weeks before the TV show begins, the Echelon Web game will start. The Echelon Web game will start eight weeks before the actual television series in order to build a participant base for the show, enable the participants’ time to acquaint themselves with the concept, and to create hype and viewer anticipation for the first broadcast. The promo could potentially be broadcast several times before the start date of the actual show in order to reach the viewers who may not have seen it the first time.

### **3.2.4 Echelon TV**

Six contestants must both work together in teams in order to uncover the next clue in the Echelon story; and compete with one another in order to be one of the three that continues on to the following week’s broadcast. Each week, contestants will uncover new clues, bringing them closer to solving the overall Echelon mystery.

### **3.2.5 Echelon Web Game**

Viewers compete with one another in the Echelon Web game to gain points, rise in rank, and be selected for the three open spots in the following weeks television program. During the television broadcast viewers can interact with the contestants on the show via the Internet and SMS. By successfully assisting a contestant in the show, the viewer gets

points applied to his score in the Web game, bringing him closer to a spot on the TV program in the studio itself.

### **3.2.6 Final Round**

The players who have successfully made it onto the show after the sixth episode will compete over the next four weeks for the final prize. At this point, no new contestants will be brought onto the show, and the primary focus of viewer participation will be assisting individual contestants on the show and working to solve the overall Echelon mystery<sup>12</sup>. Each week, one contestant will be sent home, until there are only three contestants left. The final television show will see the climax of the game when one of the three contestants discovers the last piece in the puzzle and is crowned the winner.

## **3.3 The Television Concept**

In each episode of the Echelon Television program, six contestants are divided into two teams of three and given a new mission. The mission will be the same for each team. The ultimate goal of each mission is to discover the surveillance videotape that is the next chapter in the Echelon story. In completing the mission, they will also get access to the information that will be uploaded to the Echelon Web site and incorporated into the following weeks' game play.

The missions will be designed to challenge the contestants both physically and mentally. Furthermore, the degree to which a team can quickly solve problems and move on is dependent on the amount of assistance they receive from the interactive viewers. As the viewers are free to choose which contestants they will help, the level of assistance a contestant receives will be dependent on his personality and the alliances he has previously made in the Web game.

The members of a team must work together in order to complete all but the final stage of the mission. In the final stage, the teams are broken up, and the contestants compete against each other. Each contestant's performance in the earlier stages, along with the number of transmissions they have received from viewers will influence their ability to succeed in the final stage. The three contestants who complete the final stage first will be selected to complete the mission and advance to the following week's program.

During the game players will discover information and clues, which are then broadcast to the viewer to be deciphered. Deciphering this information will be akin to solving a riddle or puzzle, and it will be presented in a way that both the active participants and passive viewers will be entertained. When the viewers have deciphered the information, they can transmit it back to the contestant of their choice.

---

<sup>12</sup> To ensure the continuing participation of the audience, a prize could also be awarded to the viewer who is most instrumental in helping the winning player through the final round.

### 3.3.1 Interactive Potential

The following are possible ways in which the viewer could interact and influence the television program:

- decipher information broadcast during the program and send back to contestants via the Internet or SMS.
- control surveillance cameras on the actual TV program via the Internet.
- find clues and helpful information on the web site that can be sent to the contestants before the TV program begins.
- communicate directly with a player in the final stage and guide her to her goal.

## 3.4 The Web Concept

### 3.4.1 The Web game

In the Web game, participants act as agents, interacting with, spying on and competing with one another to find clues, collect points and rise in rank. The Echelon Web site is designed to look like a high tech communication center and has a number of different interfaces through which players can chat, play mini-games, send private messages, and find information. These elements are all implemented into a larger unified game, which is intended to create a precarious yet playful and exciting atmosphere.

### 3.4.2 Targets and Assignments

In the Web game, each player has to keep three other players under surveillance; they are his *targets*. The player has an “*assignment card*” for each of his targets. An “assignment card” has a value and a list of six *assignments*. Examples of the assignments on an “assignment card” could for instance be:

- hold onto this target card for two days
- stay in the same chat room with the target for five minutes.
- receive a message from your target.
- make your target wrongly accuse another player of surveillance.
- play a game of “Spy Room” with your target and lose.
- get the target to say the following key word in a chat room: “Big Brother”.

### 3.4.3 Submitting an Assignment Target Card

Whenever the player completes one of the assignments, the value of the card doubles (i.e. the first completed assignment gives the card a value of 2, the second 4, the third 8 and so on up to 64). At anytime after he has completed at least one assignment, the player can submit the card to Echelon and receive the value of the card added to his point total. After submitting a card, the player is issued a new target and “assignment card”.

### 3.4.4 Accusations

If at anytime during the game, a player believes he is the target of another player he can *accuse* that player of surveillance. If correct, the accuser gets 12 points and the value on

the assignment card in question. If incorrect, 12 points are taken from the accuser and given as compensation to the player who was wrongly accused.

### 3.4.5 The Pay Off\*

Once a week there is *pay off* day. On this day every player who has acquired over 500 points must give 20% of their points over 500 to two other players in the game. If a player has 600 points, then she must pay out a total of 20 points to two other players, giving half to each. The pay off must be made by 10:00 PM, and the recipients of the pay off will be announced immediately after. Players are free to agree to exchange points with each other. However, there are no means by which to insure that both parties maintain their side of the bargain.

A player cannot make a pay off to the same player twice, and she cannot make the pay off to herself. Eligible players who neglect to make a payoff will have 25% of their points over 500 removed by Echelon and redistributed at random.

### 3.4.6 Gathering Information\*

A wealth of information related to the plot of the Echelon story is hidden on the Internet, and exists in the form of documents, video clips, and audio recordings. This element of the game takes its inspiration from the captivating computer game *Myst*<sup>13</sup>, where players acquire knowledge in order to solve "riddles" and advance to the next level. In Echelon new information, or chapters in the story will be placed on the Internet each week. Players discover the information, by deciphering clues from the television show and web site (and perhaps other media) and by sharing information with one another. It is up to the player to sift through the information and determine its value. In many cases the information will be irrelevant, false, or directly misleading.

Typically, the information will be integrated into the game of surveillance on the Web. For example, possible information related assignments might be:

- make the target download the surveillance audio clip located at <http://>
- send a message to the target containing the encrypted word in "The White Paper #63".

The information will also have an impact on the game play on the television show. For example, by scrutinizing a video clip on the Web, players may discover an access code to a locked door that is part of the scene for the television program. They can then save this information, and when, in the next television broadcast, contestants must pass through

---

\* Elements were not implemented in the prototype because they were either dependent on longer game play, or on the further development of the television concept.

<sup>13</sup> *Myst* ©1994 Broderbund Software, Inc. and Cyan, Inc.

this door, they can SMS the code to whichever contestant they choose. We will discuss this interactive process further in the section on the Television concept.

### 3.4.7 Future Mobile Features

In order to take full advantage of the possibilities offered by mobile phone technology, the Echelon game play could be extended into the real world. For example, clues could be hidden in locations easily accessible to the target group. Participants could then be lead to the clue through a series of SMS messages. These messages could either come from Echelon, or from online participants who guide a player to the location of a "real world" clue by accessing a series of maps on the Echelon Web page. In the later example, a player in Aarhus may be using maps on the Web page to guide a player in Copenhagen to a clue located somewhere in the Town Hall Square.

### 3.4.8 The Echelon Prototype

Here we will offer a brief description of the navigation of the Web game, referring to images of the prototype in Appendix I.

When entering the Echelon Web game, a white barcode appears on a black background just long enough to arouse the user's curiosity. Shortly after a red laser scans over the barcode and the Echelon logo emerges from the barcode (figures 1-3). The logo fades out slowly, and the log in panel appears. Here the user can choose to log in or to sign up for the Web game.

#### Sign Up (figure 4)

When signing up for Echelon the player is asked to give information about themselves, such as name, address, and age. Here the player also chooses a username that is how the other players will know him. The players can also write a brief description about themselves, and select to be notified about developments in the Web game via SMS or Email.

#### Log In (figures 5 - 7)

After logging in, a short film plays. A camera scans through the clouds, and then across a series of buildings in a city. It stops and focuses on a public square, then zooms in on a figure standing in the corner of the square. A red cross hair appears over the figure and the camera zooms closer. The scene fades out and a message appears on the screen from Echelon welcoming the user and instructing him to open the *Surveillance Center* window to get his assignment cards. He is also reminded to keep an eye on the *Status Bar* at the bottom of the screen that continually updates important information relevant to the game. Along the top of the screen are buttons that open the different windows the player will use throughout the game. The buttons are labeled: *Chat*, *Games*, *Surveillance Center*, *Communication Center*, and *Information Center*. When the player pushes a button the window slowly slides open, presenting him with the array of functions. If he pushes the button again (or opens a new window) the window slides closed again.

### **Surveillance Center (figures 9-10)**

Here the player can see his three assignment cards. If a target is online a green light is lit on the card (the status bar also shows how many targets are online). By clicking "view" on a card, he can see a list of the assignments for the card and how many of them have been completed. If the player thinks the card is worth enough points, he can turn it into Echelon to get the points that are on the card. (figure 15). In the Surveillance Center, players can also accuse one another, and receive the results of the confirmation.

### **Communication Center (figures 11 - 13)**

Here the player can communicate with other players, sending and receiving private messages. He can also access new incoming challenges, and see if he has received any returned challenges. If he has received a returned challenge, he can click replay and the Communication Center window will slide closed, and open the Games window. The status bar is automatically updated every ten seconds to tell the user if he has received any new messages, challenges, or returned challenges.

### **Games (figures 17 - 22)**

Here the player can create, respond to or replay challenges. Currently there is only one game, which is called "Spy Room" but the Echelon concept is designed with the intent that there will be many different types of games. The spy room consists of three rows of rooms, with 5 rooms in each row. The challenger places one hidden camera in one room from each row. The player who is responding to the challenge then picks one room from each row to walk through, hoping he can avoid the hidden cameras. When the game is replayed, a small figure (a red X) appears and moves through the spy room, following the path selected by the player who responded to the challenge. If the figure goes into a room where there is a hidden camera, there is a flash of light in the room, and the challenger is announced as the winner. If the figure completes the spy room without being caught by the cameras, the challenger is declared the loser.

### **Chat (figures 24-25)**

Here the players can choose to enter six different chat rooms. Players choose a chat room by moving a "sight" over an aerial photograph of several buildings in a harbor setting. When the sight scans over a building, a panel displays the name of the chat room and the number of players present. The rooms are called *The Factory*, *Headquarters*, *The Backroom*, *The Warehouse*, *The Tower*, and *Under the Bridge*. When a player clicks on a building, they are logged into that chat room. A list then appears with the names of the players in the room and the chat messages begin filling the screen. In the room called "Under the Bridge" all users are listed as "unknown" so that they can communicate with total anonymity.

### Information Center (figure 26)

Here players can view each other's profiles, find out who is online, and where each player is ranked in the game.

### 3.4.9 Participation Requirements

It is important to understand in considering the viability of the Echelon concept that it is not necessary to have the entire audience participate. What is required is that enough players are active in the Web game so that they can always have meaningful interaction with one another, and that enough participate in the television program to give the viewer the impression that there is an exciting level of interaction between the contestants and other viewers. Though it may be helpful, it is difficult to define what percentage of the audience must participate for the success of the format. The number of viewers a program must have before it is determined a success is completely dependent on the broadcaster and the time slot of the broadcast. Therefore, it is not possible to say, for example, that for the success of Echelon, 1% of the viewers must actively participate (though if Echelon had the same number of viewers as *Survivor/Robinson Ekspeditionen* or *Big Brother*, 1% would by far be more than enough).

For the Web game to be a real success the most critical requirement is that it has a lively atmosphere and an exciting game play. The Exact number of players needed to achieve this cannot necessarily be pre-defined, but we estimated that this atmosphere can exist if between 25 and 50 participants are logged on at the peak times of the day. In order to ensure this, it is likely that roughly 300 to 400 players must be signed up for the game and play frequently. Again, for the interactive elements of the TV program to function so that they enhance the experience for all, we feel that only a limited number of viewers must participate. We estimate that if 50 viewers are active, this will be enough to create the atmosphere we strive for in the show.

We would like to stress, that the figures above are only estimates, and it would of course be ideal if many more viewers were active. What we are trying to indicate in our estimations is that a much smaller percentage of the target group is needed as participants than would be required as viewers, in order for the format to be a success. What is most important is that the small percentages of the audience that do participate do so actively and throughout the course of the program.

## 3.5 A Scenario

Oliver has seen the commercials on TV2 advertising for the new TV/WEB game concept called Echelon. There is an element of mystery in the commercial along with the promise of winning a spot on a television show that piques his curiosity. He decides to watch the promo movie the following Tuesday. The movie is quite exciting, and presents the beginning of what Oliver thinks is a very interesting and mysterious story. The show ends with a big question mark, and invites the viewers to sign up for Echelon and try to solve the mystery. Unfortunately, Oliver has a date with some friends right after the

show, but when he gets home from school the next day goes online and opens the Web page of the TV station that broadcasts Echelon. He reads the short description of the game, and thinks it sounds exciting. He decides to sign-up.

Oliver fills in the required information, chooses the username “AgentX” and logs on to Echelon. He reads the welcome message from Echelon and then opens the Surveillance Center to see his assignment cards. He clicks on the different cards and reads the 6 assignments he has to complete for each card. He opens the Information Center and reads the profile of his three targets. Oliver checks the status bar along the bottom of the screen and sees that among other things that there are 75 players online and one of his targets is logged on. He checks his assignment cards and sees that the target with the user name “Putin” is logged on. He reads the assignments and sees that one of his assignments is to “Be in the same chat room as Putin for five minutes”.

Oliver opens the chat window and a graphic appears with a satellite photograph of a cluster of buildings. He moves the mouse over each building and the display window lists the name of the building and the number of players inside. The Warehouse has the most players with 18, so Oliver clicks on it and enters.

In the Players window a list of the players inside the Warehouse appears and chat messages begin scrolling in the chat window. Oliver notices that there is a lively chat going on, and then quickly scans the list to see if “Putin” is in the room. Putin isn’t there. Oliver mouses over the satellite photo and sees that there are 10 players in the chat room called “Under The Bridge”, which is described as a dark and “anonymous” place. He logs in and discovers that anonymous means that all of the players in the room are listed as “unknown”. He finds this amusing, but he is looking for “Putin” so he logs out and enters the room called “The Factory”. He scans the list of players and quickly sees that Putin is in the room.

Oliver sits and waits excitedly, and keeps an eye on the clock.. He is a bit timid, so he doesn’t chat, but just waits. A few players leave the room, but Putin is still there, chatting with a player named “Madonna”. Suddenly, a window pops up on his screen saying “Suspicious Activity Penalty. You have been inactive in The Barracks for over three minutes, and therefore removed from the premises.”

Oliver kicks himself for having forgotten this rule. He remembers that according to the rules he is both removed from the room and all players in that room are informed of his suspicious activity. He mouses over “The Factory” again and sees that all the players have left room. He clicks back into “The Warehouse”. Putin isn’t there, and Oliver decides to let some time pass before trying to find him so that he will not arouse his suspicion.

The player named “Madonna” is there and lightly teases Oliver for what happened in “The Factory”. Oliver begins to chat with her and explains that he is new to Echelon. She and a few other players begin to tell him how things work and give him tips about how to play and what he should watch out for. Suddenly it occurs to him that Madonna

has been chatting with him quite a bit and he begins to get suspicious. He quickly leaves the Warehouse, which will prevent her from fulfilling the possible assignment “Be in the same chat room with your assignment for 5 minutes”. He enters the Warehouse again and Madonna sends him a smile and says she glad to see he is learning the game. She tells him to check his Status Bar.

Oliver looks at his Status Bar and sees that he has one new message and one challenge. He opens the Communication Center window and sees that the message is from Madonna. He reads it. “Would you like to play a game?”. He clicks on the challenge and sees that Madonna has challenged him in the Spy Room.

By now he is fairly suspicious that he is one of Madonna’s targets, and considers rejecting the challenge. He decides though, that it is all in fun, and that he has zero points and is ranked last. He has to start somewhere. He accepts the challenge and enters the Spy Room that Madonna has created for him. He reads the rules and sees that his goal is to choose different doors and navigate to the exit without entering a room where Madonna has placed a hidden camera. He chooses three doors and clicks the send the button.

A movie plays showing Oliver navigating through Madonna’s Spy Room and successfully avoiding the hidden cameras. Oliver wins and receives 2 points while Madonna loses 1. He sends her a quick message teasing her about her defeat.

He remembers that in Echelon you can accuse players of Surveillance. He opens the Help panel<sup>14</sup> and reads the rules for accusing a player. It says that if you accuse correctly you get 12 points plus all of the points the player has collected on your target card. If you accuse incorrectly you lose 12 points and the player you wrongly accuse gets 12 points. It occurs to him that Madonna could simply be trying to trick him into accusing her. On the other hand, he thinks that if she does have him as a target, it would be wise to wait until she has more points on the card before accusing her, that way the pay off would be more.

He decides to wait and keep an eye on Madonna before deciding whether or not to accuse her. Oliver goes back to the Chat Center and finds “Putin” in The Backroom. The topic of conversation is the Echelon television show (which in three weeks will air for the first time), and the players are speculating about what it will be like. Oliver gets caught up in the conversation and before he knows it five minutes have gone by and he has completed his first assignment on Putin’s assignment card. The card now has a value of two points. Another assignment on the card is “Hold onto the card for 5 days”. A third challenge is “Lose to Putin in the game called “Cold War”<sup>15</sup>. In all, there are six assignments and if he completes them all, the card will be worth 64 points. He decides to hold onto the card.

---

<sup>14</sup> This has not been implemented in the prototype, but would be essential in the actual game.

<sup>15</sup> The name for one potential game, it is not, however, implemented in the prototype.

Oliver accepts a few game challenges from other players, and sends a few challenges. He explores the different options on the Web game and discovers what he is sure must be a clue. It is a confidential document that obviously has something to do with the story from TV. He pieces together a few clues in the document that reveal the location of an audio recording. He finds the recording and listens to it, then searches the site for more hidden information. He finds a few more documents and though he doesn't feel like he has begun to solve the mystery of Echelon, the story is beginning to get even more interesting.

Eventually he goes back to the Information Center and sees that there are two hundred players signed up for Echelon and that Madonna is in sixth place. He hasn't been able to find Madonna since the game of Spy Room, but he can see she is still online. Putin has logged off. Oliver decides to send him a challenge in a game of "Cold War" and then he logs off. Before logging off he sees he has gained a total of six points. He is no longer ranked last, but is still near the bottom.

### **3.5.1 The Following Week**

Oliver has been on Echelon several times in the last week, spending a total of about three hours playing the game. After the first day he told his friends about the game, and discovered that he had actually been in the same chat room as one of his friends the night before. Since then several of his friends have signed up too, and he has met them online several times and played a number of games with them. In the last week he collected 32 points on Putin's card and successfully submitted it and he managed to get two other players to wrongly accuse him. On top of that, yesterday was "Pay Off" day. He paid out 20 points to two other players he had met in the chat room but received 30 points in payoff from Madonna. He has begun to put a few pieces of the mystery in place with the information he had collected in the Web game. He is now ranked 20<sup>th</sup> and there are 400 players signed up for the game. There are only seven weeks left to the first TV show, and the game is already beginning to heat up.

## 4 TARGET GROUP CONSIDERATIONS

---

When developing a product or concept it is necessary, at a very early stage, to have a clearly defined target group. The process of determining a target group should not be separate from the development of the product as it is closely related to the nature of the product itself. Throughout the stages of concept development, it is important to maintain a clear understanding of the needs, desires and habits of the target group. When considering an entertainment format such as Echelon, there are two interrelated issues at stake, which from the perspective of the broadcaster and the concept developer are important to consider. First, it must be determined if the target group has the desire to watch this kind of TV format. Second, it should be determined if the target group has the means to and interest in participating in the cross-media format. In order to consider these issues, this chapter will focus closely on the target group and the process by which new media is adopted. Furthermore, Rogers *Diffusion of Innovation Theory*<sup>16</sup> will be considered in relation to the adoption of new media and in particular to cross-media use.

In the creation of an interactive show like Echelon, it is important to distinguish between two different target groups. The group of people who would like to participate actively in the show and the website and the other group who would like to watch the television show once a week and perhaps visit the website once in a while. In order to differentiate between these two groups, the first one will be referred to as the “participant target group” and the second one as the “audience”. “Target group” will only be used for generalization and will include both groups. The focus will mainly be on the participant target group.

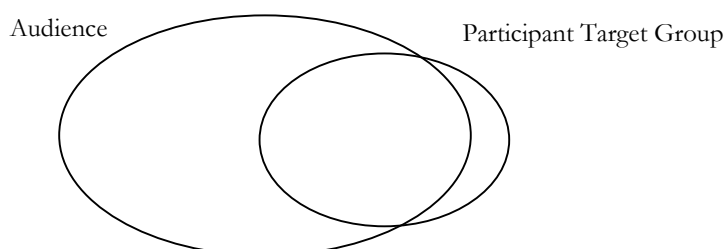


Figure 4.1: Target Group of Echelon

The overall target group of Echelon is broadly defined as Danes in the age of 17-30. There is however a difference in the “participant target group” and the “audience”. Where the “audience” will consist of the broad group of 17-30 years old, the “participant target group” will be more narrowly defined by including other characteristics, as not all 17-30 year olds can be expected to have the means nor the interest in participating

---

<sup>16</sup> Windahl, Signitzer and Olson (1992:57).

actively in Echelon. We presuppose that the people forming the Participant Target Group will be not only first adopters of new technology but they will also share a mutual sense of “media exhibitionism”. In the following we will discuss the *Diffusion of Innovation Theory* in relation to the results of our Media habit survey in order to prove validity to our definition of the target group.

## 4.1 Participant Target Group: Early Adoption of Cross-Media

Cross-media involves two or more media that are used in an integrated and coordinated fashion. The adoption of or participation in a cross-media concept can require two potential changes from the participant. It may either demand that users adopt a totally new medium (or technology) or that they begin to use a known medium in new ways. The advent of the Internet for example, required users to adopt an unknown medium, whereas the use of SMS or text TV are examples of users learning to use a known media, here mobile phones and television, in new and different ways. We are primarily concerned with the later demand. As we will show, our target group has access to the necessary media that the Echelon concept utilizes so there will be few who have to adopt a new medium. What is required of the participants however is that they use these media in a new way. Our primary focus is cross-media with Television at the center of the media integration, but we will also examine cross-media adoption in relation to other media such as Internet/mobile telephony.

Cross-media use, however, could theoretically be considered as an adoption of a new medium and it is therefore relevant to take a look at the *Early Innovation Diffusion Theory* first described by E.M. Rogers in the early eighties.

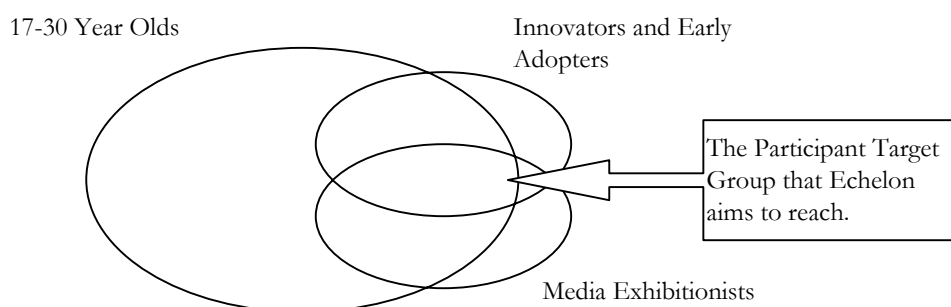


Figure 4.2: Participant Target Group

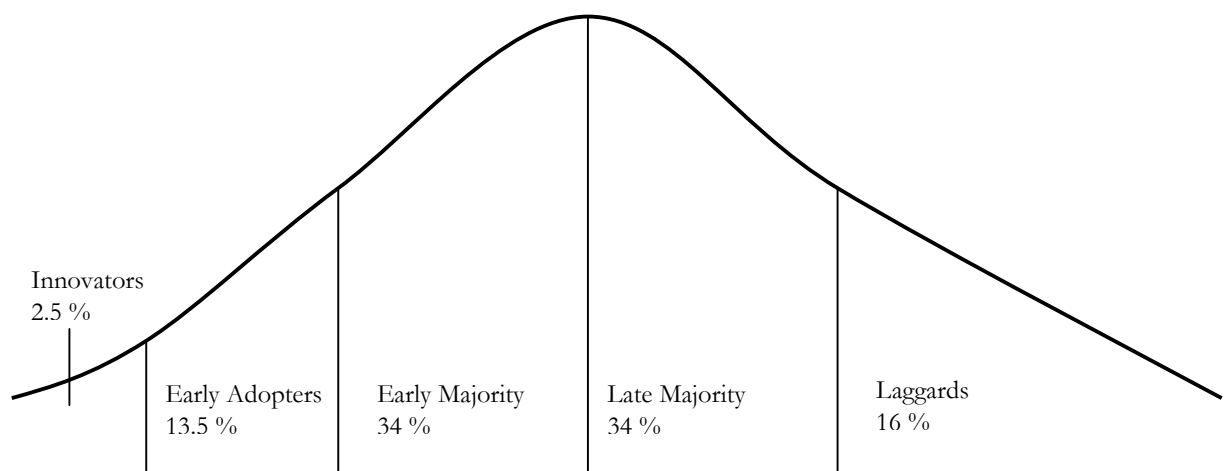
### 4.1.1 Diffusion of Innovation Theory

The main focus of the diffusion of innovation theory is whether an innovation is adopted or rejected rather than *how* it is adopted<sup>17</sup>. In the theory the adoption is not solely limited to an opinion or the consumption of a product, very often innovation theory regards a behavioral change within the individual. The theory defines diffusion as the adoption of the innovation.

The adoption process can be divided into several stages: *knowledge*, *persuasion*, *decision*, *implementation* and *confirmation*. Relating this to the adoption of a new product, the consumer first has to know this new product exists, before an attempt of persuasion can begin. Then the consumer has to decide on whether to adopt or reject it and then (in the case of adoption) implement the new product into his or her everyday life. Finally he/she should receive confirmation of some kind, assuring him/her that it was a good choice to adopt the new product.

Rogers continues the theory by categorizing the degree of innovation among the adopters. As illustrated below in figure 4.3 the adopters are divided into five categories. These can shortly be described as follows:

1. Innovators: People who take risks and have more cosmopolitan relationships than members of the other categories.
2. Early Adopters: People who are respected role models in the social environment and whom others ask for advise.
3. Early Majority: People who are open minded towards innovations and take liberal decisions.
4. Late Majority: People who tend to be critical and often need persuasion and pressure in order to adopt an innovation.
5. Laggards: People who are traditional in their thought and very suspicious towards



innovations.

Figure 4.3: Rogers' definition of degree of innovation<sup>18</sup>

The categories tend to mirror social position and level of education in that highly educated are more likely to be among innovators, early adopters and early majority<sup>19</sup>. Moreover, the access to mass media and new technology are higher among the first categories; the innovators may even use the technology purely for its “new-technology-factor” instead of its usefulness. An example of this is the WAP phone. Although the amount and quality of services has been quite limited, there has been a willingness among the innovators and early adopters towards the new medium. The innovators/early adopters of WAP phones consisted of a “high profile<sup>20</sup>” target group and the “tech generation<sup>21</sup>”. Although the WAP services did not succeed in offering the “mobile Internet” as promised in the ads, this small group of people were still willing to pay for the newest gizmo.<sup>22</sup>

Rogers claim that the different adopter categories are susceptible to different messages and arguments as well as being influenced through different channels. Late adopters, for example, are likely to adopt the innovation by persuasion of early adopters. This interpersonal channel is not necessarily the best choice of communication for late adopters, yet it can be useful for this group as well, not as persuasion but rather as a justification for the cost. Late adopters have, as mentioned, limited resources in terms of money, education and literacy<sup>23</sup>. Where innovators and early adopters are susceptible to messages such as newness and actuality of an innovation, late majority and laggards are more likely convinced by messages arguing that the innovation is used successfully by a great number of people. An example of this is the current TV commercial (“Polle fra Snavet”) for Sonofon mobile phones. Here a young, less intelligent “Red Neck” is taught how to use his “mobilos” (his mobile phone) through his friends' victimization. Polle is represented as ignorant and “un-cool” compared to his friends, who all know how to use their mobile phones. This is a clear example of an educatory message from the early adopters/early majority to the late majority and laggards.

---

<sup>17</sup> Severin, 1988 in Windahl, Signitzer and Olson (1992:57).

<sup>18</sup> Rogers (1983:114).

<sup>19</sup> Rogers (1983).

<sup>20</sup> By “high profile” we are referring to the group of people who were in possession of the early WAP phones. This was mostly people working in the IT-Industry or people with a higher income, which allowed them to purchase the – then -rather expensive devices.

<sup>21</sup> Youngsters between 18-30 that are raised with computers, mobile phones and other technical devices as an integrated part of their everyday life.

<sup>22</sup> Barkhuus, Cauchi, McLean, Norberg and Pruzan (2000).

<sup>23</sup> Windahl, Signitzer and Olson (1992:63).

Regarding the aspect of innovation within the theory, Rogers highlights how an innovation requires certain qualities. These include the *advantages* of an innovation compared to the old alternatives and its *compatibility* with the existing context. The innovation should also not be too *complex*, meaning it should not be perceived as difficult to use or understand, and it should be readily *available* to try without total commitment. Last, the innovation should be *observable* in that benefits and disadvantages are clear to the adopter. These qualities will be elaborated according to new technology in the following section.

#### 4.1.2 Diffusion of Innovation in Relation to Cross-Media Use

In order to relate the above-mentioned theory to the adoption of cross-media, one important factor should be pointed out. Rogers' theory assumes that a product will eventually reach the entire population (that is the population of a certain community) but it is likely that with the rapid development of new media through the last two decades, the theory should be revised. Media such as the personal computer/Internet access have yet to reach the laggards and it is questionable if they ever will. Statistics indicate that certain individuals are opposed to the technologies or that they do not feel a need for these "gadgets"<sup>24</sup>. According to Rogers' theory they are still considered part of the population and advertisement is still targeting these people but the question remains, whether they will ever adopt the innovation. Moreover, technical innovation is faster than ever and the VCR might be the last consumer-electronics product to reach 90% penetration<sup>25</sup>. This means that Rogers curve is not easily applicable to the adoption of newer media.

Using several media interchangeably is different from adopting a new media in that the adoption of each media independently has to be in place and the user should already be familiar with the new technologies. Furthermore, it is not certain that all the users of a single technology will be able to handle the complexity of the cross-media use; a study from Stanford Research Institute made in 1997<sup>26</sup> indicates that the early majority does not have this ability. The study claims that the early majority value simplicity over sophistication and if companies hope to reach beyond early adopters, they 'need to adapt their products, services and marketing message to the needs of these consumers'<sup>27</sup>. The more sophisticated products are only attractive to innovators and early adopters. With a new generation that is more comfortable with multitasking, the adoption of cross-media use might be more realistic.

---

<sup>24</sup>. Denmark's statistics shows that 70 % has access to personal computer in their home "PC og adgang til Internet 2000" [www.dst.dk] and in 1999 82% had a VCR in their home "Indkomst, forbrug og priser" [www.dst.dk].

<sup>25</sup> Christie et al (1997:6).

<sup>26</sup> Christie et al (1997:8).

<sup>27</sup> Christie et al (1997:4).

Rogers' theory is still relevant, however, in that it defines the levels of adoption along with the steps of adoption and the qualities of the product. Before concluding on characteristics of the Echelon target group, the adoption of cross-media use by innovators and early adopter will therefore be applied to the diffusion of innovation theory as described by Rogers.

### **Rogers' stages of adoption in relation to cross-media use**

The stages of adoption proposed by Rogers should be applied to cross-media in a more subtle way than to other innovations such as the adoption of the Internet. When considering *knowledge*, the viewer must first be aware of the interactive possibilities in a program. This could be through exposition of the gradually diminishing limits between different media (an example of this is the Internet's move from the computer media to the mobile media as seen with WAP and PDAs). Increasingly, TV shows use other media to create a sense of interactivity and community in addition to the show itself. An example of this is the TV show *Big Brother*, which has based a major part of its concept on the viewers ability to follow the show and interact with the contestants through the website and by enabling the viewers to participate in deciding who should leave the house, by casting their votes by phone<sup>28</sup>. However, in order to make people aware of these features, the producers have to communicate through the traditional channels, such as TV sound bites, to promote interactivity and the new "allies" of the TV show. This brings on the next stage of the theory: *persuasion*. Before the viewer interacts they must first be persuaded as to the benefits of interaction<sup>29</sup>. The consumer has to *decide* on participating in the interactivity. According to Christie et al. this is the crucial part where many consumers choose 'a passive entertainment experience [instead of an interactive one](...) because their work experience is already too interactive'. The authors continue by claiming that 'little reason exists to believe that today's couch potatoes aspire to become couch commandos'. The transition is easier to make when the audience is already used to continuously adopting new media, which supports the notion that young adults will be the early adopters of cross-media use. Finally, the viewer goes through a *learning* process before *implementing* the use of other media with the TV. The *confirmation* stage in Rogers' theory is where the user gets a sense of empowerment. The chapter on Media Theory is devoted to these qualities.

### **Degree of Innovation Among the Adopters**

One of the central issues of the adoption of cross media use is the innovation among the adopters. Again it is important to keep in mind that the innovation of using more media interchangeably is a different situation than the innovation of using a new media. The adopters need to have initial access to the media and be familiar with its use before being able to draw the media into a new context. This criteria means that early adopters and

---

<sup>28</sup> See also discussion of community and its relation to customer loyalty in chapter 6 Media Analysis.

<sup>29</sup> See also the discussion of lean-back versus lean-forward in chapter 6 Media Analysis.

heavy users of new media will most likely be early adopters of cross-media use as well, a view also held by Christie et al.<sup>30</sup>. People who have adopted the mobile phone at an early state will also sooner be willing to use it combined with their TV.

When looking at our target group and their use of media there are clear indications that they will be among the early adopters of cross-media and new media in general (see above), as they generally have very high access to new technology. 83% of our respondents own a mobile phone and of these, 84% use SMS regularly. WAP however is not that popular, only 8% (14 people) have a mobile phone with WAP and of these only two people use it everyday or weekly<sup>31</sup>. The statistics for Internet access in the homes are very high as 82% of the group has Internet access in the home compared to 45% in the general Danish population<sup>32</sup>. 23% of the group have ISDN or a faster connection, making it more likely that they are high consumers of the Internet and spend many hours on this fairly new medium. 91% have their own TV, which is high since many of the respondents still live at home (22%) with their parents. We assume that this offers a greater chance of cross-media use than if the TV had the status of a family centered medium where programs had to be agreed upon. Also Set-top boxes are, in contrast to the general population quite popular with our respondents as 17 of the test subjects have one in their home - however more than half of these live at home with their parents. This number should, be read with precaution as a possible source of error could be that many of our respondents are 2<sup>nd</sup> generation immigrants, who could be suspected to own a Set Top Box (STB) in order to be able to watch some of the foreign packages such as the Turkish, Polish and Pakistani.

Overall the above numbers indicates a great distribution and use of media, such as the Internet, mobile phones, SMS and TV, in the target group and it is therefore likely that a great number of people in this group are ready for new ways of using these media.

The test subject's eagerness to interact with different media simultaneously is well supported by the results of the questionnaire. Over half of the group uses other media while watching TV, most use the telephone but 60% use the Internet simultaneously with watching TV. However, for more than half of these respondents the TV acts as background noise, which indicates that the TV is taking over the role of the radio as a secondary/background medium. When considering more direct interaction with TV programs the respondents are more hesitant. Their hesitation might be related to the fact that they haven't been "persuaded" to the benefits of interacting with the TV program yet. Although 64% have been on a website for a TV show, most (73%) have never been in direct contact with a program neither through E-mail, by phone nor by voting over

---

<sup>30</sup> Christie et al, (1997:18).

<sup>31</sup> This factor is also commented in the chapter Media Landscape where reasons for WAP's lack of popularity is dealt with.

<sup>32</sup>"PC og adgang til Internet 2000" [www.dst.dk].

the Internet. Of those who have actually interacted, 86% have only participated in a vote, either by phone or the Internet.

An important criterion for the participant target group is that members feel strongly about wanting to “be on television”. This media hysteria associated with reality TV is quite a recent phenomenon, leading to shows such as *Survivor*, *The Bar* and *Big Brother*<sup>33</sup>. Offering the regular citizen the opportunity to have his or her 15 minutes of fame; the shows rely on people’s urge to be seen by a large audience (nationwide) as well as that audience’s urge to watch the “guy next door” by peeping through the keyhole of the TV screen. The increasing popularity of this kind of television format, suggests that many people, especially young people between 20 and 30, are among this “media-hungry” group<sup>34</sup>. Although there seems to be a clear indication of willingness to use more media simultaneously the question remains whether a concept like Echelon will be able to persuade the audience into active participation.

If we look at the media habit survey, the participation factor is not very large among the respondents. However, shows like *Prisoners of the Fort*, *71° North* and *The Great Mission*<sup>35</sup> are the three programs the respondents are most eager to participate in. This indicates that the target group does have an interest in participating in the Echelon show, which we consider to be related to these three shows. The concept of having participants that are physically active but who do not reveal themselves to the same degree as in *Big Brother* and *The Bar* is what Echelon aims for as well. 42% claim that they would “perhaps” or “definitely” like to participate in either *Prisoners of the Fort*, *71° North*, *The Great Mission* or a combination of more than one of the three shows mentioned. This is a strong indicator of the interest that young people have in exposing themselves on TV and participate in shows that require motivation of exposure as well as the competitive element. An element of error, however, is that what people say they want and what they really want are not always the same and the percentage should therefore be considered the high end of the actual media participation rate.

An interesting issue regarding reality shows and quiz shows is the relationship between who wants to participate and who wants to watch. These two groups do not always overlap. *The Bar* and *Big Brother* are TV shows that stand out in this sense. They are very popular shows among our respondents but the participant eagerness is not very high. The highest rate is found in *71° North* and *Who wants to be a Millionaire?/Hvem vil være millionær* where 75% of the people who watch these shows would also be interested in participating (by answering “yes” or “perhaps” to participation).

---

<sup>33</sup> These shows have been produced in many of the European countries and many similar shows have been produced in The United States as well, though most of the concepts are originally European (Swedish and Dutch). For a further elaboration on these types of reality shows, turn to Media Analysis chapter 6.

<sup>34</sup> According to the producers of *Big Brother* the big majority of the 2200 people who applied for a part of the TV show, were between the age of 20 – 30, *Big Brother – The Talk show* (March 29<sup>th</sup>, 2001).

<sup>35</sup> “Fangerne på fortet”, TV3, ”71 Grader Nord”, TVDanmark and ”Den Store Mission”, TV2.

## The Required Qualities of the Innovation in Relation to Cross-Media Use

According to *Diffusion of Innovation* the innovation must have certain qualities that project it above other alternatives as perceived by the adopter. Cross-media use must have advantages that could be regarded as such; for instance advantages such as empowerment of the user and a sense of community among interactors. The cross-media use should be compatible with, and fit into, already existing technology, a very important factor since cross-media is based on the use of current information technology.

Another way of interpreting this compatibility is the compatibility to the consumer's lifestyle. In the case of Echelon this could be something as simple as whether or not the user has access to the Internet from the same room as where the TV is located, enabling interaction via the Internet during the TV show. In our media habit survey 59% of the respondents had access to a computer from the same room as the TV proving Echelon's compatibility (in this case) with the everyday life of the respondents.

Bringing it all back to Rogers qualities of Innovation, the degree of complexity is very relevant for cross-media. As mentioned, the innovation should not be perceived as being too complex. In the case of cross-media the adopter is already familiar with the technology, yet they are being asked to use it in a new and different way. As mentioned before, there are limitations to how the user wants to interact with the TV since TV is traditionally perceived as a lean-back medium. Presently only gaming consoles and set-top boxes are exceptions to this passive use of television. The act of interacting with TV content can on many occasions be perceived as complex, especially because it involves an active change of passive behavior. A perceived complex task could for example be the performing of complex assignments on the Internet in connection with a TV show.

Availability, however, is not relevant due to the definition of cross-media use, which is not the use of a new media, but the use of an existing media in connection with other media. It is not likely that consumers acquire new consumer electronics for the sole purpose of interacting with other media.

The last quality of innovation is the observability of advantages and drawbacks. Both the Participant Target group and the audience can observe the effects of adopting cross-media as they will get a more valuable experience. Some might be reluctant, however, to change their passive media consumption into an active usage as they are used to perceiving the television as a "lean back" media offering relaxation with little or no activity required. It is possible though that the user does not necessarily perceive action as a negative if the advantages are immediate. Moreover, innovators and early adopters might find interaction and new ways of using present media to be a challenge<sup>36</sup>.

As seen in the application of the innovation of diffusion theory to cross-media use, not all aspects of the theory are relevant or fit this kind of innovation and the theory has limited value in helping us plan for the success of the proposed format. However, it is

---

<sup>36</sup> For a discussion of the willingness to "lean forward/lean backwards" see chapter 6, Media Analysis.

interesting to see that although the development of new technologies and media require a change in the diffusion of innovation theory, the necessary qualities of an innovation are applicable to the innovation of cross-media.

## 4.2 The Echelon Target Group

As the above discussion of the target group, and the process by which new media is adopted, has shown there are clear indications that this segment of the population – the innovators and the early adopters share both the interest and the capability of using a cross-media concept like Echelon. There are however differences in the mode of using the cross-media concept, which is why we have divided the target group of Echelon in to “the participant target group” and “the audience”:

### 4.2.1 The Participant target group

The target group consists of people between 17 and 30 that are familiar with new technologies such as cell phones, WAP phones and the Internet. Furthermore the target group feels comfortable using these technologies and is prepared to use them in new alternative ways. They are among the “innovators” or “early adopters” of new media and technology. These people are often young and belong to the “tech-generation”. The group feels strongly about “being on television” – and might even be called media exhibitionists; a factor that should boost the participation rate in the Echelon game.

### 4.2.2 The Audience

The audience is different from the participant target group in a number of ways. Similar to what we discovered in our media habit investigation not all the people who watch *Big Brother* and *The Bar* would want to participate in it. Thus we do not assume that all the same people who find the Echelon show entertaining will necessarily want to play the Echelon game. The demographic characteristics, however are roughly the same, derived from the assumption that viewers like to watch TV shows with people from their own segment. Since the audience is previously defined as the somewhat passive audience of the entertainment show, they do not need to have as much access to new media as the participant target group. To benefit from the interactivity within the TV-show (such as finding the unpredictable elements amusing), the audience should be at least early majority or even early adopters.

## 5 MEDIA LANDSCAPE

---

The success of Echelon as a television oriented cross-media concept requires that new media and technologies such as the mobile phone and the Internet are widely accessible to the target group. For this reason, it is important to conduct an analysis of the current media landscape in Denmark. Where possible, we will limit our research to include the media distribution and usage patterns for *our* target group rather than for the broader population.

As the concept will only become a marketable format in the near future, this kind of analysis will only provide a partial basis on which to base decisions. In a further development of Echelon an analysis should be taken in order to grasp the extent to which the media landscape has changed, and revisions to the format should be made accordingly.

In this chapter we will attempt to answer the following questions.

- Which platforms do our target group currently have access to?
- What does the target group's media use consist of?

By answering the above questions, we hope to determine to what extent our target group is willing and able to interact with and view a cross-media format like Echelon. We will limit our research to the following media and technologies, which we find relevant in relation to the Echelon cross-media format: TV, Set-Top Boxes (STB), Text TV (TTV), game consoles, cell phones, WAP enabled cell phones, PCs and the Internet<sup>37</sup>.

Though the Echelon concept presented in this thesis utilizes only the TV, PC, Internet, and SMS enabled mobile phones, we will investigate the other technologies and media as they may potentially play an important role in future versions of Echelon. Furthermore, in considering the future prospects of cross-media and how coming technologies may impact Echelon, we will present a media forecast for Denmark in the year 2004.

### 5.1 Present Media Distribution and Usage in Denmark

#### 5.1.1 Television, Text TV and Set-Top Boxes

##### Television

96% of Danish households own a television set<sup>38</sup>. This number has been fairly stable over the last years. Our media habit survey with representatives of our target group<sup>39</sup>

---

<sup>37</sup> At this point the majority of PDAs on the market in Denmark does not have Internet access. Therefore the following analysis will not include the distribution and use of PDAs in Denmark.

<sup>38</sup> According to Gallup TV-Meter, April 2001.

shows that 91% of our respondents have their own TV set and of those not living at home, 94% have their own TV<sup>40</sup>. This is closer to the level of penetration in the whole Danish population. The lower number of TV sets among our respondents is likely explained by the fact that many live at home and therefore share the family TV. It may also be attributed to the limited net disposable income of most students.

When looking at the TV consumption, there has been a slight change in the development of TV-usage the last couple of years as shown in figure 5.1.

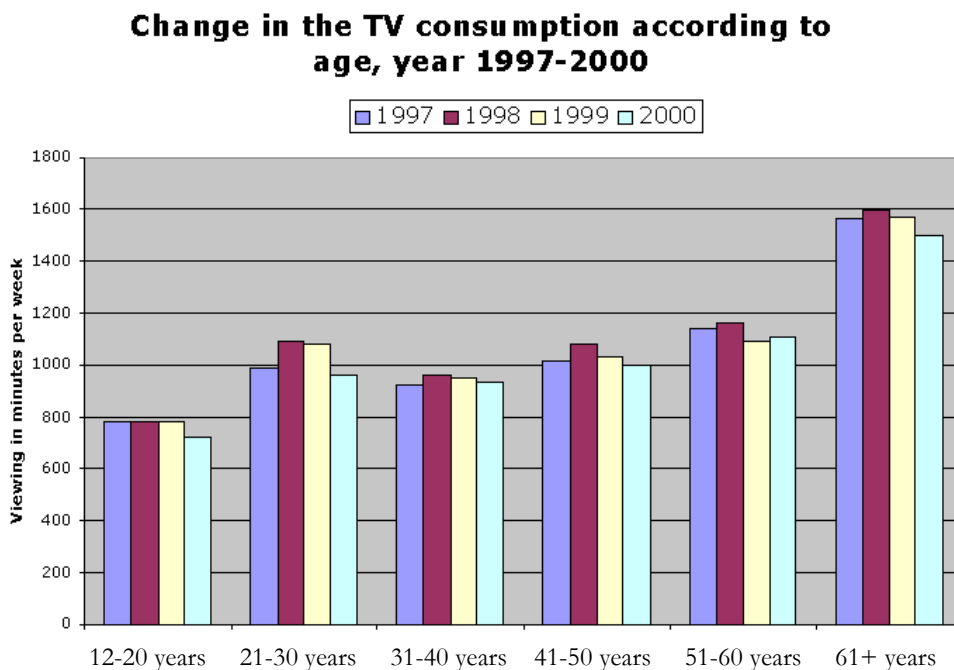


Figure 5.1: Change in TV consumption<sup>41</sup>.

The above figure shows that TV-usage had its peak in 1998, after which it has stagnated or declined slightly. In the age groups 12-20 and 21-30 there has been an even larger decrease in the TV usage from 1999 to 2000. This is likely attributed to an increased use of other media such as the Internet, game consoles and mobile devices.

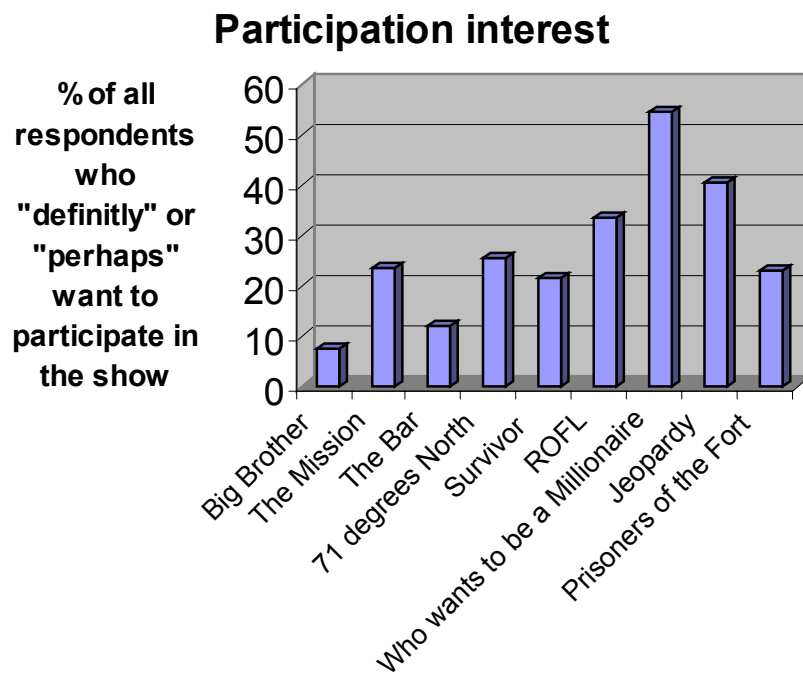
Figure 5.2 shows the percentage of respondents in the media habit survey that expressed an interest in participating as competitors in the different shows. As discussed in the previous chapter there is no real correlation between viewer-interest and participation-interest. In general there is a greater interest amongst our target group in watching reality

<sup>39</sup> For a sum up of the results of the survey please see appendix II-IV.

<sup>40</sup> By “live at home” we mean those who are living with their parents.

<sup>41</sup> Gallup, TV-Meter, 2001.

shows such as *Big Brother* and *Survivor* rather than the more quiz-oriented shows such as *Who wants to be a Millionaire* and *Jeopardy*<sup>42</sup>. The official statistics supports this: Gallup TV-meter's survey shows that *Big Brother* has a maximum of 408,000 viewer per show and *Survivor* had the greatest success with an average of 970.000 viewers<sup>43</sup> per show in the fall 2000<sup>44</sup>. In contrast, *Jeopardy* had 329,000 viewers on May 26. 2001<sup>45</sup>. *The Mission* had an audience of 564,000 for the shows in the spring of 2001 and 843,000 viewers for the shows in the fall of 2000<sup>46</sup>. Though only 11% of the age group 15-29 actually watch the show *Who wants to be a Millionaire?*, these shows have the highest degree of participation



interest amongst our target group according to our media habit survey,<sup>47</sup>.

Figure 5.2: Participation interest within the target group.

<sup>42</sup> A broader analysis of these formats will be conducted in chapter 6 Media Analysis.

<sup>43</sup> This is an increase in viewer ship as the show had an average of 876.000 viewers per show in the fall 1999. Christina Rithfeldt, TV3 Media Research.

<sup>44</sup> It should however be considered that *Big Brother* and *The Bar* are programs that are broadcast several times a day, where the quiz shows mainly have a weekly timeslot. Hence, the cumulative audience figure is even higher for the two reality shows than for *Jeopardy*.

<sup>45</sup> According to TV2s own numbers on: <http://omtv2.tv2.dk/seertal/seer.asp>.

<sup>46</sup> Annelise Langkilde, *Analysen*, TV2.

<sup>47</sup> Ibid.

## Text TV

Text TV (TTV) consumption is relevant in connection with the potential of dTV as the use of TTV requires the user to use television in a more interactive manor and for purposes other than its original intent. The fact that 86% of the respondents in our media habit survey claim that they use TTV regularly shows a willingness among this group to use the television as more than a lean back medium. 91% of the Danish households have access to TTV, and 44% of these use it at least once a week. Figure 5.3 shows a 30% increase in the use of TTV over the last 5 years. The largest increase is found in the age groups 12-20 and 21-30<sup>48</sup>.

---

<sup>48</sup> According to TV Meter, January 12th 2001 quoted in Jyllandsposten.

## Consumption of Text TV in Denmark

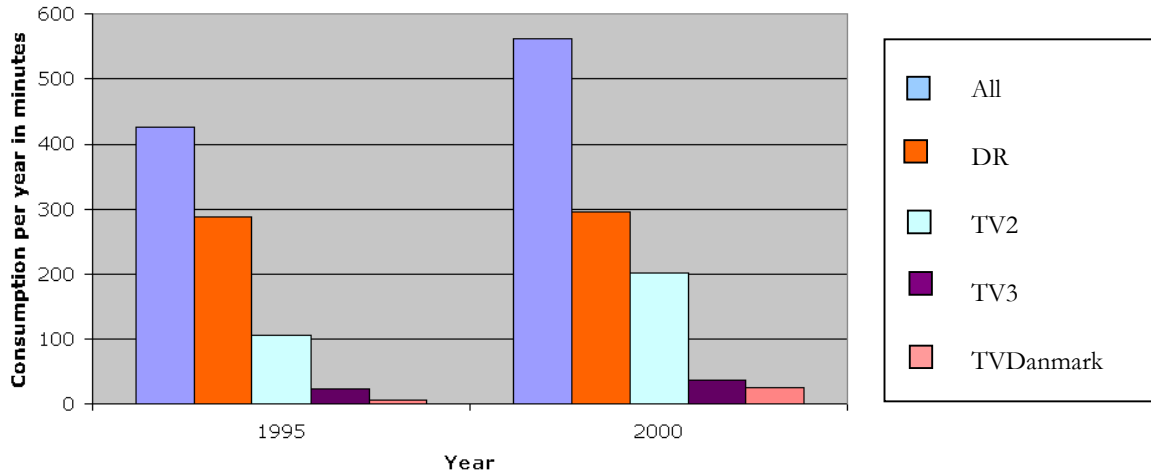


Figure 5.3: Consumption of Text TV<sup>49</sup>.

Our media habit survey showed that 86% of the respondents use TTV, and that they use it mainly for finding information. TTV chat, however, seems to be of no interest as none of the respondents have used this service. On the other hand, informal sources at TvDanmark and DR indicate that TTV chatting is widely used, with 5 – 10,000 users per day (or night in the case of TvDanmark). The lack of participation on behalf of the respondents may be attributed to the fact that the target group has not yet adopted this service, and therefore it is not a mode of communication within the community<sup>50</sup>. As we have seen in the chapter four concerning the target group, this could be because they have not yet been persuaded to the benefits of TTV chat.

### Set-Top Boxes

Digital TV was first introduced in Denmark in 1998. By December 2000 there were approximately 120,000 Danish households (6 % of the total number of households) with a STB from either *TDC On Cable*<sup>51</sup>, *Viasat* or *Canal Digital*<sup>52</sup>. In April 2001 this figure is estimated to have risen to 160,000 (8%). According to our media habit survey 10 % of the respondents own or have access to a STB and, as mentioned in the chapter of target

<sup>49</sup> Ibid.

<sup>50</sup> For a further elaboration on modes of communication within a community see the discussion on Community in Chapter 6 Media Analysis.

<sup>51</sup> Previously Teledanmark Kabel TV.

<sup>52</sup> According to interview with Agency.com, Maz Spork, May 8. 2001.

group considerations, it seems that the distribution of STB are tilted towards the ones living at home. Young people are generally perceived as early adopters of new media and thus this number can seem rather low. However, according to the survey of Trandberg<sup>53</sup>, the average owner of a Selector (TDC On Cable) is a 35-44 year old male with an annual household income of approximately DKK 500,000. The income among young people is much lower than this<sup>54</sup>, which might explain the low penetration of set top-boxes amongst young people (our media habit survey shows 6 % of the respondents living by them selves have a STB). It is assumed that purchasing other devices such as a TV set, a VCR, a computer, or a mobile phone have a higher priority among our target group than purchasing a STB. This is probably due to the current lack of content and services created specifically for the STB. In the media habit survey this is also evident, when asked how they use the STB, most of the users indicate that they primarily use the STB for the electronic programming guide and extra channels it offers.

### 5.1.2 Mobile Phones

Mobile phones are widely distributed in Denmark and they are currently the most common communication devices. The increase in number of subscribers has risen 125% from 1998 to 2000 and as of late 2000, 66% of the population had a mobile subscription<sup>55</sup>.

According to our media habit survey, 83% of the respondents own a mobile phone. The higher percentage of mobile phone owners among our respondents is likely attributed to the fact that this group may contain a larger percentage of innovators and early adopters.

The use of mobile phones for conversation has had a 78% increase from 1998 to 2000 and the number of SMS messages (short message service) sent in 2000 came to a total of 752 million messages. This means that each mobile subscriber has sent an average of 212 SMS messages in year 2000 and that more than 2 million SMS are sent every day in Denmark<sup>56</sup>. This tendency is also current in our target group where all of the respondents with a cell phone use SMS. The development of extra services (such as SMS dating services, -jokes, -games and -call tunes), directly targeted at younger segments also shows proof of the great market expectations to the increase in use of SMS among young people. The respondents in our media habit survey indicates that they mostly use SMS for communication among each other (as opposed to extra services), however, 4% of those who use SMS have also used it for interaction with TV such as voting on TV shows.

---

<sup>53</sup> Figures from Tranberg for OnCable 23. April 2000.

<sup>54</sup> For a student receiving SU the average income is usually less than DKK 100,000.

<sup>55</sup> This statistic is according to the National Telecom Agency; Telecom statistics second half of 2000.

<sup>56</sup> Ibid.

The statistics of the distribution of mobile phones and use of SMS amongst our target group is a testament to the viability of basing a good part of the interaction of the Echelon Format on the use of mobile phones and SMS.

## WAP

The present state of the WAP has disappointed those who foresaw it as the technology that would lead the mobile Internet revolution. There are no official statistics available on the current distribution of WAP in Denmark but according to Wapportal.dk the number of people owning a WAP enabled cell phone by late 2000 was approximately 100,000 of which only 50 % used the cell phone for WAP at least once a week<sup>57</sup>.

This tendency is in accordance with the media habit survey, as only 8% of the respondents owned a WAP enabled mobile phone. Furthermore, according to our survey the ownership of a WAP enabled mobile phone does not necessarily imply the use of WAP, as only 14% of the WAP owners (equivalent to 1% of the sample) stated that they used WAP on a weekly basis.

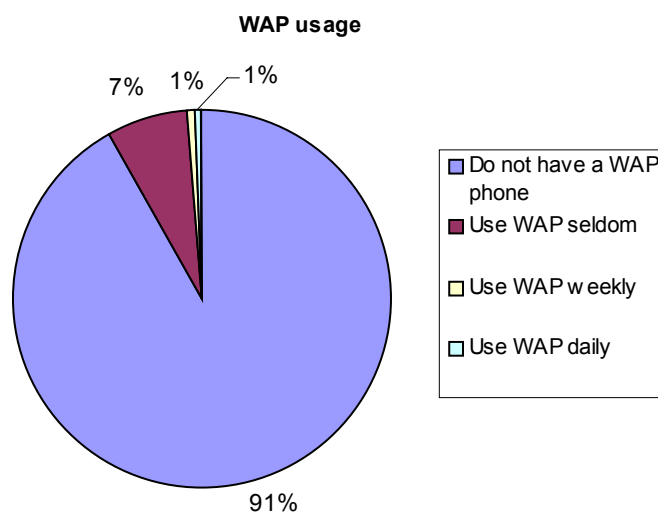


Figure 5.4: The percentage of mobile phone owners who use WAP according to the media habit survey.

Although most new mobile phones on the market are WAP enabled, there is no correlation between the increase in number of WAP phones and the actual usage of WAP. When WAP was first introduced on the market, most of the services were made for a “high profile<sup>58</sup>” target group, meaning early adopters with a considerable purchasing

---

<sup>57</sup> According to Torben Haugaard, Wapportal.dk - the largest portal for WAP services in Denmark. The above statistic stems from a survey conducted in cooperation with Vilstrup Interactive.

<sup>58</sup> By “high profile” we are referring to the group of people who were also in possession of the early WAP phoned. This was mostly people working in the IT industry or with a high income, which allowed them to purchase the rather expensive device.

power. Now that the price for WAP enabled mobile phones has decreased considerably, the type of services offered are of a more diverse nature. Yet the interest in taking advantage of the services offered seems to have stagnated – possibly due to a general disappointment with the quality of both the technology and the content.

Even though the number of people owning a WAP enabled cell phone is likely to increase due to the general increase in the production and sale of WAP phones, there is little indication that we can expect an increase of use in the near future. GPRS<sup>59</sup> and UMTS<sup>60</sup> however, will enable users to be online all the time with much faster connections, but until then there is no incentive to base a large part of the interactivity of Echelon on WAP enabled mobile phones.

### 5.1.3 PC and Internet

During the 90's the status of the PC and the Internet has changed from a device and a medium used at work, to a device and a medium used everywhere: at work, at school, in the homes and even “on the go”.

---

<sup>59</sup> General Packet Radio Service, the 2,5 generation platform for mobile communication that makes it possible to send data in packets and be online all the time in contrast to the present GSM platform. [www.nokia.dk/3g/gprs.html](http://www.nokia.dk/3g/gprs.html) [June 1<sup>st</sup> 2001].

<sup>60</sup> Universal Mobile Telecommunications System, the third generation platform that makes it possible to transmit data with a rate of as much as 2 megabits/second. [www.nokia.dk/3g/umts.html](http://www.nokia.dk/3g/umts.html) [June 1<sup>st</sup> 2001].

### The population's access to PCs in the home (2000)

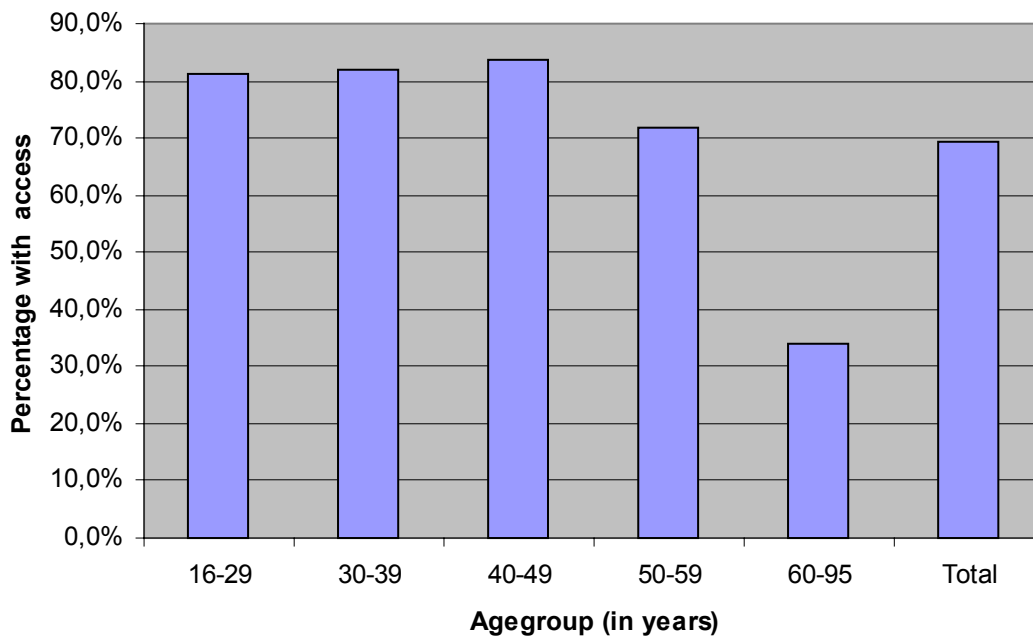


Figure 5.5: The general populations access to PCs at home<sup>61</sup>.

The Internet and PC have now spread to the majority of the population. Approximately 50% of the total population have access to the Internet from the home; this figure is much higher when the age group over 60 is excluded. Approximately 60% of our target group can access the Internet from home, and our media habit survey even showed a figure as high as 83%. Furthermore, our target group has access to and uses the Internet at school, work and Internet cafes<sup>62</sup>. This high penetration shows that a majority of our target group would have the ability to participate in the Echelon.

---

<sup>61</sup> According to Denmark's Statistics April 2000.

<sup>62</sup> According to statistics from AIM.

## Access to the Internet according to age

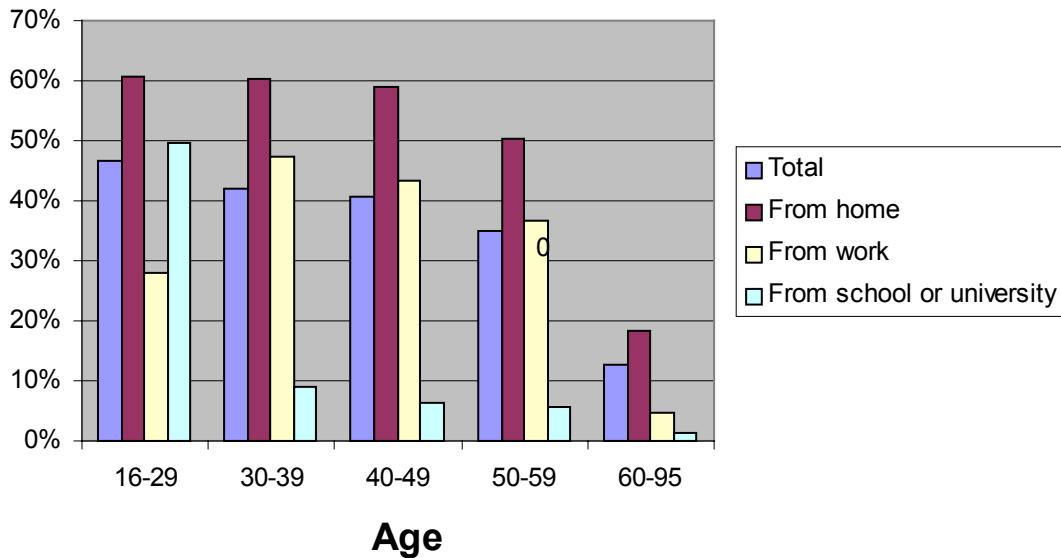


Figure 5.6: Internet access<sup>63</sup>.

## Bandwidth

The speed, or bandwidth of Internet connections has seen a steady increase in the last several years. It is now possible for the general consumer to get a reasonably priced<sup>64</sup> ADSL connection, a connection that, in the past, was primarily only affordable for professionals. It has not been possible to get any official statistics on the distribution of Internet access in Denmark. Among our respondents, however, 58 % have a modem and 23% have ISDN or a faster Internet connection. Further more, 42% of those with a modem are considering upgrading to either ADSL or ISDN.

Anecdotal evidence from Claus Bülow, then managing director of Bredbandsbolaget Danmark A/S, indicates that users switching from narrowband to broadband connections undergo radical changes in their consumption patterns within a matter of weeks. The amount of time spent on the Internet does not decline, due to reduced waiting times, it is rather maintained because the “consumption” of broadband demanding data types such as video, takes off. Though Echelon is designed to be accessible to all players with an Internet connection, as more members of the target group get faster connections the Web game could be enhanced to take advantage of this.

<sup>63</sup> AC Nielsen AIM 3. quarter 2000.

<sup>64</sup> Worldonline offers ADSL 256/128 for the price of DKK 295 a month.

## 5.2 Media Forecast 2001-2005<sup>65</sup>

As seen in the previous section, the most common media in Denmark are TV, mobile phones, and the Internet<sup>66</sup>. These three media are already well distributed among most of the Echelon target group. They are a part of everyday life of the target group and are used for a variety of purposes.

The media that are weakly represented among the Echelon target group (and among the population as a whole as well) include WAP enabled mobile phones and STBs. These are both lacking in penetration and content (which may be interdependent). However, since both media are fairly new and still in an early stage of, it is likely that the near future will look different. As the media landscape is certain to change in the near future, we will present a forecast of the next four years and discuss how future media changes may affect the Echelon format.

### 5.2.1 Television

Of all the technologies discussed in this chapter, Digital TV (dTV) is likely to have the greatest impact on the Echelon format. The potential of dTV<sup>67</sup> and the STB could be utilized to greatly enhance the interactive elements of Echelon. Danish broadcasters have already begun the transition to digital television and The Danish Ministry of Cultural Affairs has set the period between 2006-2010 as the goal for ceasing analog transmission. Several of the commercial broadcasters in Denmark are already turning off their analog signals. Viasat now broadcast the majority of its channels digitally, broadcasting only TV3 and TV3+ via analog. TVDanmark has announced it will stop the analog broadcast of TVDanmark1 on September 3 2001 when Canal Digital stops analog transmission.

Though the transition is gradually being made to digital television, whether the analog broadcasting ceases in 2006 or 2010 greatly depends on the consumer. Presently, in order to receive digital broadcasts, the viewer must purchase or rent a STB (apart from premium clients of Viasat who get a “free” set-top box). As we have seen, currently in Denmark only 8% of households have a STB, and 10-12% are forecast by the end of 2001<sup>68</sup>, which is not necessarily a slow adoption when looked at in relation to other

---

<sup>65</sup> The following tendencies are estimates based on the prior media analysis and where nothing else noted, it is based on our own estimates.

<sup>66</sup> This list only includes the media relevant to Echelon. Print and radio, for example are excluded.

<sup>67</sup> Digital TV will offer more channels (each terrestrial transmitted analog TV channel will leave room for 4-8 digital TV channels according to the type of content), a better quality of both sound and picture, digital text services (such as EPGs), the option for interactivity (through a STB which will enable both upstream and downstream transmission of data) and the possibility of transactions (opening up for t-gambling, t-commerce and on-demand services).

<sup>68</sup> According to statistics presented at the Canal Digital conference May 8, 2001 in Bergen.

technologies. However, the speed at which this adoption accelerates between now and 2006 or 2010 can be influenced by a number of factors.

For the consumer, purchasing a STB is a cost benefit decision; do the benefits of purchasing a STB outweigh the costs? Though the price of STBs has decreased in recent months, currently there is only limited digital content offered by the broadcaster or operator that will give the user any added benefits<sup>69</sup>. In 1997 Christie et al. predicted that mainstream consumers will not subscribe to interactive TV services before they can access a new style of content that offers the present qualities of the TV medium combined with the features of the Internet<sup>70</sup>. Currently in Denmark initiatives are taken in many directions to broaden the range of services for dTV. This includes new interactive programs such as *ROFL*<sup>71</sup> and plans for the introduction of t-commerce<sup>72</sup>. Furthermore, though it doesn't implement dTV technology, the broadcast of a format like Echelon could have the affect of creating an interest in interactive TV within the target group, as well as the general population. This interest and greater awareness, could work to turn the user on to the benefits of dTV. If the quality and level of content and services created for digital broadcast increases, the consumer will begin to see greater benefits in the purchase of a STB. This alone could have a significant impact on the adoption of dTV.

Creating content for dTV requires a considerable investment on behalf of the production company, the broadcaster and the operator. A significant percentage of the cost of digital broadcasting is due to the demands of producing different interactive services that are compatible with different APIs in the STBs on the market today. When a dTV standard such as Nordig 2 not only has been agreed but also implemented, the costs of producing dTV should decrease, which will be reflected in the level of content offered to the consumer. Furthermore, a dTV standard may impact the willingness of the consumer to purchase a STB as it will greatly decrease the risk of purchasing a technology that will soon be obsolete.

---

<sup>69</sup> At the present time the services offered through a STB in Denmark are mainly limited to program packages (e.g. a specific nationality, Erotica or children etc.), email, chat and games. However, they are poorly marketed and only few people know about the content. Digital TV is presently associated mainly with higher picture and sound quality as well as the extra channels.

<sup>70</sup> Christie et al. (1997:17).

<sup>71</sup> *Rene Ord For Lommepeengene*, an informative program for teenagers broadcast weekly on DR. The format is the first of its kind in Denmark as it utilizes the STB to offer the viewers extra information as well as receive three different video signals. There has been great attention towards the first mover format and ongoing negotiations regarding selling the format to Israel, Spain, Portugal, Italy, Great Britain, The Netherlands, Singapore and Japan.

<sup>72</sup> Late summer 2001 - t-commerce will be launched in Denmark by the company MediaGateway which has made alliances with the Danish bookstore Bookland, the toy store Toycity, the florist EuroFlorist and the rental company L'Easy whose products will be available through TDC Cable TV and Boxer TV-Access (a Swedish terrestrial TV provider).

While offering a wider array of content may convince the consumer of the benefits of dTV, a further reduction in the price to the consumer of the STB may also speed the adoption of dTV. If we look at other technologies we see a similar case in the adoption of mobile phones in Denmark. Mobile phones did not reach the penetration they have today until the telephone companies began subsidizing the cost, so that the mobile phone became easily affordable for the average consumer (mobile phones have been on sale for as little as DKK 1.).

BskyB has implemented a similar strategy in Great Britain. In an effort to increase the adoption of the STB, BskyB gave their customers a STB for free. Furthermore, they offer many features and services such as shopping (t-commerce), games and electronic programming guides<sup>73</sup>. If the same strategy were adopted in Denmark by, for example by TDC<sup>74</sup>, it would greatly increase the penetration of the STB.

Another important element in considering the cost of the STB to the consumer is in relation to time and ease of use. Any new technology requires time on behalf of the user in learning how to use that technology. This aspect also influences the consumers in their informal and often sub-conscious cost benefit analysis. Particularly, if the consumer finds the STB difficult to use, then the benefits of use must be even greater. Furthermore, before the consumer invests in a technology it must prove itself to be better than the technology it is replacing. In many cases the additional content offered may be enough to prove the STB better than the analog television. However, the STB currently offered by TDC has the problem that many consumers feel it takes too long to zap from channel to channel. This relatively small criticism, combined with a perceived lack of digital content may be enough to sway a potential consumer away from the STB. If new STBs that offer more features (such as an STB with a built-in Personal Video Recorder), improved user interfaces and greater speeds enter the market some of these costs will likely decrease while the added features will add to the perceived benefits.

There is the possibility that these new STB will evolve from today's video game consoles. Currently, approximately 20%<sup>75</sup> of Danish households have a game console, and this figure is expected to increase in the near future with the continued sale of Sony PS2 (released in November 2000) and the introduction of Microsoft's X-Box and Nintendo's Gamecube (both expected to be released in the fall of 2001). It is expected that both the X-Box and PS2 will incorporate Internet access in their consoles<sup>76</sup>. The game console has many technical similarities to the STB, and it is possible that in the near future it could be offered as a substitute or replacement, which would impact the adoption of dTV particularly within our target group.

---

<sup>73</sup> A similar case is presently being carried out in Norway by Viasat: MediaWatch 24-01-2001: "Viasat success med gratis boks".

<sup>74</sup> Previously Teledanmark a/s.

<sup>75</sup> Personal conversation with Christian Muff, (former employee with Egmont Online) Bredbandsbolaget.

<sup>76</sup> Sony has already released an add-on hard disk with Internet, and the X Box will have an Ethernet port.

The current initiatives of Danish television broadcasters and the goals of The Danish Ministry of Cultural Affairs indicate that dTV will be a reality. If it is first widely adopted by the target group in five years' time, it will not, in all likelihood, have an impact on the Echelon concept for the majority of the viewers as Echelon will have run its course by 2006. If any combination of the above elements can accelerate the adoption of the STB, however, the features of dTV may be incorporated into the Echelon concept to the benefit of many of its viewers.

## 5.2.2 Mobile Internet and Telephony

There is a clear indication that the wireless market will continue to expand. The introduction of GPRS and later on UMTS will offer new possibilities for the user that might very well affect the use of both SMS and WAP.

One of the main reasons for the lack of success of WAP is disappointment with certain aspects of the mobile technology (slow connections and little usability) as well as the lack of "killer applications". With GPRS the speed will be increased to 50-150 kb/s and with UMTS the speed will be increased to 144 kbps – 2 mbps (compared to the 9,6 kbps of GSM) and there will be no connection time as the user will be "always on". This will give new life to WAP services. However, the true success of WAP – as with any other technology – depends on the content offered. MMS (Multimedia Messaging), the second generation SMS, which will include text, audio and advanced graphics, is expected to be the killer application for GPRS.

The largest target groups for GPRS will be the innovators and early adopters of technology. It can be expected that this will mainly consist of a "high profile" target group who will have the money and the interest in buying the new GPRS telephones. However, the "tech generation" also serves as a great potential for new devices. As they are accustomed to new technology, they are considered early adopters of new media.

If one looks at the Japanese experience with i-Mode the main use has been for entertainment content. The Japanese market is very different from the Danish market; partly due to cultural differences but also due to the very high prices on Internet access from private homes. Yet it is interesting to glance at the Japanese experiences with the mobile Internet, as their penetration exceeds that of all other countries (20 million subscribers with an average use of 11 i-Mode pages a day<sup>77</sup>). Although i-Mode has had a general success it is especially successful among the younger segments of the population. They primarily use i-Mode as their main access to the Internet, sending and receiving e-mails (which can contain both graphics and colors) and for entertainment such as games, photos and short movies.

The current services for the European mobile Internet are primarily stock quotes, sports results, traffic, news, weather reports and listings. There are great expectations for the

---

<sup>77</sup> NTT quoted in Computerworld.dk [March 23, 2001].

future of mobile games, as the possibility of conducting online games will increase with the increase in bandwidth for cell phones. The alliance between DoCoMo and Sony Playstation confirms these expectations with their development of Playstation games for UMTS cell phones. This will open up for connecting multiple users and devices in game playing.

In the next 10 years we will experience a transition between GSM, GPRS and UMTS. The first GPRS mobile phone is on the market<sup>78</sup> and the UMTS licenses are being distributed in Denmark in the fall of 2001<sup>79</sup>. It is expected that the first UMTS phones will be on the market in the beginning of 2003 and that the mobile Internet will not increase drastically in use before this. Another player in the future of mobile Internet is the PDA. The slightly larger organic dye screen (replacing the LCD) is capable of displaying World Wide Web pages where WAP enabled mobile phones can only display pages created especially for WAP (e.g. by WML).

There is little doubt that the mobile Internet use will accelerate, though forecasts are unclear whether it is the PDA or WAP that will be the main element to promote the mobile Internet. However, as the distribution and use of mobile telephones is much higher than that of PDAs in Europe it seems likely that the mobile phones will be the main drivers of the mobile Internet in Europe. This might very well be different in the USA where PDAs have enjoyed a much higher success.<sup>80</sup>

### 5.2.3 PC and Internet

Currently 69% of the households in Denmark have a PC and with more than 80 % of our target group having access to the PC at home, there is little indication that this number will decrease in the future. The Internet is now an almost inseparable part of the PC and the number of PCs without Internet access will decrease to almost zero in the next few years.

---

<sup>78</sup> Motorola and Ericsson have their first models on the market. The biggest "player" (Nokia) has not released their first GPRS enabled phones yet, and both Danish and foreign Telecom Companies are awaiting the premier of the Nokia GPRS telephones with great anticipation, as this is expected to be the main driver of the GPRS market. Carstensen (2001:12).

<sup>79</sup> Staun (2001:6).

<sup>80</sup> The slow development of mobile phones in the USA is possibly due to the many problems with different standards. Where Europe was very fast in agreeing on one common standard (GSM) USA has had three competing digital phone standards as well as a lack of roaming agreements across the states, which has led to a lack of coverage. Also the pricing policies caused a slow distribution of mobile telephones benefiting PDAs, which have enjoyed a much greater success in the USA than in Europe. The difference in development is also evident when looking at the development of Internet access through PDAs. In Europe this has hardly an option yet where as most PDAs in USA today offers Internet access.

Not only will more homes be connected, the connections will be faster. Already now ADSL connections at 256k and 500k are offered by a number of service providers for reasonable consumer prices. This is a dramatic increase in speed from the 14k and 33k modems that were the standard only a few years ago, and according to Gilders Law<sup>81</sup> this increase in bandwidth will continue to increase considerably in years to come. The increase in bandwidth will be reflected in the way in which we use the Internet. Already now, many sites are designed to offer a multimedia experience, streaming video and sound, entertaining with animation, giving access to television broadcasts. We will not only have faster connections, we will have connections that are always on, which will also change how we perceive the computer, both as a tool and as an entertainment medium.

It is also expected that the Internet will continue to spread across platforms, to mobile devices, television and transportation vehicles (e.g. cars and commuter trains). According to Preben Mejer, director of development in TDC, the Internet access via the PC will decrease from 96% of time spent online to around 60% in the year 2005. This does not mean that we will be connected less, but rather that will be connected more often and from a range of platforms; that is to say when we drive our car, watch TV, or walk through town with a mobile device in our back pocket. When the Internet can be accessed from a computer, digital television, broadband or mobile device, its ubiquitous nature will lead to a shift in focus from the technology to the services offered.

### **5.3 Echelon's Use of Media in the Future**

When considering the future changes in the media landscape and how they may affect the Echelon format, it seems evident that TV, Internet and SMS can continue to be part of the cross-media concept as they will most likely be as popular in the near future as they are now. The technology that stands to have the greatest impact on a television based cross-media platform like Echelon, is digital TV.

The ways in which dTV is used to enhance the television program *ROFL*, is proof that Echelon could benefit immediately from incorporating the functions of dTV. Furthermore, forecasts indicate that when interactive TV becomes more common, people will be willing to interact if the concept is challenging and appealing enough<sup>82</sup>. Further advances in dTV could be incorporated in the Echelon format, potentially enabling the user to interact directly via the TV with the program, or even offering completely new interactive functions.

Although our target group might not be among the first to acquire a STB, the fact that analog broadcasting will be phased out somewhere between 2006 and 2010 even for

---

<sup>81</sup> Every 12 months optical fiber bandwidth triples in capacity. Corneliussen (2001:15).

<sup>82</sup> Christensen (2001:1).

public channels<sup>83</sup> is a good indicator that, no matter the consumers' habits, dTV will be available to virtually all households by 2010.

The implementation of GPRS or UMTS could allow for the incorporation of more sophisticated mobile aspects in the Echelon Web game. Through WAP enabled mobile phones, PDAs with wireless Internet access, or perhaps unknown future devices, the players could always be connected to the game, interacting from wherever they find themselves.

Though these media offer much promise, before they are incorporated into the Echelon format, it should be determined whether the target group - and especially the participant target group - actually has access to these media. If the penetration is high enough, there is no reason why these technologies could not be incorporated into Echelon for the benefit of both the viewer and the participant.

---

<sup>83</sup> Steps towards turning off analog broadcasting have already been taken by the Cultural Ministry and the date is proposed somewhere between 2006 and 2010. This means that a STB (or a digital TV) will be necessary for receiving any television after this date. It is predicted that if any households do not have any means of watching digital TV, it is easier to give them a STB.

## 6 MEDIA ANALYSIS

---

Attempting to reach a target group by adding new features and possibilities to a well tested media like the television calls for serious consideration about what it is one wants to accomplish and with what means. What are the different kinds of interactive features that can be used to enrich the media, are they compatible with the act of viewing television; and what can be gained from the addition of interactivity?

When setting out to develop content or services for multiple platforms, it is typically done with one of two purposes in mind: 1) To increase availability by making the same content available from different platforms (COPE) or 2) to create an enhanced experience by making different media work together. The first issue of availability could, for example be exploited by news organizations by making the same content available in both print, www, mobile devices and via text-TV. The Echelon concept makes use of multiple media largely for the second purpose, combining the assets of different media to create an enhanced experience. The Echelon concept capitalizes on the broad reach and rich language of television, the availability and mobility of SMS, and the interactive and participatory advantages of the Internet to enhance the users overall experience with the media.

In order to discuss entertainment formats on different media platforms we need a well-defined vocabulary to gain a thorough understanding of the different types of media services and their benefits, independent of the specific platform. So we open the chapter with an attempt to categorize types of media services taking as a starting point Bordewijk and Kaam's article on tele-information services<sup>84</sup> and in part Jens F. Jensen's discussions<sup>85</sup>. As we will show the Bordewijk and Kaam vocabulary fails, to certain degree, to capture some of the distinctions important to this thesis. This is why we introduce the notion of participation, which we find useful to more elaborately describe some of the interactive features of the Echelon concept.

As discussed in the introduction to the test case, (chapter 3) for a format like Echelon to succeed a minimum number of viewers are needed to participate in the interactive activities. But can we wake the couch potato? Drawing from the considerations of the target group we next turn to the issue of the television viewers' willingness to lean forward and interact. It is our claim that not only is our target group willing and able to, but also enticed by, the very acts of interaction and participation.

Next we isolate five benefits of interactivity/participation and discuss by which means of interactivity they can be achieved and how they are exploited in the Echelon format. It is our claim that these benefits can only be achieved through interactivity and some only through participation. Furthermore, we find that if the broadcaster is interested in

---

<sup>84</sup> Bordewijk and Kaam (1986).

<sup>85</sup> Jensen (1998).

successfully recapturing the interest of the young viewers it is imperative that they begin to offer these interactive and participatory elements. Otherwise someone else will.

Beyond these benefits reigns a higher level construct called communities. Even though media based communities in the past have evolved out of purely transmitted content, the participatory media provides a much more fertile ground for community building. The broadcasters can take advantage of the community members' loyalty towards the community and turn it into loyalty towards the entertainment product.

## 6.1 Types of Interaction

This discussion will address the different positions the user of an information system can take with respect to the level of control over the content creation and content retrieval. We will use the information traffic patterns presented by Bordewijk and Kaam to distinguish between the different ways a user can interact with an information system and with other users through the system. By this we hope to clarify the different meanings of the somewhat diluted term, interactivity. The aim is to define a vocabulary that can describe the differences between the features of interactive entertainment formats in a productive manner.

The discussions of and multiple opinions on what it requires for an information system to be interactive have blurred the meaning of the term 'interactive' to an extent where it has essentially become meaningless. The most radical and destructive use of the word is probably, that the reception of any text<sup>86</sup> involves interactivity, because the mere process of making sense of the text involves an interaction and negotiation between the reader and the text. This of course makes the term unsuitable as a means to describe certain features of a text that differentiate it from other texts that lack these (interactive) features. As this is exactly the kind of distinctions we wish to make this claim makes little sense in our case and will be given no further attention

A more common (and more applicable) definition of interactivity is that the information system has to be responsive to input from the user. That the user gains some kind of control over the 'what', 'when' and 'how' of the communicative process and may even participate in the production of content. This is a more operational definition but it is still very broad. There is no distinction between user control over the flow of predefined content and user creation of /contribution to content, which are two very different ways of interacting with an information system. Furthermore it doesn't distinguish between the single user interacting with a system, and users interacting with each other through an information system.

These are the issues we address by presenting the terminology of Bordewijk and Kaam. Bordewijk and Kaam identify four different patterns of information traffic: transmission,

---

<sup>86</sup> The term text is here used in the broad sense to cover any kind of symbolic material represented in a communication situation (such as books, posters, movies, www, etc.).

consultation, conversation and registration. Often a communicative situation can involve aspects of more than one of the patterns, or even all four, typically to varying degrees. The last three patterns to some extent all involve interactivity in the broad sense presented above.

The patterns are identified by stating two questions. As formulated by Jens F. Jensen:

*Is the transmitted information owned by an information service providing center or an individual information service consumer?*

*Is the transmission and use of the information controlled by an information service providing center or an individual information service consumer?<sup>87</sup>*

The answer to these questions adds up to a matrix with four fields:

TRAFFIC PATTERNS	Content issued <sup>88</sup> by center	Content issued by consumer
Program flow controlled by center	TRANSMISSION	REGISTRATION
Program flow controlled by consumer	CONSULTATION	CONVERSATION

As the terminology is developed with tele-information services in mind we have to consider whether they are easily applied to the range of different media and entertainment formats that is the scope of this thesis. Furthermore, we have to consider whether the terminology is suited for entertainment formats. But let's start out with a small introduction to the four patterns.

### 6.1.1 Transmission

The transmission pattern is characterized by having content controlled by a service providing center as well as the program flow and diffusion.

The prime examples are television and radio broadcasts in their traditional setting. The television-company decides what to broadcast, when to broadcast it and in what context. The only external activity conducted by the user is turning on the receiver, tuning in, making small adjustments on the receiving apparatus and deciding whether to leave the transmission before it is over. The content and program flow is already fixed by the time it is received by the user and the user has no way of affecting either of these parameters. Thus no interactivity is involved in the reception of the media product in this traffic pattern.

---

<sup>87</sup> Jensen (1999).

<sup>88</sup> We choose to use the formulation "issued by" instead of "owned by" as we find that this better captures the essence of the situation.

This traffic pattern can also be described as push-media (as oppose to pull-media)<sup>89</sup>. The content is pushed out to the user in a predefined order. The only option for the user is whether to receive the content or not<sup>90</sup>.

In the Echelon format this traffic pattern will be utilized to some extent during the transmission of the television show. There will be times during the transmission where no user interaction is possible (title sequences etc.) but most of the time some possibility of at least trying to affect the content of the program is open to the viewer. If the final television show is produced for the MHP platform the viewer will also always be able to control the program flow to some extent (by choosing between different cameras, brinning up chat windows etc.).

### 6.1.2 Consultation

In this traffic pattern the center still controls the content, but it is the user that controls the flow of information.

An example of this traffic pattern is the typical web site. Here all the content is contributed by a center (web-site producer) and published on the Internet. But it is the user that has to look up the web site and once the user has arrived at the web site, he decides what, when and to a degree in which order the content is received. The content is still fixed by the information center, but the reception is primarily controlled by the user. Thus some interactivity is involved in this traffic pattern.

This traffic pattern can be described as pull-media. The content is made available by an information center, but the center can only wait for the user to pull out the information and the final control over the 'when', 'what' and 'how' is held by the user.

In Echelon this traffic pattern will be used by some parts of the web site, for example in descriptive pages concerning the descriptions of the format and the rules of the game. Also the navigation from one part of the Web game to another makes use of the consultation pattern. Most of the time though, some direct intervention and thus content manipulation/production is required of the user, which leads us to the next traffic pattern.

### 6.1.3 Conversation

In this pattern the user is controlling both the content and the information flow.

---

<sup>89</sup> In the pull situation the receiver seeks out the information and thus "pulls" the information from the source. Push on the other hand is the situation where the receiver does not seek out the information herself but rather opens a communication channel and has the information "pushed" towards her.

<sup>90</sup> Negroponte (1995).

This traffic patterns is used for instance by instant messaging systems<sup>91</sup>. Typically the only thing the center does is provide the medium for the communication situation. It is the users of the system that control the content by creating sentences and submitting them to the conversation. Immediately after the sentence is submitted it is viewable by the other user(s). The users also decide whose messages they wish to view and respond to, when to start a conversation and so on. This is a case where one could claim that the user controls (actually creates) the content and also controls the flow of information. The situation is not unambiguous though, as we shall see later.

In Echelon this traffic pattern will have a large impact. A great part of the web site will consist of different chat rooms, in which users communicate with each other, either as an element of the game, or for their own amusement and bond making. We as the center of Echelon have no control over when the conversations will take place and even less control over the subjects of the conversation.

#### **6.1.4 Registration**

This traffic pattern appears in situation where the control of the content is held by the user, but the use of the content is controlled by the center.

The registration pattern is increasing together with the commercialization of WWW. If for instance you download freeware, participate in competitions or try to access certain information sites you are frequently asked to register yourself as a user, answering all sorts of questions. You control what to answer (the content) but how the information is used is beyond your control and solely up to the center.

In the Echelon format several cases of registration take place. If you want to participate in the game you have to register yourself as an Echelon user. All conversations and usage of the chat rooms are logged in order for the surveillance cards to be calculated correctly. Hints to the television shows' contestants are contributed by the viewers and saved by the center, but the use of the hints is beyond the control of the contributor.

As Bordewijk and Kaam explain these categories (or patterns) are idealized and thus most information system are best described as a mix of some or all of the patterns. Of course even more so when dealing with cross-media formats.

### **6.2 Registration + Consultation = Participation?**

Some of the services under investigation here can be quite ambiguous and difficult to categorize and capture with the above patterns. One particular set of problems arises

---

<sup>91</sup> Instant Messaging is a free Internet service that enables the user to see when others are online and exchange messages in real time.

when we have more than one user in the equation. Let's look at four different situations where this is the case.

### 6.2.1 Situation I

The first situation that we mention here is interaction via a newsgroup<sup>92</sup> such as alt.jokes. Here a user can submit content (a joke) in the form of a newsgroup posting. It is then automatically (or through a moderator) made accessible for all other users of the newsgroup.

The first step in this situation (posting to the newsgroup) can be perceived as a clear-cut example of registration and the next step (reading the posting on the newsgroup) an example of consultation. The use of a newsgroup can thus be described as interchanging between the registration pattern and the consultation pattern.

Of the four situations described here this is probably the least problematic to capture using Bordewijk and Kaam's traffic patterns.

### 6.2.2 Situation II

A public chat room like the ones created for the Echelon web site. When a user wants to use the chat he or she writes a message in a form field and then submits it to the chat server. The server then redistributes the message to the other participants involved in the chat. The other users can then read the message and respond to it.

The users might experience the chat situation as conversation through an open line, but from a technical perspective you could just as well categorize the events as first an act of registration (the user registers a message on the server) followed by an act of transmission (the server transmits the message to the other users).

### 6.2.3 Situation III

A television show like *Hjemmevideo*<sup>93</sup>. The user tapes a silly situation and sends in the tape to the television station. So far the content is produced (controlled) by the user but the use of the content is controlled by the center (the television station). Here we have a case of registration. Later on the same content is broadcast by the television station to a range of users, thus using the transmission pattern. The different parts of the situation can be categorized, but viewed as one act of communication involving several users and a center, the situation is hard to categorize.

---

<sup>92</sup> Newsgroups are electronic bulletin boards where the users can post messages typically regarding specific subjects and read other user's messages and responses.

<sup>93</sup> The Danish version of *America's Funniest Home Videos*.

The same situation happens when a viewer emails or sends an SMS to a television show, and that piece of content is later on used in the show.

## 6.2.4 Situation IV

The last of the situations exists when a user calls (or chats) directly to a live television broadcast. This happens for instance in the case of *Hugo, the TV-troll*. Here viewers call up the television show and then control a computer game using the buttons on his or hers telephone. The playing of the game is transmitted directly in the show.

This situation is especially hard to categorize. Clearly we face an act of transmission as the playing of the game is broadcast via the television show. But how do we describe the controlling of the TV-troll? It could be claimed that the viewer controlling the troll is engaged in an act of consultation: The player decides whether Hugo is to go left or right choosing what information to receive next (a picture of Hugo avoiding an obstacle or a picture of Hugo hitting an obstacle). But how do we categorize the player's relationship to the viewers of the show? Is he conversing with them via the TV-troll and the television show or is he registering information to the television station that is then transmitted? Or is he in fact engaged in an act of transmission suddenly changing position from user to center?

## 6.2.5 Participation

Put more generally: What we talk about is *the act of submitting content (registration) that is a) available for other users to grab (consultation) or b) distributed in a fixed manner (transmission), in c) real-time or d) delayed*. To describe this situation we introduce the term *participation*.

But as thee a, d, c and d might suggest we're not quite done yet. We still need to distinguish between different types of participation. The distinction can be formulated as two questions:

- *Is the content presented to other users immediately after the contribution, creating a sense of conversation, or not. That is: Real-time or delayed.*
- *Is the content available to the other users through a consultation pattern or through a transmission pattern. That is: Consulted or transmitted.*

The answers to these questions leaves us with four different types of participation as illustrated by this matrix:

PARTICIPATION	Delayed	Real-time
Consulted	I	II
Transmitted	III	IV

As suggested the four above mentioned situations would be placed in the matrix as follows:

- *Situation I:* Delayed, consulted participation.
- *Situation II:* Real-time, consulted participation.
- *Situation III:* Delayed, transmitted participation.
- *Situation IV:* Real-time transmitted participation.

Clearly the categorization of a situation as one of the above participation patterns only makes sense if the situation is a case of participation to start with. This is clearly not the situation for all cases of use of even an interactive entertainment format such as Echelon. Thus to start out with we use the traffic patterns from Bordewijk and Kaam to describe the different features of different entertainment formats and the Echelon format. But when we need a more thorough description of the different kinds of participation involved we use the participation patterns identified above.

We keep the broad definition of interactivity as a situation in which the user has some kind of influence on the communicative events. Participation defines a subset of these situations, namely the (interactive) situations in which the user submits content that becomes available for other users.

## 6.3 Willingness To Lean Forward

The ways in which viewers traditionally interact with a particular media is an important consideration in developing an interactive entertainment concept. Though it is the goal that the Echelon television program is dramatic and engaging enough to entertain the passive viewer, it's success is dependent upon the participation of the television audience. This raises the question of whether television is a suitable interactive media?

In the following section we will briefly discuss the issue of the viewers' willingness to interact with traditional media in new ways. At issue here is primarily television and the ways in which a concept like Echelon places new demands on the viewer. We will define the two terms "lean back" and "lean forward" and discuss how the same media is often used in different ways. In doing this we hope to show how the interaction required of the viewer in a concept like Echelon is more an extension of their natural viewing activity, rather than a new demand.

Television is traditionally perceived as a "lean back" media (utilizing the transmission pattern of communication) with the viewer being relatively passive, while the Internet or computer is perceived as "lean forward" media with the user being an active participant (consultation and conversation). These two terms obviously describe the user's general posture and level of activity, but they also tell us something about the user's intent and expectation when viewing/interacting with a media format.

With lean back media, the intent is often that of relaxation and escape. Examples here might be the theater, a novel or the cinema. The viewer expects to be entertained, (one could almost say taken on a journey) with little or no activity required from him in the process. In most cases any activity demanded of him is perceived as “noise” and simply distracts from the reception of the message, or interferes with the intended effect, namely relaxation.

With lean forward media the users intent may very well be escape, but it is seldom relaxation to the same degree as we see in lean back media. Here, the user may expect to be informed, to be “connected” to a community or an individual, and they may expect to be entertained. Some classic examples of lean forward media would be the telephone, video game, or the Internet. The user expects to participate to varying degrees, and this activity rather than being perceived as noise enhances the users experience and can contribute to the intended effect. This is the ultimate goal with a concept like Echelon, which brings us back to the question of whether TV is a suitable medium for interactivity.

Though television is generally considered a lean back media, when looked at more specifically, it is clear that the viewer’s intent and expectations toward the medium change depending upon the particular program. Movies or sitcoms viewed on television are quite clearly lean back. A news program on the other hand, gives the user considerably different expectations. Here, rather than being entertained, the user intends to be informed, and perhaps connected to society. A different level of concentration is perhaps required of the viewer, and though they are not necessarily active, their state is closer to that of lean forward than lean back. This is clearly evident in the case of quiz programs, where the viewer is often passively participating by answer the questions themselves, in many cases they are even competing with the contestants on the show. It is this kind of participation that a concept like Echelon takes its inspiration from. The interactive elements of Echelon utilize technology to turn this passive participation into active participation.

As we have seen from the discussion of innovation theory in Chapter 4, the target group has the necessary means to interact with a concept like Echelon. The question remains do they have the desire, or to use Rogers terminology can they be “persuaded”? In order for the interactive elements to succeed it is necessary that one percent of the audience from a successful television program actively participate in the show. Within our target group, at least one percent can be classified as “innovators”, that is people who are willing to try things simply because of the novelty of it. Thus, the strength of persuasion for the initial participants is simply that the concept is new and therefore exciting. At this point it is critical that the act of participating is entertaining and engaging enough that it persuades the “innovators” to continue. We can certainly hope that “early adopters” will begin to participate as well, but as mentioned the interactive elements themselves can succeed and contribute to the quality of the television program even if only the “innovators” participate. Below we will discuss some the ways interactivity can add a new

and exciting dimension to a television program and enhance the viewers' experience to a degree that they are persuaded to lean forward and use the medium in a new way.

## 6.4 Benefits of Interactivity and Participation

But why is interactivity and its more radical cousin participation something we should strive to offer the user? It is our claim that it gives the user a different kind of satisfaction than the pure transmitted entertainment. We have isolated five qualities important to the Echelon format that the user can experience as a consequence of the different (interactive) traffic patterns and kinds of participation:

- *Selection*, which is the user's possibility of retrieving exactly the information that he or she in particular finds interesting presented in a way that satisfies him or her in particular. In some situations the system can be set to remember the user's preferences, which leads to *customization*.
- *Communication*, which is the user's ability to interact with other people, not just an entertainment system.
- *Empowerment*, which is the feeling that the user is in control. That he or she can influence the way the events unfold.
- *Game play*, which means that the user is presented some kind of game element. That he or she can do good or bad and can improve.
- *Exhibitionism*, which in lack of a better word describes the user's urge to be on the stage. To enter this extra reality created by the (mass-) media that plays such an important part in modern life.

Let's look at them in turn to further study how we can provide the users these sensations

### 6.4.1 Selection

This quality is largely a result of the traffic pattern consultation. Not 'pushing' the content towards the receiver but rather letting him 'pull out' the content that he finds entertaining, is exactly what characterizes the consultation pattern. In this way the user can decide for him self, which content he finds amusing and choose to receive that instead of other content. Thus an entertainment provider can hit a broad segment with more narrow content without every receiver having to view content he doesn't find interesting.

As with the other qualities the experience of freedom to select is not necessarily connected with the actual freedom to select. *ROFL* is a game show for children, where viewers equipped with a STB among other things can navigate through a menu system that changes during the show. The information, that can be navigated through is

downloaded to the box only once<sup>94</sup> and is then activated in part by time-codes and in part by user interaction. The user might get the impression that the set-top box is downloading information at his request, which is actually not the case. But to the user experience this makes no difference.

DR has already noticed one of the benefits of offering the users the possibility of selection in connection to the game show *ROFL*. When a segment of the game show didn't please, the viewers supplied with the possibility of selection (the ones with a STB) tended to choose to watch one of the backstage cameras or reading background information instead of switching channel. This goes to show that selection can actually preserve users that might otherwise have been lost halfway through the show.

When registration is added to the equation selection can be further extended to produce customization. This is the case when the entertainment system some way or another registers the user and provide different information to the individual users. This might be by user request as is the case when the user can select his favorite color as the background color of a web site or select which items should be displayed in a menu-bar.

It might also happen without the user's knowledge, which is the case for instance if an electronic program guide (EPG) remembers the user's preferences to present programs that the user would probably prefer before the rest. This is also heavily used by banner-ads on the Internet for them to get to the right target group only. The portal Yahoo uses this approach on a click-to-click basis: If a user for example is searching for cars he will very likely see a banner-add for cars on the next page from Yahoo he visits. Clearly the emphasize in the latter case is more on maximizing banner-clicks than entertaining the user, but the principle by which the effect is achieved is similar.

Customization that ranges over several uses of a system might also give the user the pleasant feeling of being known by the system from visit to visit. The user might feel important, a VIP, that the system cares for him and does an effort to please him.

## 6.4.2 Communication

The ability to communicate directly with other participants can arise from various forms of interactivity, namely the kinds of interactivity that involve participation. Of course communication is a broad concept, but what we mean to capture here is interaction between two or more individuals with at least formally equal positions.

The reasons for seeking to create intra-personal communication in connection with an entertainment concept are many. To name a few, it prevents predictability, for the participants the communication can be a goal in itself, and it can help create the sense of community that we shall hear about towards the end of this section.

---

<sup>94</sup> Actually the same data might be send out a few times to account for network glimpse. But in effect only once.

Therefore the Echelon Web game presents its users with a rich set of communication channels and if you want to succeed in the game you have to use them extensively. A lot of the assignments on the surveillance card have to do with communication with your target, either in real-time for instance through the chat rooms or delayed through messages or challenges. The concept is also built up in a way that makes it quite possible that Web game participants know the contestants of the TV show from interaction on the Web, as the contestants are recruited from the Web game. This makes it more exciting to watch the show, as you will have picked your favorites up front and might even have some kind of personal relationship with them. At the same time it makes it feel more likely that you yourself are a candidate for the TV show.

### 6.4.3 Empowerment

The feeling of empowerment derives from control: That the user can influence the course of events in some way or another.

The sensation of empowerment can be based on two grounds: 1) The feeling that the user influences what the user himself experiences, tricked by the feeling of freedom of selection, and 2) the feeling that you contribute to or in some other way influences what other people experience. The sensation of empowerment is present in both scenarios, maybe a little stronger in the second.

As the first ground for empowerment is directly derived from the sensation of selection, the same traffic patterns can be used to create this variant of empowerment. That is the consultation pattern, maybe combined with the registration pattern to create customization. In the Echelon Web game the participants themselves can to a great extent choose their own course of action. Some might find it most amusing to play Spy Room against someone they already know from real life, others might enjoy the experience of meeting new people in the chat rooms. In any case the single user has the power to control his or hers playing situation, that besides the pleasure of selection give rise to a sense of empowerment. "I, myself, am in control".

To foster the second ground for empowerment, the user must be given a sense of influence on the information received by other users. This can happen through participation. Depending on the kind of participation the feeling of empowerment might be stronger or weaker.

The strongest and most direct feeling of empowerment probably arises from real-time, transmitted participation. Here the user borrows the transmission channel and is the (co) creator of content pushed to a wide variety of people. The user's actions are immediately observable by all the viewers of the transmitted content. In most cases though the user has to operate within some kind of predefined space with a set of predefined actions. This framework can be more or less restrictive giving the user greater or weaker control over the content production. An example of this occurs in the TV show, Echelon, where a selected user via the Web can gain remote control over a camera. By moving the camera he has to "catch" the participants of the TV show as they try to sneak through a

room. The framework here is quite restrictive as the only mean of influencing content is through the movement of a camera. But the empowerment is present giving the user the sense of co-control over the TV show.

Empowerment triggered by delayed, transmitted participation occurs when a user's actions have a delayed influence on transmitted content. The feeling of direct control might diminish as some kind of editorial apparatus is squeezed in between the user and the transmission channel. In the Echelon format actions taken by the user in the Web game can influence the unfolding of the events in the following TV show. As the players of the Web game are assigned to one team or the other up front they can solve different tasks on the Web that makes it easier for their team to win. The Web players can also help the TV contestants during the show by sending in clues that the team might choose to follow. A more indirect way of influencing the transmitted content is by helping other participants get on the TV show.

Real-time, consulted participation can also empower the user. Here the user gains real-time influence on the unfolding of events in a consulted medium such as the Web. One might argue that real-time influence on consulted content is actually communication. As the discussion of the for Bordewijk and Kaam patterns above suggests we tend to agree, but with the nuance that communication more accurately is to be conceived as a specialized case of real-time influence on consulted content. As an example of the specialized case, communication, we have the extensive use of chat rooms in the Echelon Web game. When a user sends a message he or her is co-creator of the content in a specific chat room at a specific time. The users' ways of communicating can change the tone of the game or even change the reception of the goals of being in that chat room. Where the overall goal is to trick your targets, a chat session might turn out to be more about social activity if that is what the majority of the players choose to create content on. Thus the users are empowered by communication to change the course of events. An example of real-time influence on consulted material might be future mini-games as the game Spy Room but in real-time involving two or more players.

Finally we have empowerment created by delayed, consulted participation. Practically every move the participants make in the Echelon Web game is influencing the course of events. The most clear-cut empowerment of this kind is probably the fact that the participants' performance in the game and their profile can be viewed at anytime by the other participants.

#### **6.4.4 Game Play**

One of the entertainment formats that rely most heavily on interactivity is the (computer-) game. Therefore it is not surprising that 'game play' is created via interactivity. Game play can help capture and withhold the participant's interest by providing an overall goal, the feeling that you want to win, to do well. In the Echelon game the participants can also look forward to prizes in form of TV show participation or increased possibility of empowerment in the form of influence on the unfolding of the TV.

A game can be either against a system (single-player), against a limited group of opponents or in a multi-player environment. Echelon makes use of all these possibilities although the single player element is limited. The multi-player environment is omnipresent as it involves the users for an ongoing, ever evolving game. Even the playing of the two-player games (e.g. Spy Room) is a part of the grand game.

The two-player games of Echelon relies on basic game elements such as luck and skill. Even if luck is the predominant factor in Spy Room and nor many points are given for a victory, there is still the simple satisfaction of victory.

More interesting is the assignments connected with the surveillance cards, as they presuppose communication in order to be fulfilled. An example of an assignment is 'Make your target say the following keyword in a chat room: Nokia'. Here the game play serves multiple purposes. There is the game element: can you get your target to say the word, without triggering her suspicion? It serves as a communication kick-starter: you have to chat with your target. And finally a commercial angle: get the young people to talk about Nokia.

### 6.4.5 Exhibitionism

With the term "exhibitionism" we wish to capture the sense of being "on stage". Entering the extra reality created by the (mass-) media.

The media has become an important factor of modern life pervading everything from the public sphere to the formation of communities. Role models and objects of identification stem largely from the media and maybe that's the reason why so many people apply for the various reality shows around. For the latest version of *Survivor* in Denmark over 8000 people applied; the first showing of Big Brother in Denmark had approximately 2200 applicants. With these numbers it seems like a fair assumption, that the possibility of winning a spot on a TV show is an asset for a Web game like Echelon.

But Echelon presents more levels of exhibitionism beyond the ultimate level, that of being on the actual TV show. Via the modes of participation that influence consulted content, the user can enter the media stage of the Echelon Web game. At first glance, this may not seem particularly interesting, but if the Echelon concept succeeds the stage of the TV show will, to a degree, merge with the stage of the Web game. In the Web game participants will be able to meet and interact with people who might later be famous or may already have been on the show.

An aspect of the Echelon concept that is nearly as appealing as being on TV, is the fact that the users can gain control over parts of the TV show via the Web game. This could be the controlling of a surveillance camera or having the players in the show bring forward your tip as a valuable contribution to their success.

And finally: to get on the show, you have to do well in the Web game. When a show like *Survivor* has 8000 applicants, why throw this dedicated group of people away only using

16 of them? Why not hold on to their attention by stretching out the process of selection and making it a part of the actual concept? In Denmark a program like *The Mission* had 5000 participants in the studio spanning ten programs, which seemed like a good idea. But the concept failed a little, partly because it was impossible for the viewer to relate to so many players. What we strive for in the Echelon concept is to keep this vast amount of participants in a medium better suited for this kind of multi-player environment, namely the Internet. Here the size of the game space can be scaled to fit the actual number of players simply by creating or removing chat rooms. Maybe even dividing the entire game space into smaller spaces if that is required.

With these five qualities at hand the content provider is in a good position to make the viewer lean-forward and adopt the cross-media use of an entertainment format like Echelon. The qualities gained from interactivity and participation will enrich the user experience and also introduce a more lively, spontaneous and unpredictable element in the transmitted content. Also the ability to communicate and the feeling of empowerment create fertile ground for community building as a further asset to the user.

From the broadcasters perspective the possibilities of selection, communication, empowerment, game play and exhibitionism can help get the attention of a target group, that is gradually abandoning television for more interactive media, and the formation of communities can increase their loyalty towards the concept. It also serves as a mean to stretch out the span of the entertainment format from a weekly spot maybe 10-20 weeks a year, to an ongoing challenge.

While there are many benefits to including interactive elements in a television program, it is important to remember that the foundation for a concept like Echelon is the television program itself. Thus, when developing a cross-media format based on television it is essential to ensure that the concept has a viable foundation. In the following section we will briefly discuss some of the elements necessary to create a successful television program.

## **6.5 The Elements of Successful Television: A Theoretical Approach**

In developing an interactive television program the first and highest priority must be that it is entertaining to the viewer. A program could have the most exciting interactive possibilities, but if it does not capture the interest of the passive viewer, it will not succeed. In the following section we will examine some of the elements necessary to create a successful television program. As most television programs are in essence forms of story telling, we will borrow terminology from literary theory in our analysis.

Television programs fall under several different genre, the most common are action, comedy, drama, and in the last few years we have seen the creation of the new genre most often referred to as “reality TV”. Though they differ in style and affect, what all successful programs within these genres have in common is that they engage the viewer

by evoking an emotional response. This response is an essential element in creating first-rate TV programs. If the viewer is not engaged in the program they lose interest.

A television program can engage the viewer in many different ways. If we look at a program like *Survivor*, we see that it utilizes a number of elements in order to interest the viewer. First is the *theme* itself, which is that a group of people are stranded on a deserted island where they must rely on their strength and intelligence in order to survive. This is an old theme, which has proved itself successful in varying forms both on television and in film and literature. The theme plays on the fantasies of the viewer that often exist as a counter reaction to our modern society. A fantasy, which manifests itself in a longing to return to a less complicated life where one's success is more easily measured. *Survivor* enables the viewers to live vicariously through the characters on the show and in a sense, experience the fantasy themselves.

One key to the success of *Survivor* is that the contestants are ordinary people. This creates a situation where the viewer watches and thinks "that could be me". They follow the actions taken and decisions made by the contestants on the show, and are engaged in that they place themselves in the same situation and decide how they would have reacted. Whether the viewer themselves would care to participate in the actual show does not affect the level of entertainment, because the show engages them to such a degree that they already are participating. (This same kind of passive participation exists to an even greater degree in game shows like *Jeopardy* and *Who Wants to Be a Millionaire?*)

It is important to remember that though the contestants chosen for *Survivor* are ordinary people, they are nonetheless cast for the show because they share qualities that the producers have determined will be interesting to the viewers. Furthermore, they are chosen and grouped in relation to the qualities of other cast members so the producers can insure a mix of personalities that will when combined with the *plot*, will ultimately give rise to conflict and drama.

The plot of *Survivor* is perhaps the most effective element used to engage the viewer. *Survivor* has a classic dramatic plot structure first described by Aristotle in *Poetics*, with a conflict or conflicts that create a rising tension until a climax is reached, leading into the denouement<sup>95</sup>. Each episode of *Survivor* (at least when the contestants are still divided into two teams) essentially has two climaxes. The first minor climax comes when one of the teams is determined the winner of the weekly competition, this is followed by a denouement in which the losing team must then decide which cast member must be sent home. This denouement however, quickly leads into the next and final climax when the losing team casts their votes, which are then counted one by one, in a dramatic fashion, until it is determined which contestant must leave the island. Directly following this is the final denouement when the losing contestant is escorted off the island, and the remaining contestants come to terms with their decision. Furthermore, there is a plot structure that spans the entire series, increasing in tension as fewer and fewer contestants are left on

---

<sup>95</sup> Aristotle, chapter 18.

the island, and climaxing in the last episode when a final contest determines which contestant is the overall winner. The first plot structure succeeds in giving each episode a rising tension and dramatic conclusion, while the overall plot of the series works to extend the drama from one episode to the next, thus engaging the viewers and enticing them to continue watching week after week.

The fixed climaxes of *Survivor* establish the plot, but they also work to create character development among the contestants. In literature, as M.H. Abrams explains, "plot and character are (...) interdependent critical concepts," it is through interaction with the plot that characters "exhibit their moral and dispositional qualities"<sup>96</sup>. The scripted conflicts in *Survivor* (i.e. the contests and group decision making process) have the affect of drawing out and exposed the individual personalities and characteristics of the contestants. The mix of personalities and competing interests gives rise to unscripted conflicts among the players that form the foundation for many *subplots*. Subplots are essentially interesting stories within a larger story or plot, that, according to Abrams "serves to broaden our perspective on the main plot and to enhance rather than diffuse the overall effect"<sup>97</sup>. These sub-plots in *Survivor* may share their climax with the fixed climaxes of the show, but they can also span several episodes and have their own independent climaxes. It is through these unscripted conflicts and subplots that *Survivor* (and other reality TV programs for that matter) gets a unique energy that thoroughly engages the viewer.

The character development that arises from the plot has two other important effects that contribute to the success of *Survivor*. As the personalities of the contestants are exposed through the conflicts in the show, the viewers begin to choose their own their own protagonists and antagonists. This is an important part of the process of creating the tension or *suspense* in the plot. In literature, suspense can be defined as "a lack of certainty, on the part of a concerned reader, about what is going to happen, especially to characters with whom the reader has established a bond of sympathy"<sup>98</sup>. Here if we substitute "reader" with "viewer", we see that character development, by creating sympathy in the viewer toward particular contestants (the viewer's chosen protagonists), contributes to the suspense of each climax in the show.

The second important aspect of character development is in relation to the contestants themselves. As the personalities of the contestants are revealed, contestants begin to form alliances and divide into loosely knit camps. This gives rise to *intrigue* that as Abrams describes is when "a character initiates a scheme which depends for its success on the ignorance or gullibility of the person or persons against whom it is directed"<sup>99</sup>. The intrigue that arises in *Survivor* often becomes the bases of the many subplots, and adds another very interesting and unscripted dimension to the program.

---

<sup>96</sup> Abrams, (1993:159).

<sup>97</sup> Abrams, (1993:161).

<sup>98</sup> Abrams (1993:160).

<sup>99</sup> Abrams (1993:160).

With the exception of the general plot and fixed conflicts in the *Survivor*, many of the elements we have discussed above are the result of unscripted events in the program instigated by the contestants themselves. Though they are unscripted, they are not unintended, but rather the results of a well thought out TV program that creates fertile ground for the birth of conflict and drama.

It is the intention that the elements proposed in the Echelon TV concept can achieve the same dramatic results as seen in *Survivor*. This should, at the very least, be the goal toward which further development of the concept should strive. Echelon is based on a common, and previously successful theme; that of the spy story. The contestants, and participants are given the opportunity to play the role of spy or agent, which can invoke the viewers' fantasy in the same way as seen in *Survivor*. Furthermore, the plot provides for both drama and climax within each episode, and an overall unifying plot structure is employed to maintain the interest of the viewer throughout the series.

In the case of Echelon, there are essentially two stories, the mystery itself, which the producers of the program will have absolute control over, and that of the contest, which the producers can shape, but not control. This lack of control could potentially be a weakness in the overall concept. As discussed above, the casting of the characters in *Survivor* enables the producer to better ensure a dramatic development and creation of subplots. Because the contestants for the Echelon TV program will be chosen based on their performance on the web, the concept, in its current state, does not allow for any form of casting. The risk then is that viewers find the contestants on the program to be uninteresting and un-engaging.

Though the game show *Who Wants to be a Millionaire?* has shown that it is possible to create a successful television program without any form of casting<sup>100</sup>, this may very well be genre specific. Echelon has similarities to the game show, yet also shares qualities with "reality TV", where the viewers develop a different kind of relationship with the contestants.

Instead of casting the contestants we have implemented a number of elements in the Echelon TV and Web game that are intended to increase the likelihood that the contestants possess the qualities to make them interesting characters on a TV program. The Echelon Web game is designed such that participants' success depends on their social skills. The participants must interact and converse with each other in order to complete assignments and by successfully making a good impression on the other participants, one can increase the likelihood of receiving points through the pay off. Though it is not a certainty, it may be assumed that if a participant has the social skills necessary to excel in the game, she will also possess qualities that will make her interesting on television.

---

<sup>100</sup> According to Charlotte Holm. Production Manager, Metronome.

Furthermore, the television concept has been designed so that viewers are free to assist the player of their choice. Here it is assumed that the viewers will assist the contestant with whom they feel the most sympathy. In order for this bond of sympathy to be created, the contestant must first exhibit qualities that are appealing to the viewer. In many respects, this element of the program can be seen as a form of voting, where through their participation, viewers are voting for the contestant they would most like to see continue.

It is possible that other methods should be implemented that will give the producers greater control over the selection of contestants. This could, for example, be a preliminary round between the Web game and the TV show, where the top 20 Web participants are selected for a try out for the show. This try out could be another kind of contest, based on the Echelon theme, where a participant's success is more strongly related to his possession of qualities that will contribute to the overall success of the program. Implementation of such a stage however, may affect the spirit of the concept as it exists now, where participants feel a sense of empowerment both in their ability to influence the game and in the knowledge that their success may lead directly to a spot on the actual TV program. This should be taken into consideration in the decision to implement such a stage.

Ideally, the television show will see a number of interesting contestants who continue through several episodes and into the final round. This is important in that the longer a contestant stays on the program, the greater the chance for character development. In order to achieve this, elements could be implemented in the program that would increase the likelihood that popular players who have been on several times will be able to continue.

As discussed in the presentation of the Echelon in chapter 3, it is important that the TV concept go through many stages of testing and development. Further development of the concept should work to insure that the program has successfully implemented several or all of the elements discussed in the analysis of *Survivor*. It is important that the program is structured in a way that allows for the unscripted conflict and drama that has played such a big role in the popularity of *Survivor*.

## **6.6 Loyalty and Community**

Above we have discussed the ways in which elements such as participation, interactivity, character and drama can be utilized and combined to create a successful entertainment concept. In this section we will examine the importance of community, and how this can have an impact on the acceptance and popularity of a media format. We will define the two types of community affected by a cross-media format like Echelon and discuss the ways in which different media can foster community. Furthermore, we will show how membership and participation in a community can inspire what is often referred to as "viewer loyalty" toward a television program or in the case of the Echelon web game, user loyalty.

In *Understanding Community in the Information Age*, Steven G. Jones writes that the degree to which we value community is evident in ‘the rhetorical use of community in social planning and the strength of persuasion the term “community” contains<sup>101</sup>. The benefits of community are manifold. They strengthen and bind society and at the same time empower the individual, giving him a sense of identity and belonging. We seem to have an innate tendency to form communities, and we regard these communities highly. We have hailed the arrival of the “information superhighway” for a number of reasons, a primary one being its ability to bring us closer by overcoming the barriers of place and time. Indeed, in the past twenty years one of the principal functions of Internet technology has been both the strengthening of existing communities and the creation of new. As we have discussed above the act of communicating itself, which the Internet gives great potential for, often results in the creation of community.

Cross-media offers the potential of further breaking the limits of place and time, giving rise to new and unforeseen communities. The advent of new technologies, both wired and wireless means that we are always connected. We will increasingly have the ability to interact at any time and from any locale with the communities in which we are members. While examining the promise of technology in community building, however, it is important to remember that “connection does not inherently make for community, nor does it lead to any necessary exchanges of information, meaning and sense making at all.”<sup>102</sup>

### 6.6.1 Communities: Virtual, Organic and Mobile

When discussing the impact of cross-media entertainment on community, it is important to understand that we are dealing with two different types of community, *organic* and *virtual*. Here we will borrow from Jan van Dijk who in *The Network Society* defines *organic* communities as being, “bound to time, place and natural environments (...) mainly based on face-to-face communication” while *virtual* communities “are associations of people not tied to time, place and other physical or material circumstances, other than those of the people and media enabling them”<sup>103</sup>. Due to these physical and material limitations participation in *virtual* communities has occurred in situations where the user is relatively isolated from the organic world. Though members’ *virtual* relationships can transcend space, their participation in the community is bound to the computer. Mobile phone technology offers the potential for a greater merging of the virtual and organic. We may increasingly see the formation what we will call the *mobile* community. This is largely an extension of a *virtual* community though it differs in that the limits in the media enabling it, primarily in terms of place, are significantly lower.

---

<sup>101</sup> Jones (1995:26).

<sup>102</sup> Jones (1995:12)

<sup>103</sup> van Dijk (1999:159).

Below we will explain how the different media used in Echelon can affect community. Though the Internet is often seen as the domain of *virtual* communities, it is not the sole proprietor. Television too can give rise to virtual communities, and likewise the Internet, particularly with email, has had a tremendous impact on pre-existing *organic* communities. Furthermore, mobile phone technology gives the allows for the development of *mobile* communities, which can potentially create the merging of the *virtual* and *organic* communities. Each media or technology has the potential to affect and strengthen different types of community in its own way. As we will see below this is largely dependent on who is using the media and for what purpose.

### 6.6.2 Television and Organic Communities (We are What We Watch)

Van Dijk claims that “every community has it’s own particular structure and activities, a social organization, a language and modes of interaction, and finally it’s own culture and identity”<sup>104</sup>. If one examines modern society from this perspective, it becomes clear that television plays a powerful role in and is often an integral part of the communities we form. Television is both an “activity” and a mode of “interaction” it influences our “language” and supports our “culture and identity”.

We watch television for a number of reasons, entertainment, education and information; we watch to escape and/or to connect. The latter two are particularly interesting in examining the influence of television on community. Television is the modern day equivalent of the campfire, it is an activity that connects us by acting as a focal point for our interaction. This analogy is obvious when people watch television in groups (be it a family watching a family oriented program, or a friends watching a sporting event). However, regardless of how we watch television, alone or in groups, it is often a social activity. By watching a particular program or programs we are maintaining connection to our popular culture. Often, even when we are watching television to escape, we are escaping from reality (a troubling day at work), and reinforcing our connection to a community. This connection allows us to understand the language of the communities we interact with, a language which is essential to our participation.

The degree to which television influences communities depends on the particular television program and the communities themselves. In the last year in Denmark, the television programs *Big Brother*, *Survivor* and *the Bar* have occupied an unusual amount of space in our collective conscious. This can be seen in the frequency with which the two programs have received front-page coverage in not only the tabloid press, but also the more serious mainstream media. An analysis by Observer Danmark showed that in a period of 4 months there were nearly 1500 articles published in the daily press about the programs *Big Brother* and *The Bar*<sup>105</sup>. Though they haven’t received the same level of

---

<sup>104</sup> van Dijk (1999:159).

<sup>105</sup> Grønnegaard (2001:9).

attention in the press, in the past shows such as *Dallas*, *Twin Peaks* and *Matador* have captured our interest in a similar way.

The result in each case is that the TV show becomes a “mode of interaction”, the subject of our conversations through which we can exchange information, not only about the program, but also about ourselves. Discussing our favorite characters in *Big Brother* or *Survivor* allows us to establish our own identities and better understand others. In the case of *Matador* (a program about a small Danish community during WWII) the program worked to strengthen a collective Danish identity. Soap Operas in America served a socially binding function for a considerable percentage of housewives. Television as “mode of interaction” allows a group to share and exchange a broad spectrum of human emotions; anger, humor, pride, sorrow, joy. This sharing of emotion has a very powerful effect on the strengthening of a community.

The influence of television discussed above is in relation to existing *organic* communities. The exchange of information is often face-to-face, at the very least between people who know each other ahead of time. What often happens in this case is that an existing community “adopts” a television program; the programs that gain popularity become part of our pop-culture and affect the language of our interaction.

### 6.6.3 Television and Virtual Communities

In certain cases the power of television is such that it creates communities where there were none. These communities, in many cases, are not limited by place or time, and thus can be defined as being *virtual*. In her article “Will the Real Body Please Stand Up”, Allucquere Rosanne Stone shows that this ability to create community is not unique to television, but rather inherent in mass communication. Stone demonstrate how both printed texts and electronic communication (radio, telegraph, and phonograph) gave rise to communities by uniting “people who were physically separated”<sup>106</sup>. In her discussion on television and *virtual* communities she offers the television show *Star Trek* and the community that call themselves *Trekies*, as one of the best examples of a television show creating community. She describes them as ‘a huge, heterogeneous group partially based on commerce but mostly on a set of ideas’<sup>107</sup>.

Stark Trek is perhaps the best known, but certainly not the only example of television based communities. The establishing of a fan club for a television actor or program is often the start of a community. On another level, are the programs, such as *Twin Peaks*, *Buffy the Vampire Slayer*, and *The X Files* to name a few modern examples, that go on to attain cult status. This cult status is the result of the zeal and often fanaticism of the viewers. These viewers can be characterized as members of a community whose identities are to a discernible degree linked to the program at its center.

---

<sup>106</sup> Mayer (1999:269).

<sup>107</sup> Mayer (1999:271).

Television based communities can extend into the *organic* world (a group of friends can share a common identity in that they are all *Trekkies*), but these communities are primarily characterized as *virtual*. Though they existed prior to the Internet, these communities have certainly flourished in cyberspace.

#### 6.6.4 The Internet, Cyberspace and Virtual Communities

One of the first results of linking computers in a network was the spawning of *virtual* communities. As our computers became connected, we too became connected; exchanging information with others and finding common interests free from the constraints of time and place. As users began to interact with each other online, they discovered that they were experiencing a new form of social contact<sup>108</sup>. The social relations that ensued gave rise to a clear sense of community among participants.

The first *virtual* communities began in the electronic bulletin board services (BBS) of the 1970's. BBS's were *virtual* places where people could come together around the exchange of ideas. These boards were started as shareware programs that were freely distributed by programmers with the intent of nourishing "the community in expectation that such nourishment would 'come round' to the nourisher"<sup>109</sup>. It was this concept of sharing that was essential in the forming of community and this sharing still exists in one form or another in diverse number of virtual communities that exist today. As Jones puts it, an "important element in cyber spatial relations is the sharing of information. It is not sharing in the sense of the *transmission* of information that binds communities in cyberspace. It is the ritual of sharing of information<sup>110</sup> that pulls it together"<sup>111</sup>.

*What* is shared is dependent upon the type of community in question, and can range from scientific information to private emotions. Of primary interest here though is how the act of sharing "information" online can "form a new matrix of social relations"<sup>112</sup>. These social relations can be very like the relations we see in the *organic* world, and yet they can be different in that virtual interaction has an element of freedom not found in our *organic* communities.

#### 6.6.5 Life in Cyberspace

There are a vast number of *virtual* communities in existence today, formed around any number of interests and activities. As we are dealing with an entertainment concept, we will concentrate our discussion on the type of communities relevant to Echelon, namely those that arise in social chat rooms. Though Echelon offers several different methods of

---

<sup>108</sup> Jones in Mayer (1999:16).

<sup>109</sup> Stone in Mayer (1999:272).

<sup>110</sup> Carey (1989).

<sup>111</sup> Jones in Mayer (1999:19-20).

<sup>112</sup> Jones in Mayer (1999:15).

interaction, the primary social interaction will occur via the chat and message system. The chat rooms are the gathering place for the members of Echelon's *virtual* community.

In "Electropolis: Communication On Internet Relay Chat" Elizabeth M. Reid looks at the type of social interactions that takes place in Internet relay chat (IRC) systems. What she found is that in cyberspace people felt a much greater sense of freedom than organic communities allowed. This freedom coupled with what Jones describes as "a sense that we are embarking on an adventure in creating new communities and new forms of community,"<sup>113</sup> gives virtual experience a degree of excitement that otherwise might be lacking in a place that is at it's essence a culmination of raw data, zeros and ones.

Reid characterizes chat communities as 'essentially a playground. Within its domain people are free to experiment with different forms of communication and self-representation'<sup>114</sup>. Due to the anonymity of virtual communication, people are largely free from the constraints of their real world identities. Jones sees this as a freedom of mobility, which he describes as "a mobility of status, class, social role, and character"<sup>115</sup>. Participants feel free to take greater risks, experimenting with different personalities, or taking on entirely different identities. Reid found that this mobility and freedom resulted in interaction that she describes as a kind of game<sup>116</sup>. Computer mediated communication "lends it self to irony, pastiche, playfulness and celebration of ephemeral and essentially superficial examples of witty bravado"<sup>117</sup>.

With this virtual freedom also comes diminished inhibitions, which allows for an intimacy in *virtual* communities that may otherwise be repressed in real world relationships. This intimacy, or sharing of emotions plays a primary role in creating and maintaining the community. When participants open up and share with one another, they create bonds and emotional investments. The loyalty that participants feel toward virtual communities is often much less than that seen in organic communities. But in as much as there is loyalty it exists in the emotional bonds created between the members.

### 6.6.6 Cross-Media/ -Communities

A cross-media concept like Echelon has the potential of fostering both virtual and organic communities. As we have discussed, successful television programs become a part of pop-culture and often a "mode of interaction" for pre-existing communities. If popular, Echelon will in all likelihood become exactly this for the target group. The program is designed so that viewers are the characters as well, therefore Echelon is not just a program they watch, but an activity they participate in. With the implementation of

---

<sup>113</sup> Jones in Mayer (1999:14).

<sup>114</sup> Reid (1991:4).

<sup>115</sup> Jones in Mayer (1999:17).

<sup>116</sup> Reid (1991:9).

<sup>117</sup> Reid (1991:12).

the web game, each viewer or participant has a unique individual perspective on the program. Part of the Echelon “experience” then is the sharing of different perspectives and information. Furthermore, the participants on the program are not only their peers, but also individuals they have interacted with at some point on the web site. Thus, for the active participants, simply talking about “news” in the community will be talking about Echelon.

The website functions as both a new channel of communication for existing communities, but also creates new *virtual* communities with many of the characteristics described by Reid. Echelon takes its inspiration from the identity game, which is an inherent aspect of Reid’s chat communities. Participants are encouraged to play, to pretend, to take on new identities. These activities become a part of the game itself. The fun of Echelon is to fool others and to be fooled.

The game play itself requires conversation amongst the participants and Echelon has several elements that are implemented to inspire and instigate conversation. The “keyword” assignment, for example, can have several functions, one of which is to initiate chat. The goal, of course, is that the chat in Echelon takes on a life of it’s own, and the conversations ultimately reflect the conversations seen in the players’ organic community. However, like conversations in the “real world” it often helps to have a topic or an event that can act as an impetus to the conversations. A player may begin a conversation with the ulterior motive of making a player say a particular “keyword” but in order to successfully do this, his motive will have to become secondary and he will have to engage the other player in a natural conversation.

It is also the intention that aspects of the game will create camaraderie and encourage meaningful interaction. “The Pay Off” is a weekly concept that requires that players with over a certain amount of points must give a percentage of their points to two other players. Players cannot give to the same player twice. These will certainly result in deal making and negotiating, but at another level it will motivate players to interact with each other, to create relationships and find “allies”. This kind of “forced sharing” certainly cannot be likened to the kind of emotional sharing that Reid is talking about, but it will have an affect on the type of interaction in the community. Participants will certainly be playful and try to fool each other, but they will also try to stay in good standing within the community. To do this they must open up to a degree and interact in a meaningful way with others.

The goal with Echelon is that it will result in the merging of *virtual* and *organic* communities. Friends will discuss Echelon and exchange information and differing perspectives in the same way that they do with current popular media. They will meet each other online and engage each other in the game play, perhaps even having one another as targets. At the same time, while participating in Echelon they will develop new virtual relationships. This creates an interesting situation where a group of friends could all share a common virtual friend who they have only met and interacted with online. As mentioned above, this could be taken to a further extreme by taking advantage of SMS, a technology, which is already extremely popular with the target group. The web game

could easily be extended in a way that would enable players to participate via their mobile phones and certain assignments on “Surveillance Cards” could require action in the real world. Features like this would result in the forming of what we have called *mobile* communities, in this case however, this mobile community would both be an extension of the *virtual* community created by Echelon and the *organic* communities that existed prior to it.

The target group’s participation in Echelon will have the affect of both creating and strengthening community. Alone, as a television program, a concept like Echelon can become part of the pop culture, and thus a mode of interaction within the community. The more the target group participates with Echelon however, the more likely this is to happen.

## 6.7 Community Giving Rise to Loyalty

Though *virtual* communities are the result of social interaction between members and often give very real emotional experiences, they differ from organic communities in more ways than a relation to time and place. Van Dijk explains that,

*members in virtual communities usually have only one thing in common: the interest that brought them together. They are heterogeneous in everything else. In an organic community, on the other hand, people have several interests in common, which makes such a community relatively homogeneous. This provides an organic community with better chances of building and maintaining its own culture and identity than a virtual community*<sup>118</sup>.

How then does this heterogeneous/homogenous difference in the two types of community affect the member’s feelings of commitment toward the community? This brings us to the question of loyalty, both from the perspective of community, and from the perspective of “viewer loyalty”. Though these two types of loyalty are seemingly different, they have very much to do with each other.

In broadcasting, there is much talk about “viewer loyalty” and much effort to create this “loyalty”. With the exception of cult communities however, loyalty is seldom felt toward any particular television show or web site.

Loyalty can only be talked about in as much as an entertainment format becomes part of the pop culture, and thus is used as a “mode of communication” within a community. Thus, what may be perceived as viewer loyalty is in effect loyalty to the community. This is not to say that there is community pressure to view or participate in a particular media format. Rather, participation and viewing, in varying degrees is related to an individual’s ability to participate in the community.

---

<sup>118</sup> van Dijk (1999:160).

In the case of Echelon, membership in the *virtual* community presupposes participation. The degree to which Echelon online entertains can obviously affect the degree of an individual's participation. Once a viewer participates however, the social relationships developed in the *virtual* community can give incentive for continued participation. But does the player feel any commitment to this community? This is highly dependent on the emotional investments he has made in the community, and bonds he has greeted with others. One can imagine a number of different types of virtual communities (i.e. communities based on illness or disease) where the members' level of investment is high; they have shared very emotional experiences. In these situations, the individuals would very likely begin to feel a sense of commitment toward the other members and the community as a whole. In Echelon, friendships will likely grow in the virtual space, but there will not be this level of emotional bonding. These collective friendships may result in community building, and give the members a sense of belonging that *inspire* them to return, but they will not feel a strong sense of *commitment* to the virtual community.

There is a much greater sense of commitment within organic communities, as van Dijk points out because they are more homogenous. The more a group has in common the greater the opportunity for sharing with one another and the stronger the bonds. Once individuals have made a certain level of investment in a community, and as they begin to define themselves in relationship to it, the greater their interest in maintaining the community. The building of a culture within a community can then be seen as the effort to find things in common, to create avenues for shared experiences, which will further strengthen the community.

In this way, a group's desire and need for the community is manifested in what can be perceived as "viewer loyalty". A group adopts a television program as part of their culture, and utilizes the shared experiences that come from the program to strengthen the community. A teenager wouldn't dream of missing an episode of program X because she would feel left out the next day at school. If she continued to miss the program, she would lose an avenue of communication to the community. The group is fairly homogenous, so she certainly has other avenues of communication, and the strength of her bond to the community very much lies in these avenues of communication. As they become cut off, she drifts from the group. Thus, she does what she can to maintain these avenues. She stays an active participant in the group, she joins common activities, listens to the popular music, and watches the popular television programs.

Many of the elements in a concept like Echelon are important from the perspective of a broadcaster, because they increase the degree to which the program becomes a part of the pop culture. The average popular television program is broadcast once a week. It may very well be a mode of communication within a community, but in most cases this communication is limited to the day of and the day after the broadcast. For a number of reasons, the broadcaster cannot increase the degree to which a program is part of the pop culture by simply broadcasting it more often. However, by combining different media, and utilizing the potential of each, a broadcaster can increase the penetration of a

concept into the popular culture. Echelon has the ability to stretch the television community's activities across a week and even across summer and winter breaks.

Though we have differentiated between the television program and the web game, it is important to remember that the two media flow into each other. Playing the game can in many ways be likened to watching the television program in that one is observing and participating in events that are related to and influence the "story" that unfolds on TV. At the same time viewing and participation are different in that they entertain the participant in different ways. Therefore Echelon becomes both a television program and an activity, creating a wider range of discussion within the community regarding Echelon. As we have seen, the level of this type of discussion can greatly increase the degree to which a media becomes a mode of interaction within the target group, which can result in what is perceived as "viewer loyalty" toward the program itself.

## 7 MACROECONOMIC IMPLICATIONS FOR ECHELON

---

Echelon is designed to provide the broadcaster with a number of unique possibilities both with regards to content and marketing potential. The target group that Echelon aims at is one that is of interest to both public and commercial broadcasters, yet increasingly difficult to reach due to their broad media tendencies. It is within Echelon's target group that we see the most dramatic decrease in television viewing and in order to win back this audience, broadcasters must develop dramatic new programs that meet the increased expectations of a group that has grown accustomed to interactive entertainment from their extensive web use. At the same time it is important that television broadcasters utilize the potential of the "competing" media in order to reach out to the lost viewers and recapture their interest.

The Echelon format is developed with no specific TV station in mind; rather it has been shaped independently from any restraints that may have existed, had it been created for one particular TV station. The TV landscape in Denmark is changing rapidly and there now exist a number of different business models for the TV stations. Below we will consider the Echelon format in relation to representatives of these models.

The most dominant TV station model in Denmark is still public service. Among these stations are The Danish Broadcasting Corporation (DR) and TV2 which each have two channels, a "mother channel" (DR and TV2) and their "young" channels (DR2 and TV2 Zulu). They do not follow the same business model, as we will elaborate below, however, they both must take into consideration the requirements of public service. Commercial channels on the other hand need to compete on different terms. We have chosen to focus on just one, TV3, as it is currently the most dominant and popular commercial station in Denmark<sup>119</sup>.

After the analysis of the different TV stations, the incentives, benefits and potential implications of hosting a cross-media format like Echelon will be considered from the perspectives of both the public service station and a commercial station. Rather than concluding, which model will be the better for Echelon, we will show how the adoption by either a public service station or a commercial station might affect the Echelon format.

### 7.1 The Public Service Channels: DR and TV2

The Danish Broadcasting Corporation (DR) is a public foundation, governed by the provisions of the Broadcasting Act of December 20, 2000 and ministerial orders from Ministry of Cultural Affairs. It is the only TV station in Denmark exclusively funded by

---

<sup>119</sup> According to Gallup TV-Meter, TV3 has the third largest percentage of viewers, while TV2 has the largest share followed by DR (Gallup TV-Meter May 2001).

revenue from a broadcasting license<sup>120</sup>. The Public Service requirements mean that DR must be accessible to all Danes. In 1999, 98 % of all Danes made use of DR at least once a week either through radio, TV or the Internet<sup>121</sup>.

As a public broadcaster DR is obliged to offer high quality programming and a wide choice of programs and services for all age and social groups. Furthermore, DR is required to offer objective and professional news coverage. DR is the country's largest electronic news provider on radio, television and the Internet, and news and current affairs are cornerstones of its Public Service activities. Another main obligation of DR is to reflect Danish culture, and DR is the country's largest provider of Danish music and drama. In 2000 DR had a share of 31.8% of the total television viewing in Denmark<sup>122</sup>.

TV2, like DR, is regulated by the Ministry of Cultural Affairs. TV2 differs however, in that it is a private foundation, which receives a large percentage of its revenues from advertising. In year 2000 75% of TV2's operating revenues came from advertising revenues and 25% came from public broadcasting funds. Furthermore, some TV shows such as the weather, Tour de France, OL and *The Mission* are fully sponsored by private corporations. According to Danish commercial legislation, a maximum of 15% of TV2's programming can consist of advertisements and there can be a maximum of 12 minutes of advertisements per hour. Out of the total daily programming (currently 17-18 hours) approximately 8% is used for advertisements<sup>123</sup>.

As TV2 receives 25% of its revenues from the broadcast license it is obliged to meet the same Public Service demands as DR. Thus its programs must be independent of financial and political special interests and it must strive to broadcast TV offering a high quality and wide choice of programs and services for all age and social groups.

TV2 is based on an external commissioning mode meaning that only news, current affairs and sports, which constitute 35% of the programming (approximately 17 hours a week), are produced by TV2 itself. The remaining 65% are commissioned productions from companies such as *Nordisk Film*, *Skandinavisk Film Kompagni* and *Metronome Productions A/S*. In 2000 TV2 had a share of 36 % of the total viewer ship in Denmark<sup>124</sup>.

---

<sup>120</sup> The license fee is set by Parliament for a four-year period. The main part goes to DR since TV2 is primarily financed by advertising. DR is receiving 85 %, TV2 receives 14,9 % and the last 0,8 % of the license income is given to local radio- and TV stations. To receive DR Radio, DR TV, TV 2 and local radio/TV a household must pay DKK 5,42 per day (color license fee 2001, incl. radio). "Bekendtgørelse af lov om radio- og fjernsynsvirksomhed". www.kulturministeriet.dk [May 19, 2001].

<sup>121</sup> Programregnskab (1999:3).

<sup>122</sup> Gallup, TV-Meter.

<sup>123</sup> <http://omtv2.tv2.dk/>

<sup>124</sup> Gallup, TV-Meter.

DR and TV2 are required to coordinate their programming so that programs from the same category, such as news, Danish drama, sports events and children programs, are not broadcast at the same time on the two channels.

### 7.1.1 Freedom of Action: Political

As DR is fully license-dependent, its programming and Public Service requirements are politically determined. DR is required to produce annual public accounts of its programming describing how it has met the public service demands as described by the government.

Currently there seems to be a general satisfaction with the quality and services of DR. However, the future of DR is very closely intertwined with the opinion of the ruling parties. As long as DR keeps its reach there are no indications that the current governing parties will cut down on their support to DR. However, if the reach decreases, there is no guarantee that this support will be maintained. In order to maintain its relevance, it is essential that DR keep abreast of future media trends. When the Internet emerged as a viable new medium, it was necessary that DR extended its services from the traditional media of television and radio to include the new medium, and therefore they have developed extensive online services. With the advent of new technologies the media landscape will again change and it will be critical for DR to respond in order to maintain its reach. Without a high reach the *raison d'être* for license funding will disappear as well as the support from the current government.

If the upcoming election<sup>125</sup> leads to a change in governing parties it might very well change the prospects of DR. According to Venstre (Denmark's Liberal Party)<sup>126</sup> the digitalization of television and the many new platforms and media formats will undermine the current state of public service. Either DR will have to demand license fees for all platforms receiving DR content, which Venstre is against, or else DR and its Public Service content will have to be offered on a subscription basis, as is the case with the commercial stations. In Venstre's opinion DR should continue to concentrate on developing Public Service content, meaning offering the kind of content that is not being produced by the commercial stations. However, it should be an individual decision whether to subscribe to DR or not.

Although only 25% of TV2 is financed by license income it is a private foundation, fully regulated by the government. As with DR, there is a clear definition of the Public Service demands made of TV2, and the Ministry of Cultural Affairs defines the framework for its programming. TV2 is also required to make an annual public service audit where they are to report on the extent to which they have complied with the public service goals stipulated by the government.

---

<sup>125</sup> The date for the next election has not yet been determined. The latest possible date is March 2002.

<sup>126</sup> Media Spokesperson Jens Rohde, February 2 2001, [www.venstre.dk](http://www.venstre.dk) [May 19<sup>th</sup>, 2001].

As with DR, the future of TV2's public funding is politically determined and the current government has only expressed satisfaction with TV2 and its programming. Thus the prospects of TV2 are good as long as it maintains its current reach.

According to recent joint statements from "Venstre" and "the Conservative Folk Party", however, one of their goals, if they should come to power after the next election, will be to privatize TV2 and liberalize the current laws for advertising so that they will be in line with the advertising laws for the newspaper industry. Thus commercial breaks within the programs (which are currently illegal) will be allowed. According to Venstre's Media Spokesman Jens Rohde, the digital terrestrial transmission network will open up a whole new market and bring in new commercial competitors, which will undermine the current economic foundation of TV2. For this reason the right wing coalition finds it necessary to privatize TV2 as soon as possible to ensure that it will not become an economic burden on the Danish State.

### 7.1.2 Freedom of Action: Legal

Both DR and TV2 are subject to Danish legislation regarding TV and Radio. There is thus a great legal puzzle to be solved for every maneuver taken by the corporations. Besides the Public Service requirements, which always have to be taken into consideration in the programming, DR, and TV2 have to pay close attention to e.g. *Konkurrenceloven*, *Markedsføringsloven*, *Registerloven* and *the Dørsalgsloven* (legislation governing Competition and Monopolies, Marketing, Data Privacy and Door-to-Door Sales).

A comprehensive account of the complex and multifaceted legal and regulatory issues facing convergent media is a daunting task and is out of scope for a thesis of this kind. We have therefore chosen to briefly analyze and discuss central legal issues such as the laws governing marketing, competition and data protection to exemplify how DR and TV2 are indeed constantly affected by the Danish legislation.

#### Legislation Governing Competition and Monopolies

Both DR and TV2 need to pay close attention not to adopt practices that distort competition by abusing their Public Service advantages. Due to the fact that they are the only stations with almost 100% nationwide coverage as well as being the only recipients of license income, they both have a competitive advantage over other broadcasters in the market. They may not however, take advantage of this in positioning themselves in relation to their competitors.

For example, though it may be beneficial to many users if DR-Online (DR's website [www.dr.dk](http://www.dr.dk)) were to function as a portal, this would be problematic in many ways. DR would have a clear competitive advantage over smaller commercially funded portals that are fully dependent on their advertising-, transaction- and subscription revenues. Furthermore, though it may seem an obvious service for DR online to provide a link to an online bookstore at the end of a book review, or to a travel agency at the end of an

article about travel tips, it would be seen as an unfair practice if DR were to link to only one bookstore or one travel agency from a portal supported by public money.

TV2's portal has been accused of doing just that since www.TV2.dk serves as a portal for both TV2's regular services and activities as well as commercial sub-divisions for traveling, job market, real estate, boats and cars. As TV2 is entering a market of commercial players who are dependent on their advertising, subscription and transaction revenues, their practices distort competition as they have a clear competitive power due to their position as a public body with a license income. There are very strict rules for TV2 web regarding the balance of public service and its commercial activities. The TV2 website does get money from TV2/Odense (the broadcaster) but they have to be very careful how they use that money in order to prevent being accused of unfair competition. www.TV2.dk is currently the 5<sup>th</sup> most visited site in Denmark.

### Legislation Governing Marketing

Having an ordinary news service on DR-Online or tv2.dk can also be controversial. Currently it is not possible to sign up for a newsletter electronically. If DR offers its customers such a service on their website they will have to require that the customers inquire by regular post instead of just filling out an online registration form. The same goes for any other kind of "push" technology, meaning that DR cannot send any form of e-mails or SMS with out first having the recipient's written permission.<sup>127</sup>

### Legislation Governing Data Protection

There are also strong restrictions on DR and TV2's handling of data<sup>128</sup>. Currently DR is struggling to figure out how to store news and information in its database. The problem is that if they store news on say, a politician, they can be accused of keeping a registry of people's political affiliations as it is against the law to store data on race, political affiliation or sexual orientation without permission from *The Danish Data Protection Agency (Datatilsynet*<sup>129</sup>) For internal use and in connection with news broadcast DR and TV2 can store data for a limit of three years. It is however essential that the database is restricted for internal use only<sup>130</sup> in order not to conflict with the *Act on Processing of Personal Data (Persondataloven)*.

Asides from the letter of the law, which is determined by Danish legislation, both stations are subject to the unwritten laws of society –ethical standards. Although the channels are free to act in certain ways, they may not always choose to do so if their actions may lead to discontent in the public opinion.

---

<sup>127</sup> Interview with Marie Louise Jersild, DR-Online, May 2001.

<sup>128</sup> "Massemediers informationsdatabaser og medieansvar": Law no. 430 of 01/06/1994.

<sup>129</sup> Formerly known as *Registertilsynet*.

<sup>130</sup> Interview with Marianne Borker, Legal Adviser DR June 6 2001.

TV2 has chosen to be self-regulating on the matter of advertising aimed at children and in connection with children programming. Thus TV2 currently keeps a five-minute commercial free zone around the children programming. Furthermore, TV2 does not air any commercials aimed at children under 12 years of age before 9.30 AM. Without exercising self-regulation, it is quite likely that legislation on commercials for children would otherwise have been drafted by the Ministry of Cultural Affairs. And as the Minister has been involved in the elaboration of the regulations it is also likely that the laws would have been fairly similar to the current standards of TV2. Yet this act of self-regulation has made TV2 stand out as being socially aware and responsible and thus strengthened its brand in the eyes of the public.

Currently there are no legal restrictions on sponsorships on www.dr.dk. Thus the site could take advantage of lack of regulation and receive sponsorships on the site, which would increase its revenues. However, DR-Online has chosen to avoid sponsorships on the site, in the belief that this might undermine DR-Online's credibility and integrity in the population.

### 7.1.3 Freedom of Action: Economic

Every fourth year the parliamentary mass media accord determines the economic prospects of DR. This creates stability and security that enables DR to operate almost unaffected by economic turbulence in the media market and in society at large. However, this stability can also be seen as constricting as it leaves little room for growth.

Even though DR is a public foundation, it is still managed in much the same way as a commercially based organization. But in contrast to a regular business, which has the main focus of generating the greatest profit possible for the shareholders, DR's primary focus is to live up to its Public Service demands and its and a secondary concern is to manage its activities in a financially responsible fashion<sup>131</sup>. Currently 92% of the annual revenues stem from license, 6% from sales, sponsorships and co-productions, 1% from DR Multimedia and 1% from interest payments. Although DR is engaged in a number of profit creating activities there are however strict rules as to how it conducts its business. An example of this is the sponsorship laws, which prohibit DR from receiving sponsorships which might negatively affect the credibility and independence of the program, the reporter, or DR's integrity. In addition, certain types of programs, such as children programs and news, may not be sponsored under any circumstances.

In 1999 TV2 experienced a decrease in their advertising revenues<sup>132</sup> due to the increase in competition from commercial TV stations. Because of the competition, TV2 has no interest in being broadcast via cable or satellites as it will then have to compete with, say TV3/Viasat for the advertising revenues and risk losing viewers who can more readily

---

<sup>131</sup> Interview with Hanne Bolbjerg, Legal Adviser DR May 21<sup>st</sup> 2001.

<sup>132</sup> Public Service Beretning (1999:4).

zap away to the competition than they can on analog TV. There are currently no incentives for TV2 to be broadcast in other ways than on the nation-wide analog terrestrial transmission network. However, this might change in the second quarter of 2002 when digital terrestrial television goes live, on which TV2 will be represented.

The dual demands of being a Public Service station and at the same time being a player in the commercial market makes TV2 vulnerable in the competitive TV landscape. On the one hand public service requirements mean restrictions on TV2's programming and advertising. On the other hand, the limited license funding makes the station dependent on advertising revenues. TV2 is, however, the only commercial station with nationwide coverage. This gives TV2 an advantage over other advertising financed TV stations when competing for the advertising revenues, as its advertisements will be seen by a much larger number of people.

## **7.2 The Commercial Channel: TV3**

TV3 is a fully commercial channel owned by Viasat<sup>133</sup> - a part of the Modern Times group. It began broadcasting in December 1987 as Denmark's first commercial television channel, challenging the Danish state monopolies. Today, the Danish version of TV3 is transmitted from the TV3 Broadcast Center outside London. TV3 has a unique position with a strong brand throughout Scandinavia, and it is the leading advertising-funded satellite channel in Scandinavia. In 2000 TV3 had a share of 9% of total viewing in Denmark<sup>134</sup>.

### **7.2.1 Freedom of Action: Political**

TV3/Viasat is broadcast from England, which means that it is not subject to Danish but British legislation. This gives the station much greater freedom in both content and marketing. For example their programming includes commercial breaks during the programs, which is against Danish law.

### **7.2.2 Freedom of Action: Legal**

TV3/Viasat operates under British legislation and the terms of EU directives. Any agreements entered into with Danish bodies are purely voluntary. An example of such an agreement is that TV3 does not broadcast advertisements targeted at children in connection with their children programming. This is in accordance with the guidelines laid down by the Danish Ministry of Cultural Affairs, but the fact that TV3 follows this is purely voluntary.

---

<sup>133</sup> Viasat is the largest pay TV provider in Scandinavia. To receive any of Viasat's programming a Satellite or cable network is needed.

<sup>134</sup> Gallup, TV-Meter.

Even though TV3 does not operate under Danish legislation it does serve a purpose that the TV station enters into agreements with Danish bodies, as this will help the station strengthen its brand in the population. In that respect they have to take Danish ethics into consideration. An example of what TV3 is trying to avoid is the current situation of TvDanmark 1<sup>135</sup>. TvDanmark1 outbid both DR and TV2 in the fight for acquiring the rights to broadcast Denmark's away games in the World Cup qualifying rounds. However, as TvDanmark only reaches 60% of the Danish population their aim of promoting the channel as "Denmark's new sports channel" has failed. Instead of Danes gathering around the screen to watch sports on TvDanmark the Danes are now gathering in a dislike against the channel, which has "taken away the national sport from the people". Although TvDanmark has legally purchased its right to broadcast the sports events they are now in a situation where their actions are turning the population against them leading to a decrease in viewers and advertising revenues<sup>136</sup>.

### 7.2.3 Freedom of Action: Economic

As TV3/Viasat is fully commercial the main economic interest group is the stockholder. TV3/Viasat is a business as any other and the main focus is to create and offer content, which will draw the highest number of viewers and thus create the largest advertising revenues.

The economic freedom of action does however make them dependant on the general economical market trends. Hence they do not enjoy the same economic security as DR, who can rely on a fixed budget for throughout a four year period. TV3 is thus dependent on its ability to continuously create new types of content and services, which will attract viewers and lead to new revenue streams.

## 7.3 Incentives and Consequences for Echelon

As the above discussion has shown there are marked differences between the two television models. There is the public service station that operates primarily for the benefit of the entire Danish population, subject to the restrictions of Ministry of Cultural Affairs, yet relatively secure with a fixed license income. At the other end of the spectrum are the commercial broadcasters, whose primary interest is the shareholders, and who are subject to the demands of a competitive market, yet have considerably more freedom. With these two very different models, it is important to consider the implications of adoption of a format like Echelon for both public service and commercial stations. In the following we will show how its adoption by either a public service station or a commercial station might affect the format and outline the benefits that can be had in broadcasting Echelon.

---

<sup>135</sup> TvDanmark 1 is broadcast via London and is only receivable through either satellite dish or cable TV.

<sup>136</sup> Ilsoe (2001:1).

### 7.3.1 Constraints for Echelon: Public service

The production of Echelon for a public service station can lead to restrictions on the concept, as there are a number of laws and unwritten rules that need to be taken into consideration before broadcasting the show. Thus certain features of the format might have to be modified in order to fulfill the obligations as formulated by the ministerial orders from the Ministry of Cultural Affairs.

One element of Echelon that would be affected by this is that concerning SMS and Email. If contestants choose, they can receive an email or SMS every time a new message or challenge is given on the Web game. This notification serves as a reminder of the ongoing game and may work to draw the players back to the game. However, as DR and TV2 are subject to legislation on marketing (*Markedsføringsloven*), they cannot simply push out information unless the users have signed a written agreement to receive push information either through SMS or e-mail. Under current law it is not possible to do give one's consent electronically. Thus TV2/DR will have to request that the users print out a document and "snail-mail" it in order to be able to push information to the users. It is quite unlikely that the users will go out of their way to do so. The place where this would have the greatest impact is in the proposed Future Mobile Futures that would extend the game into the real world and work to create a mobile community. This would not be possible with the current restrictions placed on the public service broadcasters. With the exception of the notification via SMS or Email, however, this law would not affect the concept as it is implemented in the prototype.

Another constraint on the use of Echelon by DR/TV2 may come from the ethical considerations of being a public service provider. This is a less tangible variable as it is fully dependant on general tendencies and trends of society, which are continuously changing. From this aspect the Echelon format could be blamed for encouraging young people to spend more time in front of not just the TV but the computer as well. One of the assignments in the Web game is to stay active online for a certain amount of time: If the player stays in the same chat room with a target for 5 minutes he/she will gain points. There are no regulations against encouraging the viewers to stay in front of the screen – this is after all the main business of both DR and TV2. However, as the game rewards young people for staying online they might be criticized for encouraging inactive behavior of young people.

The financing of Echelon might also become somewhat problematic, especially for DR, which is fully license dependant. Although the implementation of a cross-media format like Echelon will demand large investments DR cannot apply a large surcharge on, say, incoming SMS. DR could acquire a small fee for each SMS message as pay-per-use for the extra service. As not all viewers are expected to participate interactively it is reasonable to let those participating pay for the service so that this new service will not be at the expense of the services targeted at the traditional viewers. Although there are no official regulations against SMS surcharges it is against DR's politics to charge the viewers in order to make a profit. Thus it would only be in order to finance the new format that DR would charge an extra fee for the SMS interaction. Currently, however, it

is not possible to demand extra charges for receiving SMS', as the phone companies do not have the technical solutions to do so. A solution is expected in the near future as the first test with surcharges has just been conducted by TDC with the VIC<sup>137</sup> ringing tunes. Most likely DR would be able to charge approximately DKK 3,00 per SMS received.<sup>138</sup> As Echelon is aimed at the age group 17-30 this will not conflict with the regulations regarding children.<sup>139</sup>

### 7.3.2 Consequences for Echelon: Commercial

To broadcast Echelon on a commercial station will be subject to fewer legal restrictions on the cross-media concept, especially as TV3 is broadcast under British legislation. However, due to its dependence on the advertising revenues it is restricted by the demand for large audiences and the overall interest and participation in the cross-media concept.

One possible impact of a TV3's broadcast of Echelon is that the high level of commercialism may have a negative impact on community development, as the users might be turned off by the many advertisements. If every SMS or email sent from Echelon has a sponsor message it might create bad will towards the message itself. This may consequently lead to a decrease in the interest and bad will towards Echelon. Furthermore, if TV3 enters into exclusive agreements with its sponsors, e.g. TDC, it may also create a negative attitude towards the program. In connection with *Big Brother*, TDC had an exclusive agreement with TvDanmark, which enabled only TDC customers to call in and cast their votes on the contestants in the TV show. If Echelon creates a similar agreement with, say, a telephone company it might create ill will amongst those that use another phone company, which can have the consequence that they cease to watch the show/site.

### 7.3.3 Benefits: Public Service

The public service station's position in the Denmark is increasingly challenged by the commercial stations' intrusion into the media market. The commercial players are primarily focused on formats that satisfying general needs (often for the lowest common denominator) in order to attract the most viewers and generate high advertising revenues, while in contrast the programming of DR/TV2 is under a constant challenge to provide popular and meaningful, high quality programs both for the general population and for the narrowly defined segments.

Recent research shows that television viewing is declining among those under 30 and that public service channels in particular are losing their grip on the younger part of the

---

<sup>137</sup> VIC, or TDC Mobil, is TDC's division for mobile phones.

<sup>138</sup> Interview with Marie Louise Jersild, DR-Online, May 2001.

<sup>139</sup> DR considers "Children" as the age group 0-12.

population.<sup>140</sup> If the public service providers fail to reach this segment this will conflict with the public service commitment of reaching all groups of the population. This young segment is a critical target group for the public service providers as they are an important potential foundation stone of public debate, which is a prerequisite of our democracy. As one of the premises of public service is to strengthen democracy it is essential that they do not fail in reaching out to the target group, the citizens of a democratic society of the future.

Both TV2 and DR are now rearming in the battle to sustain the interest of the younger part of population<sup>141</sup>. In order to maintain their vitality, TV2 and DR must compete with the new television formats aimed at the younger segments, such as *Big Brother*, *The Bar* and *Survivor*, which have been broadcast by the commercial stations in recent years. Offering a TV format like Echelon would allow the stations to compete with the commercial station's "reality shows", while still offering a higher quality format that does not rely on voyeurism, but on the interaction and brainpower of the users. Echelon can help brand the public service stations among the young population. As a cross-media format, it will help the public service providers' position themselves in the media market as frontrunners in the new media landscape, which will appeal to the target group where there is already heavy use of new media.

Current "reality programs" are generally based on a kind of negativity, where the focus is on eliminating, or "voting home", the contestants who are unlikable. This is either done by fellow participants or by the viewers. In Echelon the approach is the opposite, as the participants will be rewarded according to the degree to which they help the. An example of the "positive" aspect of the format is that rather than asking the viewers to cast their votes in order to expel contestants, they are asked to help the contestants to get through the program successfully. Another example is the weekly "pay off" where the Web game players must give points to fellow players. By doing so they may be rewarded in return. By rewarding social rather than antisocial behavior Echelon is disassociating itself from the trend in current reality shows. By broadcasting this type of reality show DR and TV2 would be able to attract the younger segments without including elements that would be in conflict with the public service profile.

TV2 was originally given an option to buy the popular TV show *Big Brother*, which would have ensured them large advertising revenues. They chose to turn down the offer as they did not find that such a format – however legal it was for them to show it – would live up to the population's demand for quality TV nor would it have been in line with the image which TV2 wants to project<sup>142</sup>. In all likelihood, though it would have been a success, TV2 would have been heavily criticized were they to broadcast *Big Brother*. By choosing Echelon, TV2 will enjoy some of the same advertising revenues that they lost

---

<sup>140</sup> Rosenkrands (2001:20).

<sup>141</sup> Programregnskab DR (2000:4) and <http://omtv2.tv2.dk/information/faq.asp> [May 25 2001].

<sup>142</sup> Anette Rømer in "Mere Reality på vej", Politiken April 15<sup>th</sup>, 2001.

by rejecting *Big Brother* without being subject to the same kind of criticism that they would have been, had they broadcast *Big Brother*.

While they are losing young viewers to other channels, they are also losing young viewers to other media. It is an acknowledged fact that if the focus of DR/TV2 continues to be on traditional TV/radio formats it will be hard to maintain the current reach as the new platforms are taking their share of people's media consumption<sup>143</sup>. In 1999 the average Dane had a weekly TV consumption of 18 hours<sup>144</sup> and there are no indications that these Multiple Digital Channels and the increase in supply will lead to an increase in media consumption but rather that the media consumption will become more fragmented. Thus by broadening their profile to also include platforms other than TV and radio DR/TV2 are increasing the chances of maintaining their current reach in the population.

The concept of public service can also be interpreted as being broadly educational – in much the same way as “to inform, educate and entertain” are tenets of public broadcasting at the BBC. With digital TV household penetration figures of 12-14% by the end of 2002 leading to between 38-51% by the end of 2004, DR/TV2 (to quote Director General Christian S. Nissen) have an interest in “Interactive Lighthouses”, examples of enhanced and interactive television that demonstrate digital added value to the population. A format such as Echelon could be a candidate for such an Interactive Lighthouse – like *ROFL*<sup>145</sup>, which will help viewers prepare themselves for the TV of the future. As the early adopters of technology often are found amongst young people, TV2 and DR will benefit primarily from aiming these first types of programs at the young target groups. By enjoying this first mover advantage through producing new cross-media concepts like *ROFL* and Echelon, DR/TV2 will also send out a political signal that they are fulfilling an important part of the media development in Denmark and that their presence and production will make an essential difference in the development of dTV in Denmark.

Because viewers will be able to participate in Echelon 24 hours a day, the broadcaster will have a great marketing potential. On television, changing from one program to another can often mean a change in the target group. Rather than lose the target group in this process (to other channels or other media), DR/TV2 could, directly after the conclusion of a TV program popular with the target, show a teaser for the Echelon Web game. The program “Big Brother” is able to capitalize on this kind of marketing and successfully hold the viewers' interest. Viewers can go directly from the evening broadcast to the live stream on the Internet.

---

<sup>143</sup> According to Hanne Bolbjerg, Legal Adviser DR.

<sup>144</sup> Konvergens i netværkssamfundet (2001:64).

<sup>145</sup> *Rene ord for lommepengene* is the first interactive TV program broadcast on DR and is perceived as being a frontrunner in the iTV market.

The advertising potential of cross-media can also help create greater awareness of both Echelon and of DR/TV2 at large. As the interaction on the website is a prerequisite for the TV format, Echelon will create traffic on the traditional site of DR/TV2. Simply by generating traffic through the site, the broadcaster will have the occasion to advertise for and make the players aware of other television programs and services offered by the broadcaster that may be attractive to the target group. Aside from attracting viewers for other programs, this type of advertising can help to strengthen the position of the broadcaster within the target group as a whole. Particularly with this target group branding is a critical issue, and anything a broadcaster can do to increase their relevance within the target group will strengthen their market position.

### 7.3.4 Incentives: Commercial

The commercial stations are fully dependent on their capability to attract large audiences, which will enable them to generate large advertising and subscription revenues. Thus being able to offer new and attractive formats is vital in the competition for the viewers.

A cross-media concept like Echelon will help position TV3 as a frontrunner in the new media market. The fact that Echelon permits interaction via several platforms will also ensure TV3 exposure from more than just the TV screen. TV3 already has a strong grip on the younger segments, which is a very attractive target group for the advertisers. TV advertising is also mostly used for commercials for fast moving consumer goods, of which the young segments are large-scale consumers<sup>146</sup>. However valuable, the younger segments are also the hardest to maintain a relationship with, as their sense of loyalty to a given channel is rarely very strong<sup>147</sup>. Where the limited media offers of the past (until 1988 the only available channels for the Danish viewers in Eastern Denmark were DR and SVT1 /2 – the Swedish public service channels) made it possible to reach large segments through mass media productions, the current media market characterized by a multiplicity of channels and choice makes it harder to reach large number of people through a single channel. Although this applies to the entire population, the individualistic and fragmented use of media especially holds true for the young population. This fragmentation will only continue to grow with the increasing number of Multiple Digital Channels. Where the power used to belong to those controlling the media it is now in the hands of those choosing the media<sup>148</sup>. Thus if advertisers wish to reach the young segments, it is necessary that they do so through different channels such as direct mail, events, sponsorships and other strategies. A cross-media concept like Echelon will offer TV3 a compelling case to its advertisers. Due to the innovative use of media platforms it will enable advertisers to use new forms of advertising.

---

<sup>146</sup> Møller (2001:12).

<sup>147</sup> Morten Østergaard in Rosenkrands(2001:20).

<sup>148</sup> *Institut for Konjunkturanalyse: Danskerne 2001 – Vælgerne dagsorden og det nye medie billede* (April 2001) in Rosenkrands (2001:20).

Via Echelon, the broadcaster will have access to information about the individuals such as their age, gender, and residence, which would allow them to offer target marketing for an attractive group of consumers. If they choose to do so, the broadcaster could request further information such as hobbies, vocation and income. With this information the broadcaster can generate specific banner ads that are of direct interest to the player. The game itself could be sponsored by a number of companies that are interested in reaching the target group. Their logo could be displayed on the screen which, if the participants spend between two and three hours a week playing the web game, would be very effective marketing.

Furthermore, TV3 may be able to push somewhat personalized ads to the users through email and SMS. It will not create an entirely open gateway to the users but when pushing information regarding new messages or challenges it will be possible to buy, say, banners, which are targeted at a specific age group or sex. Also alternative forms of advertising such as sponsorships in the form of personalized logos or ringing tones will give advertisers the possibility of reaching their target groups in new ways<sup>149</sup>.

On the website, TV3 could enable the users to send postcards and SMS. This would be interpreted as an extra service of Echelon but would really act as another means of creating attention to Echelon. The postcards and SMS' could also include small banner ads for partnering company's products.

As TV3 is not restricted by Danish advertising legislation they could use the Echelon format to capitalize on the commercial breaks within the show. For example, viewers must collect clues and solve riddles in order to assist the contestants on the program. It would be possible then to have a few of the clues given via a television commercial. This allows the broadcaster can sell more valuable advertising slots as they can better assure that the viewer will give the advertisement their full attention.

TV3 could also enter into alliances with companies and create awareness about Echelon and the participating companies in new ways. The clues to solve the games on the website could be found on the label or the lid of soft drinks or on the milk bottles. Fast food chains such as McDonald's could offer points for each meal purchased which would add to the total score of the participants. If a broadcaster were to take on sponsors in producing Echelon, they could do many things to incorporate the sponsor into the game itself. When a player gets an assignment instructing them to make their target say a keyword, an occasional keyword could be the name of the sponsor, or a product made by the sponsor. This type of advertising would run the risk of being quite transparent in many circumstances, in others however, it would work naturally within the concept. For example, if a record company were the sponsor, the key word could be the name of one of their musicians. Or a key word could be Nokia, or the name of a

---

<sup>149</sup> An example of this is TDC's sponsorship of Big Brother. Not only did TDC get publicity through their traditional sponsorship of the program, the website and the technical solutions. They also created attention by offering Big Brother logos and ringing tones exclusively for TDC customers.

new computer game or movie. This type of subtle advertising could work to generate conversation and interest around a specific product.

## **7.4 The Broadcaster and the Benefits of Echelon**

As we have seen in the above analysis the model behind the broadcasting corporations, being public service or commercial, leads to different incentives, benefits and implications of hosting a cross-media format like Echelon. However, regardless of the model the ability to offer new and attractive formats is vital in the competition for the viewers.

Echelon has many of the elements in place that could work to cement the broadcaster's position in the community of the target group. Because the program meets the viewer on so many fronts, the Internet, the TV, and mobile phones, there could be a kind of snowball effect to establish and enforce this community. The more people who participate, the more they talk about Echelon, inspiring yet more participation. If this process took place, Echelon would assume an important role in the community of the viewers, and this can only be seen as a benefit to the broadcaster as it is the element that gives rise to loyalty.

Echelon is designed to provide the broadcaster with a number of unique possibilities both with regards to content and marketing potential. The target group that Echelon is aimed at is one that is of interest to the both public and commercial broadcasters, yet increasingly difficult to "capture" due to their broad media tendencies. As mentioned above, television is losing a part of its audience as a result of the competition from other media. It is within Echelon's target group that we see the most dramatic decrease in television viewing, and these viewers have primarily been lost to the Internet and game consoles. In order to win back this audience, broadcasters must develop dramatic new programs that meet the increased expectations of a group that has grown accustomed to extremely interactive entertainment. At the same time it is important that television broadcasters utilize the potential of the "competing" media in order to not only keep their share but also to reach out to the lost viewers and recapture their interest. This is exactly what Echelon aims to do.

## 8 CHOICE OF TECHNOLOGY

---

When setting out to develop a system the choice of technology has a major impact on the success and future life of the system. Matters of compatibility, scalability, stability and liability, extendibility, efficiency as well as modularity and interfaces between modules has to be taking in to consideration. Furthermore an institution or company has to have some kind of certainty, that available workforce can run, maintain and extend the system.

In this chapter we will discuss the above issues in connection with the different technologies at stake in the prototype of the Echelon Web game. For each of the high-level technologies we will describe what purpose they serve as well as their advantages and disadvantages. This includes the World Wide Web, http and Web server programming, socket connections for real-time communication, database for data storage and retrieval. These are all discussed under the headline of Back-end Technologies. Second, a discussion on XML used for abstracting the interface between front-end and back-end is taken before the Flash as a front-end presentation technology is considered.

In the next two chapters we will use the terms data tier, middle tier and presentation tier to represent the different high-level modules of the system design. These expressions will perhaps make more sense in the context of the next chapter, where they will be used more heavily. When it clarifies the discussion to draw the border sharply in terms of what happens at the Web server and what happens at the other side of the network, we use talk about the back-end and front-end.

### 8.1 Back-End Technologies

The majority of interactivity and participation of Echelon takes place through the World Wide Web. Therefore the Web server<sup>150</sup> is at the heart of the technical solution.

The protocol of the World Wide Web is http. At the fundamental level the Web server's job is to 1) listen for http-requests from clients, 2) find out what computing and data-manipulation are required and get the job done and finally 3) return an http-response to the client. Data and header-information are packed with both requests and responses.

Philip Greenspun sums up the most important factors in choosing a Web server<sup>151</sup>:

- The application programming interface (API)
- How to connect to relational database management systems (RDBMS)
- Support and source code availability

---

<sup>150</sup> Unless otherwise stated, we use the term 'Web server' we refer to the software handling the requests, not the physical machine.

<sup>151</sup> Greenspun (1999:215).

- Availability of plug-in software packages
- Speed

For the implementation of the test case we had to choose a specific Web server for development and testing. For that purpose we chose the Web server and servlet container Jakarta Tomcat. Mainly because it is freely available and thus provides an easy accessible platform for development. Better performance might have been achieved with other solutions, but our primary concern was at a higher level, concerning program invocation mechanism, programming language and API, data storage mechanism and additional data transmission protocols. The choices we made were:

- a) To use a Web server API instead of programming with CGI
- b) To use the Java Servlet 2.2 specification as a Web server API
- c) (in natural extension of the choice of Java) To use JDBC as database connection tool

Furthermore the system had to support real-time communication between client and server for which we chose:

- d) To use TCP/IP socket connections

### 8.1.1 Program Invocation Mechanism - CGI vs. Web server API

CGI is a standard and stands for Common Gateway Interface. The standard dictates how the Web server communicates with and invokes small server side programs, CGI programs. CGI programs are typically written in Perl and interpreted by the Web server at the time of execution. The CGI programs can be pre-compiled although that spoils the (sole) advantage of CGI: its portability. Virtually every Web server on the market is able to execute CGI programs, and most of them come with a Perl interpreter.

A major problem with this scheme is that every time the Web server calls up a CGI program a new process is started and, after execution, closed down. It takes time to start up a new fork like this so if a Web service depends strongly on execution of server side programs this can considerably slow it down.

Another related problem is with database connectivity. As the CGI program is started anew on every execution, it also has to open up a new database connection upon every request. This too, is slowing down the process<sup>152</sup>.

In opposition to this invocation mechanism is the server application programming interface (the server API). Here the application programs are executed inside the same process/fork as the Web server, which saves the time of opening up new processes and

---

<sup>152</sup> Greenspun (1999: 280).

the overhead that an explosion of processes can produce. In addition the Web server can open up a series of database connection and lend them out to the application programs by request, saving the overhead of opening and closing connections all the time. An example of how this can be done is implemented in the Echelon test case and described in the chapter Implementation of the Test Case. The problem with programming against a specific server API is that you considerably delimit the range of Web servers at your disposal. Specific Web servers typically make one specific server API available.

### 8.1.2 Java as Server API - Servlet 2.2

As a server API we have chosen the Java Servlet 2.2 specification out of a range of different APIs available. The most popular ones are PHP (Personal Home Page), ASP (Microsoft Active Server Pages) and Sun's Java Servlets/JSP (Java Server Pages) and to name a few of the more esoteric ones there are MSP (ML Server Pages) or AOLserver's Tcl/ADP (AOLServer Dynamic Pages).

There are a few reasons why we ended up choosing Java:

1. You get a full fledge (object oriented) programming language at your disposal
2. You get a rich API with a range of libraries, not just the API specific to Web server programming
3. It provides a gentle way of interfacing to a database (JDBC<sup>153</sup>)
4. It is somewhat portable. The standard is free for every vendor to implement, so an increasing number of Web servers support it
5. It's easy and there are a lot of Java programmers out there
6. And, well, we like to program in Java...

Java presents two frameworks for Web server programming: Servlets and JSP. The prime difference between the two, are the ways in which the programs are written. Basically a server programs primary task is to generate text (HTML, XML, WML etc.) that the Web server can return to the user. With the servlet framework the text to return is incorporated in the Java code, whereas the JSP framework incorporate the Java code in the text. Actually the JSP framework is just servlets at a higher level of abstraction to make it easier to use to text production. The single JPS-page is upon first request compiled into a corresponding servlet that the Web server administrates access to.

In short JSP is good if you have a lot of text/HTML and a just little Java code, or if you have a set of graphic designers working around the code. Servlets are good if the programming code is dominant and the returning text result is short. In the case of the

---

<sup>153</sup> JDBC apparently stands for Java Database Connectivity.

Echelon Web game we have a good bit of programming following each request and we only simple XML-pages to return. The front-end technology, Flash, takes care of the layout and the fancy user interface issues, therefore servlets was the obvious choice.

A Web server providing a Java servlet framework, wraps up the Web interaction in a Java oriented way. It encapsulates, as objects, http-requests, http-responses, http-headers, cookies and other http-manipulation utilities. Upon first request for a servlet the Web server instantiates the corresponding Java-class and wraps it in a servlet container. Once in the container, the same instance lives on to receive calls. When the Web server receives an http-request, it calls the inherited **service()**-method on the servlet instance. The **service()**-method in turn redirects the call to the method corresponding to the type of request: Http GET requests to **doGet()**, http POST to **doPost()**, http PUT to **doPut()** etc.

### 8.1.3 Relational Databases and JDBC as Database Connection Tool

Like most other systems the Echelon Web game needs to make data persistent. As next chapter (Implementation of the Web Game) will show the whole game-play is highly dependent on the state of the data in the system. The relational database has consolidated its position as the way to store and retrieve data in a fast, flexible, reliable and easy accessible manner but there are other possibilities though. The data could be stored as XML-documents in a file system, in a flat file database or as serialized Java objects. The relational database, however, seemed the obvious choice, and is also the persistent mechanism that we are most familiar with. On the downside, the relational data model used by relational databases somewhat differs from the object oriented way of thinking. This brings JDBC into the picture.

JDBC offers a uniform, object oriented way of accessing relational databases from Java. The JDBC API consists of a set of Java interfaces that is implemented by a concrete JDBC-implementation. The different database vendors usually provide a set of Java-classes that implements the JDBC interfaces, the JDBC-driver.

The framework abstracts among other things the concepts of connections, queries, updates, query results, table and database information. JDBC provides the global Java interfaces, the JDBC-driver implements the Java interfaces, the client programmer (us in this case) loads the appropriate driver, asks the DriverManager-class for a connection to a specific database and gets in return a connection adequately disguised as a Java object implementing the interface `java.sql.Connection`. The Connection-object can be used to create Statement-objects; the Statement-object can be used for executing SQL-queries and return ResultSet-objects; the ResultSet-object works as an Iterator to the result of the query and so on, all in a nice object oriented manner.

Here the magic stops, however. It is still necessary to write SQL to the database and the syntax differs from database to database. Also the supported data types and data formatting vary from database to database. Even though JDBC makes the use of databases from Java easier and more uniform, the database differences still have quite an

impact on the Java code. In the chapter, Implementation of the Web Game, it will be described how we have tried to minimize the influence of this obstacle.

### 8.1.4 Sockets

For some parts of the Echelon system we need real-time communication. For that purpose we open a direct TCP/IP socket connection. That enables us to push content directly out to the clients. When using sockets the clients don't request fresh content via http, but listen at a socket instead.

When using a socket, it is not necessary to know what kind of technology exists in the other end of the socket. Some kind of agreement just has to exist on how the data is formatted. In our case the format is XML formatted character data. Next section will explain how we have strived to de-couple the front-end and back-end as much as possible, and how XML over TCP/IP sockets supports us nicely in achieving this goal.

## 8.2 XML

There has been much hype surrounding the mark-up language XML. To demystify things a little it should be stated that XML is merely a way of representing data tree as a stream of characters. This makes it possible to send tree structures over a network or save it as a text-file. A set of formal rules defines what is legal XML-syntax, which enables a uniform treatment and processing of semantically very different XML-documents.

The XML specification<sup>154</sup> only states the formal rules for how to define an XML vocabulary. The application developer can either use a predefined vocabulary fit for the problem at hand (e.g. WML for WAP sites or VML for representing vector graphics) or tailor a new one himself.

Either way, data from one programming paradigm and/or address space can be encoding in an agreed upon XML-dialect, sent to another paradigm/address space, and finally be decoded and processed there. This de-couples the two paradigms and means that they have to know very little about each other. In fact all they need to know is what the XML-dialect is and how to locate each other. Then they have to share a common understanding of the problem space at hand in order to make sense of the data exchanged.

This de-coupling makes it easier to change e.g. front-end and back-end components independently, or to provide similar interfaces for entire new systems, which is essential in the development of cross-media. On top of that, we found it challenging to use XML as a means of interfacing the two different technologies used for front- and back-end, and thereby putting XML to work in a realistic programming setting.

---

<sup>154</sup> <http://www.w3.org/TR/2000/REC-xml-20001006>

## 8.3 Front-end Technology

In choosing the front-end technology for the Echelon Web game, there were many issues to take into consideration. The three major considerations were accessibility, design, and ease by which the technology could communicate via an XML interface. It was the combination of these three that lead us to choose Flash 5 as the basis for front-end development.

### 8.3.1 Accessibility

Echelon is not designed for a niche market, but rather aimed toward a broad target group. It is therefore important that the technologies chosen in the cross media concept are accessible to a significant segment of the target group. The Flash 5 plug-in required to view Echelon is compatible with a wide range of systems and platforms: Windows 95, 98, Me, NT, and 2000 Professional; Mac OS 8.1 or later, and Pentium based Linux Redhat 6.0 or later. With the exception of Linux where Netscape version 4 is required, Flash 5 is compatible back to versions 3 of Netscape and Explorer<sup>155</sup>. An NPD Research study from March 2001 shows that 65 %of the Internet users in Europe have the plug-in required to view Flash 5 content<sup>156</sup>. Furthermore, for those who do not have the plug-in, it is available for free download and at macromedia.com. The file size is between 219k and 470k, depending on the platform, which requires a download between one and two minutes with a 56k modem. Though 65% is only a small majority, we find it important to consider that Flash 5 was only introduced in October, 2000. When looking at early versions of Flash it had a much higher rate of penetration, for example 91 % of browsers in Europe are able to view Flash 4 content. Even more importantly, the Flash player is included as a default plug-in in newer versions of Netscape and Explorer, and comes preinstalled with many systems<sup>157</sup>. The above indicates that Flash is becoming a standard, and we can therefore conclude that penetration of Flash 5 will only increase in the coming months as users continue to download the free player and that it will in all likelihood be included as a default plug-in in future browser versions and system software.

### 8.3.2 Design

Design is an important element in relation to our target group and in relation to the product itself as an entertainment format. The target group has followed the development of the Internet from the beginning, when it was primarily text-based html, to the present where broadband and processor speed has allowed for websites that combine rich graphics, sound, and animation. They are aware of the newest Internet technologies, and frequent sites that take full advantage of these. Many of the companies that market products toward our target group utilize the more advanced technology to

---

<sup>155</sup> <http://www.macromedia.com/software/flash/productinfo/systemreqs/>

<sup>156</sup> <http://www.macromedia.com/software/flash/survey/whitepaper/>

<sup>157</sup> <http://www.macromedia.com/software/flash/survey/whitepaper/>

create sites that they hope will reflect the quality of their product. A good example of this is Nike.com which has used Flash to create a very trendy and stylish website in an effort to strengthen their image. It is important to the success of Echelon that the site not only functions well, but that it excites the user visually and creates a strong first impression. Furthermore, because the Web site is part of a unified cross-media concept, it is important that it supports and reinforces the overall Echelon format. In order to do this, the site will rely heavily on graphics and ultimately come to reflect the graphic style of the television program.

For a number of reasons, we found that Flash was the ideal program to achieve the design required for the Echelon concept. A site that is heavy on graphics requires considerably more time to download than a purely text based site. One of the benefits of Flash is that an entire movie or site can be downloaded at once. Though initially this requires a longer download time for the user, it provides important navigational benefits. Due to the level of interactivity in the Echelon site, there is significant navigation required from the user. Downloading all of the heavy graphics at once greatly improves the speed of the overall navigation process, which allows for a much smoother flow of the game play.

Flash movies are viewed in the users browser via the Flash plug-in and the benefit is that plug-in interprets and displays the movie exactly the same regardless of the browser or platform in use. This affords many advantages over other formats in terms of layout and design. When using html and Java applets, the designer must consider many issues of compatibility, as display and interpretation of these formats is largely dependent on the browser and platform. With Flash, the designer has much greater control over the layout and can insure that each user has the same visual experience. Furthermore, Flash has the advantage that it can embed fonts, which gives the designer even greater control. In the case of Echelon, this allows for a consistency of design between the television program and the web site that would be difficult to attain in other formats. In terms of development time, Flash is multi-functional package in that it incorporates graphics tools, animation tools and a scripting interface. This multi-functionality provides for a degree of control and ease of development greater than that found in most other formats.

### **8.3.3 Communication via XML Interface**

Cross media requires that different platforms are able to communicate with each other, either directly or via a third application. To limit the complications that may arise from this communication, we have chosen to transfer data via and XML interface. Thus it is important that our front-end system can be designed, with relative ease, around this interface. The Action Script API of Flash 5 built in functions that are designed specifically to handle XML documents. There are functions for creating and sending XML as well as functions for receiving and parsing XML. Furthermore, it is possible to open an XML socket, by which the Flash client can communicate directly with the

server. The implementation of these elements in Flash 5 makes a very viable technology for communicating via XML with the rest of the system.

## **8.4 Benefits of the Technologies at Hand**

The technologies chosen for the prototype implementation provides a good foundation, not only for the Web game alone, but also as a flexible and extendable framework for further development. The XML interface provides a de-coupling of front-back and potentially also back-back. The future technologies that might come in play in the Echelon format can benefit from this.

Further more the Java Servlets and JDBC frameworks are open standards, which mean that any vendor can make an application that implements the specified interfaces and behaviors. The benefit is, that the choice of Java Servlets and JDBC does not tie the product under development to any specific vendor or Web server and database. Further more, should the Java based MHP standard turn out to get a good foothold in the dTV market, the choice of Java would probably be even more advantageous, in integrating the Web and dTV.

The main technical focus of this thesis, though, is to implement the prototype and get the proposed set of technologies in play. Details on these subjects are up next.

## 9 IMPLEMENTATION OF THE WEB GAME

---

The functional prototype, which we have implemented, represents only a subset of the Echelon entertainment system. It implements a first version of the Echelon Web game.

The purposes of the prototype are:

- 1) To present the idea of the Web game, and the atmosphere and graphic style of the Echelon concept and to use that to collect reactions from the target group to point out subjects of change in game play, user interface design and the Echelon concept as a whole.
- 2) To get some of the proposed technologies in play and to suggest a system architecture for the Echelon system and in connection with this, to try out XML as an interface between a Java back-end and a Flash front-end, including real-time communication.

The test case could, if successful, also function as a prototype for a final version of the Web game.

To determine the user's possible actions in the Echelon Web game we have identified a set of use-cases. The use-cases serve as point of departure in that they drive the development of the system and describe the tasks the system should be able to handle. So that's how this chapter kicks off as well.

In reference to purpose number two, to get some of the technologies in play, we have set as goals, that the system should be open for changes, in that it should be possible to switch front-end (presentation tier), back-end (business logic tier) and preferably also database (data-tier) independently. This discussion will be opened in the section on System Architecture.

Then we turn to at the very back of the system, the data tier, as this discussion lays out the foundation for the vocabulary used to discuss the actors and entities of the system. The XML-interface between presentation and middle tier is up next. This should clarify some of the considerations in developing the middle and presentation tiers, which are up for scrutiny hereafter.

We conclude the chapter by describing tests of the system. This includes systematic unit test of the `EchelonSql` class, and a user test of the Web game with 25 people. The latter uncovered some severe performance problems that had to be accounted for.

A few code snippets are not our own creation. These are:

- ConnectionPool.java, written by Marty Hall<sup>158</sup>.
- Md5sum.java, interface code, written by Peter Sestoft
- The endless **int**- and **String**-arrays and the algorithm of SmsAdress.java is reworked from a JavaScript taken from <http://sms.ofir.dk>
- The character reading mechanism in the **run()**-method of ChatClient.java, is written by Derek Clayton of <http://www.moock.org>.
- The basic structure of the socket handling mechanism on the client side is inspired by work done by Colin Moock of <http://www.moock.org>.

## 9.1 The Echelon Use cases

The concept of use cases is frequently used in connection with the development of a computer program<sup>159</sup> but also in relation to development and usability testing of user interfaces<sup>160</sup>. The guidelines for use cases therefore depend on the application area. In the Echelon system we have mainly applied use cases to the development of the system as a whole.

Use cases are made to find the user requirement of a system and it especially related to the development of the tasks that the user needs to perform. They represent detailed scenarios that the user will be performing in the final system. A use case is, according to Rosenberg and Scott, “a sequence of actions that an actor [...] performs within a system to achieve a particular goal”<sup>161</sup>. The use cases should represent functionality required of the system. The use cases can have different actors depending the task and the individual use cases are structured according to actor. According to this “use case driven approach”, the use cases should be written from the perspective of the user and aim to have close ties to the user manual in the end<sup>162</sup>.

The Echelon Web game consists of the use-cases in the table below (a detailed description is in appendix VIII). To make the use cases easy to read they are arranged according to the window they concern. Since the Echelon Web game has only one kind of user the, actor in the use cases is always the player<sup>163</sup>.

---

<sup>158</sup> Hall(2000:504-507).

<sup>159</sup> As seen in Rosenberg and Scott (1999)s.

<sup>160</sup> As seen in Lauesen (20009).

<sup>161</sup> Rosenberg and Scott (1999:38).

<sup>162</sup> Ibid, p. 41.

<sup>163</sup> In the future prototypes and final version there would be the administrator actor as well, however this aspect is outside the scope of the current prototype.

Access tasks	Chat Center	Games	Communication Center	Surveillance Center	Information Center
Create Profile	Log Onto Room	Create challenge	View in-box	View Surveillance Cards	View list of players
Log On	Chat in the Chat Room		Send Message	Submit Surveillance Card	View player profile
Log Off	Leave Room		Read Message	Accuse player of Surveillance	
			Reply to Message		
			Delete Message		
		Respond to Challenge	Accept Challenge		
			Reject Challenge		
		View Returned Challenge, step 2	View Returned Challenge, step 1		

Table 9.1: Use cases

One part of use cases is the drawing of screen mock-ups. They should be created along with the use cases but not dependent upon them, meaning that the use cases should not specify any of the screen mock-up design<sup>164</sup>. On the contrary, the screen mock-ups should support the use cases and have each use case written next to it. Another term for screen mock-ups is “virtual windows” that is the drafts of the “physical” windows in the final system<sup>165</sup>. These are part of Lauesen’s approach to developing user-friendly user interfaces. We have had ongoing hermeneutic discussions of the structure of navigation and information architecture since the first drafts of the virtual windows (see appendix IX). The virtual windows have been developed as drafts for the Flash drawings and as working documents. In Lauesen’s approach the virtual windows are tested on members of the target group and revised before they are implemented on the screen. Because of time constraints and that the user test turned out to only gain technical knowledge, we have not made this systematic usability test of the Web game<sup>166</sup>.

## 9.2 System Architecture

The system is composed of three major building blocks (tiers): The presentation tier, the business logic (or middle) tier and the data tier<sup>167</sup>. To start from the back, the data tier handles persistence. In the Echelon Web game the data tier consists of a relational database. The middle tier is responsible for manipulating data and input from the users. The middle tier in our case is a Java application running in a Java Web server. The

<sup>164</sup> Rosenberg and Scott (1999:42)

<sup>165</sup> Lauesen (2000:68)

<sup>166</sup> See also delimitations in chapter 1.

<sup>167</sup> Shan (1998:7)

presentation tier handles the user interface for which we use Flash movies running inside a Web browser.

Interfacing the presentation tier and the middle tier we use XML over http and TCP/IP-sockets. Interfacing the middle tier and the data tier we use the Java API framework, JDBC:

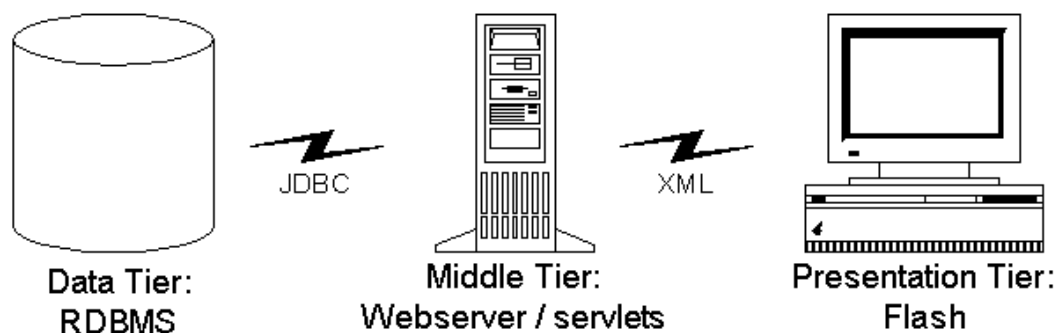


Figure 9.2: System Architecture

This design has several advantages. For one it makes it easier to change or modify the individual tiers without having to change the others. If it is later decided that the front should be Java Applets instead of Flash, you can make that change without touching the back-end. Or you can still keep the front-end, even if you have to implement the back-end in a different programming language or integrate it in an application server. Should the database prove to be too inefficient (which we in fact encountered) it requires some classes added to the JDBC parts, but once that is done, you can switch database by setting a parameter in the configuration class, **EchelonSettings**, of the middle tier.

The design also enables parallel development of presentation, middle and data tier. Once the interfaces have been agreed upon it is possible to code up against an interface instead of a working system. This worked extremely well with the presentation- and middle tier XML-interface, as the XML code in the interface is very conveniently written in a text editor and used for testing. In developing the client side we initiated a global variables that allowed us to easily switch between predefined static XML documents and real server communication<sup>168</sup>. On the server side, the http-requests from Flash were easily simulated in Internet Explorer that displayed the XML-result nicely.

The parallel development process proved a bit harder with the data tier and middle tier JDBC-interface; we could write code and compile without immediate integration, but the middle tier classes relied to heavily on the results from the JDBC classes that in turn didn't make much sense without connection to the database.

---

<sup>168</sup> This feature has been removed from the Flash documentation for clarity, but is still present in the prototype for further development.

Finally it makes the system more open for adding other front-ends (presentations), such as a WML interface through a set of XSL programs<sup>169</sup>, or connection with external systems, such as an iTV-system. The external system can either connect through the http/XML-interface already implemented, or a new socket connection can be created that communicates XML with the external system. In fact, a bit like Flash sometimes communicates in XML with the middle tier via a socket connection (more on that later).

## 9.3 The Data Tier

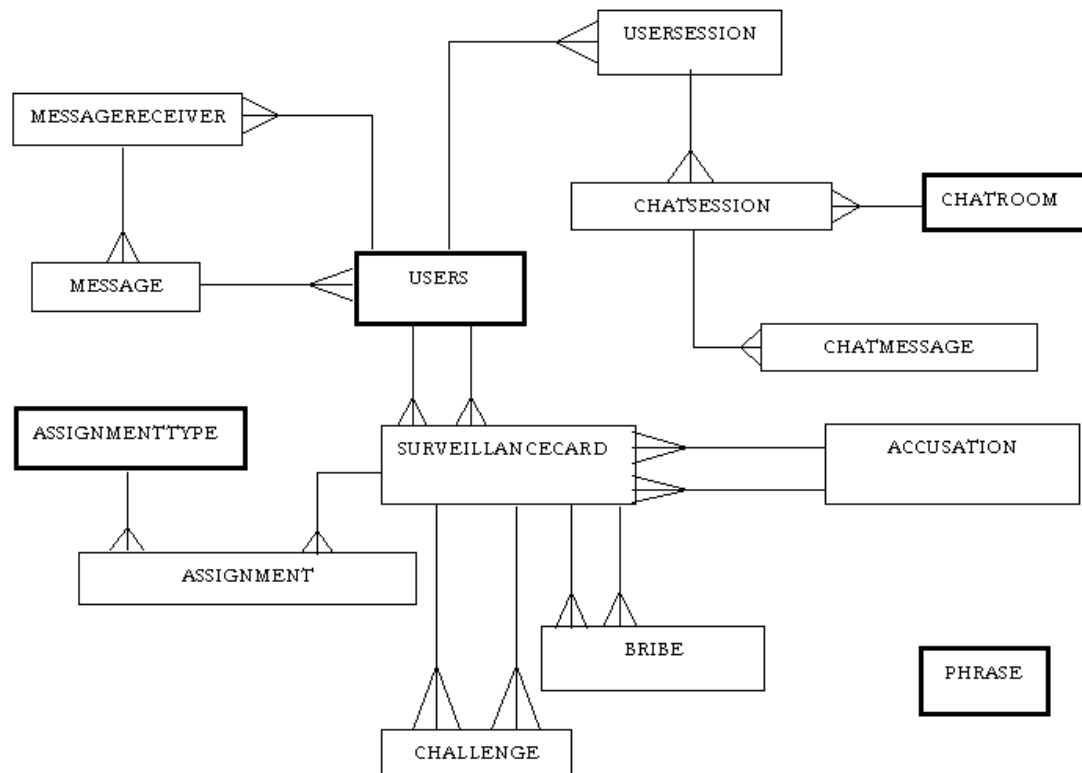
The data model of the Echelon system is developed with two objects in mind. First, as little as possible redundant data should be stored, but the data should still be easy to obtain through the model. The data model is thus normalized to third normal form. Second, it should retain all information necessary for the system to operate, which in turn includes the ability to view the history of the activity within Echelon. The design of the data model will be described next.

Next we will briefly consider the differences in the two databases that we have been working with, CloudScape and MySQL.

### 9.3.1 Description of the Data Model

The data model is showed in figure 9.3 and a detailed version is available in appendix X.

Figure 9.3: Data model.



<sup>169</sup> XSL is a language for transforming XML-documents. A set of XSL programs could be defined to translate the XML produced by the middle tier into e.g. WML or HTML.

The notation used in the figure is the ER-notation of Lauesen's notes from 2001<sup>170</sup>. The relation of one to many is noted like a fork where the "one" is the handle and the "many" is the prongs. The boxes in bold are the independent tables that do not have any foreign keys. The description below includes the most fundamental tables and those special cases where the model isn't self-explanatory. The table names are, to make them easy distinguishable, set in all capital letters.

The center of the data model is the most important thing in the Web game: the user. The table is called **USERS** because of Cloudscapes keyword **user** prohibits us from using the singular term. All other tables keep the convention of naming tables in singular. This table has all the information on the user including the username (the name displayed to others in the Echelon game) and the user's real name and address. The user gets a row in the **USERSESSION** table for each time he logs on. It has a start- and an end-timestamp, so that the system can keep track of the user's behavior. This information is used to determine if the user is online.

The **USERSESSION** table has a time field called **ping** that is updated for every http-request sent by the Flash client that holds the **usersessionid**. **Ping** is then used to determine whether the user has ended his session without going through the proper log-off procedure. The status bar in the Flash client sends a request every 10<sup>th</sup> second to the server that contains the **usersessionid**, which keeps the **ping** updated even if the user is relatively passive for a period of time. If the user closes the Flash client without logging off, the status bar will no longer send its request and after 40 seconds the server will automatically log the user off and close the user session. By setting the endtime field in the **USERSESSION** table to current timestamp, the user is logged off. This is also the way to determine if the session is active: if endtime equals null, the usersession is still active.

Besides user sessions, the user can have a number of chat sessions. Because the chat sessions are always taking place within a user session (a user can not chat without being logged on the system), the **CHATSESSION** table has a reference to the **usersessionid** in **USERSESSION** instead of a reference directly to the **USERS** table. This indirection is for the convenience of the queries and is compensated for with the creation of a view: **userchatsessionview**. This combines the **CHATSESSION** table with information on the user. It functions almost as a separate table or stored query that has its own fields/attributes.

The **SURVEILLANCECARD** table has two references to **username** in **USERS**: one for the holder of the card and one for the target. It has a **timeofissue** field that is used to check if the assignments are completed after the card is issued. Each card can theoretically have an unlimited number of assignments, however, the number is limited to six in the program.

---

<sup>170</sup> Lauesen,(2000). Appendix B p 11.

Each assignment in the **ASSIGNMENT** table is connected to a card. The assignment has an assignment type from **ASSIGNMENTTYPE** in order to give the assignments a description. Also the assignments' completion algorithm depends on the assignment type. The algorithms are specified in the Java classes of type **EchelonSql** and used by the class **SurveillanceCard**. To make a new type of assignment, it is therefore necessary to modify Java classes and as well as inserting a corresponding row in the database. More on the surveillance card design in the description of the middle tier.

**PHRASE** is a table with no reference to other tables. It is used to store keywords and phrases for the assignments that need these. All assignments have a randomly assigned keyword when they are created, but the field will not always be used. It is in the implementation of the assignments that it is determined if the assignment need a keyword. Again this is made in order to make the data model general and make it easier to define new assignments.

It should be possible for a message to be sent to multiple receivers, therefore it is necessary with an extra table: **RECEIVER**. This table only has the fields of **receiver** and the **messageid** so the message can reference more than one receiver record. The feature of several recipients is not implemented in the prototype, but the data model is created with this feature in mind.

The **CHALLENGE** table consists of the challenges one user sends another as well as the recording of the played game. The table has a **returned** field (**boolean**) because the win situation is recorded as a **boolean** as well and by default is false (this would indicate that the challenged user had won). It also has a **rejected** field and a **readbychallenger** field that can tell the system if it should be showed in the list of returned challenges. The "camera 1-3" are the fields that the challenger sets in order to assign cameras to the spy room area. The "open 1-3" are the doors that the receiver of the challenge will open. It is not checked directly in the database that the numbers are within the correct range (1-5, 6-10 and 11-15) but this is for generality reasons; it is then easy to change the format of the spy room area without changing the structure of the database. The numbers are then confirmed in the JDBC code that inserts the values into the database as well as the method that gets the values out. The value of 0 is used for the doors when they are not set yet, that is when the challenge has not been returned yet.

**BRIBE** is a table that is not used in the prototype of the game. It is for future implementation of the concept that one user can bribe another for information. The table consists of a **briber** and a **receiver** as well as an amount of points for the bribe.

### 9.3.2 Choice of Database

The choice of database has changed in the course of prototype development due to bad performance of the CloudScape database. As it is now, the database can be changed from Cloudscape to MySQL by changing a static integer in the **EchelonSettings** class of the middle tier (this is also described further down). Along with the database switch, a few changes have to be reflected in the SQL strategy.

MySQL does not support the data type **boolean**. A **boolean** would optimally be implemented as a **tinyint**, which is an integer that is represented by one byte meaning that it can have a value between 0 and 255 or -128 and 127 (depending on it being defined as unsigned or not). However, since CloudScape does implement booleans as **'false'** and **'true'**, the booleans in MySQL are defined as a **varchar()** that is five characters long and contain the words **'true'** or **'false'**. This is done to minimize difference in implementation of the two database specific versions of **EchelonSql** (**EchelonSql** and **MySQLSql**).

Another difference is that the view-strategy does not work for MySQL, though, since this database does not support views. To compensate for this lacking feature, the view is instead created as temporary tables before each query that uses the view and is dropped immediately after. As the temporary table is only visible within the scope of the individual connection, the simultaneous creation, use and dropping of temporary tables do not introduce any hazards to the system.

MySQL does not support nested queries which is used a few places in the queries to the CloudScape database. That means that these queries have to be different for the MySQL database. For some of the queries temporary tables are created and dropped again before after execution; in others the SQL statements have been rearranged to use multiple joins instead of nesting.

The database performance will be evaluated in the test section further down where the user test will be mentioned as well.

## 9.4 The XML-Interface

For interfacing the back-end and the front-end we have developed our own XML vocabulary. The Flash clients never get anything but XML from the Web server, but nonetheless the client and server communicates in a few different ways:

The Web server in most cases get an http GET request with data attached as parameters, and thus not XML-formatted. It returns an XML-formatted text response.

In the cases where the Flash client needs to send more complex data to the server, it sends via an http POST with XML-formatted data included in the body. Also in this case the Web server returns an XML-formatted text response.

In the case of the chat system the server pushes XML-formatted character data through a socket to the client

And finally, in establishing and setting up a chat socket connection, in order to inform the server of its identity, the Flash client pushes XML-formatted character data through to the server.

The vocabulary is developed in close connection with the parsing situation, in the prototype, in which it participates. This enables the parsing process on both the client and the server to presuppose very strict adherence to an agreed upon syntax, which makes the parsing easier. It has thus not been considered relevant to create a general XML vocabulary for Echelon information exchange.

It would probably be a good idea to define a formal vocabulary, with a strict DTD<sup>171</sup> defining the grammar, before using the XML interface for radically different types of communication (e.g. the communication between a Web system and an iTV system). But in our case it seemed more pragmatic to use a general set of terms derived from the entities and attributes of the Echelon Web game (such as “user”, “username” etc.) and then use a syntax convenient to the specific data exchange.

The syntax for the http-communication is legal XML, according to the specification, and some additional rules was setup:

- 1) The first tag is always: `<?xml version="1.0" encoding="ISO-8859-1"?>`, which states the XML version and the character set used. This is required in order for a document to be legal XML.
- 2) The top node in the XML tree is always `<echelon>`. This node has no siblings. This also adheres to the XML-specification, which states that the top node of an XML document cannot have siblings.
- 3) If the client has been given a session id, the lone child of `<echelon>` is `<session id="$sessionid">`. This enables automatic check of the user sessions' validity in a uniform manner across documents.

For the socket communication we used a simplified notation, not strictly adhering to the formal rules, in that it omits the `<?xml version="1.0" encoding="ISO-8859-1"?>`. This was done for simplicity purposes, but in hindsight we might as well have constructed the syntax for the socket communication from the same guidelines as the rest.

One major flaw, which should be corrected prior to the release of the system, is that the parsing mechanisms don't systematically take the reserved XML characters into consideration. All unpredictable strings, that is user issued content, should have been run through a function that substitutes ‘&’ with ‘&amp;’, ‘<’ with ‘&lt;’ and ‘>’ with ‘&gt;’ prior to being included in an XML document. And the other way around when unparsing node-values as strings. This lack is purely due to the time constraint on the prototype development. Examples of the XML vocabulary in use can be found in appendix XII.

## 9.5 Middle Tier Design

The discussions in this section presuppose some knowledge of Java and Java servlets, the latter briefly discussed in the chapter on choice of technology. Some parts of the middle tier use *design patterns* to solve common object oriented development problems. The term

---

<sup>171</sup> DTD stands for Document Type Definition and is, simply put, a document defining what is valid syntax within a specific XML vocabulary.

‘design pattern’ was introduced by the architect Christopher Alexander to mean a reusable solution to a common problem in laying out buildings and towns. Gamma et al. translates the metaphor to object oriented design: Design patterns in this context are “*descriptions of communicating objects and classes that are customized to solve a general design problem in a particular context*”<sup>172</sup>. We explicitly use the two design patterns *Factory Method* and *Singleton*. Their intent will be clarified at the point in this text where their use is described.

The Java-classes of the prototype is divided into four packages:

- `edu.it.echelon.servlets` (25 regular and 3 test classes)
- `edu.it.echelon.util` (17 regular and 10 inner classes)
- `edu.it.echelon.adm` (4 classes)
- `edu.it.echelon.test` (2 test classes)

Their collaborations are illustrated in figure 9.4 (which probably makes more sense after reading this section). A larger version is available in appendix XI.

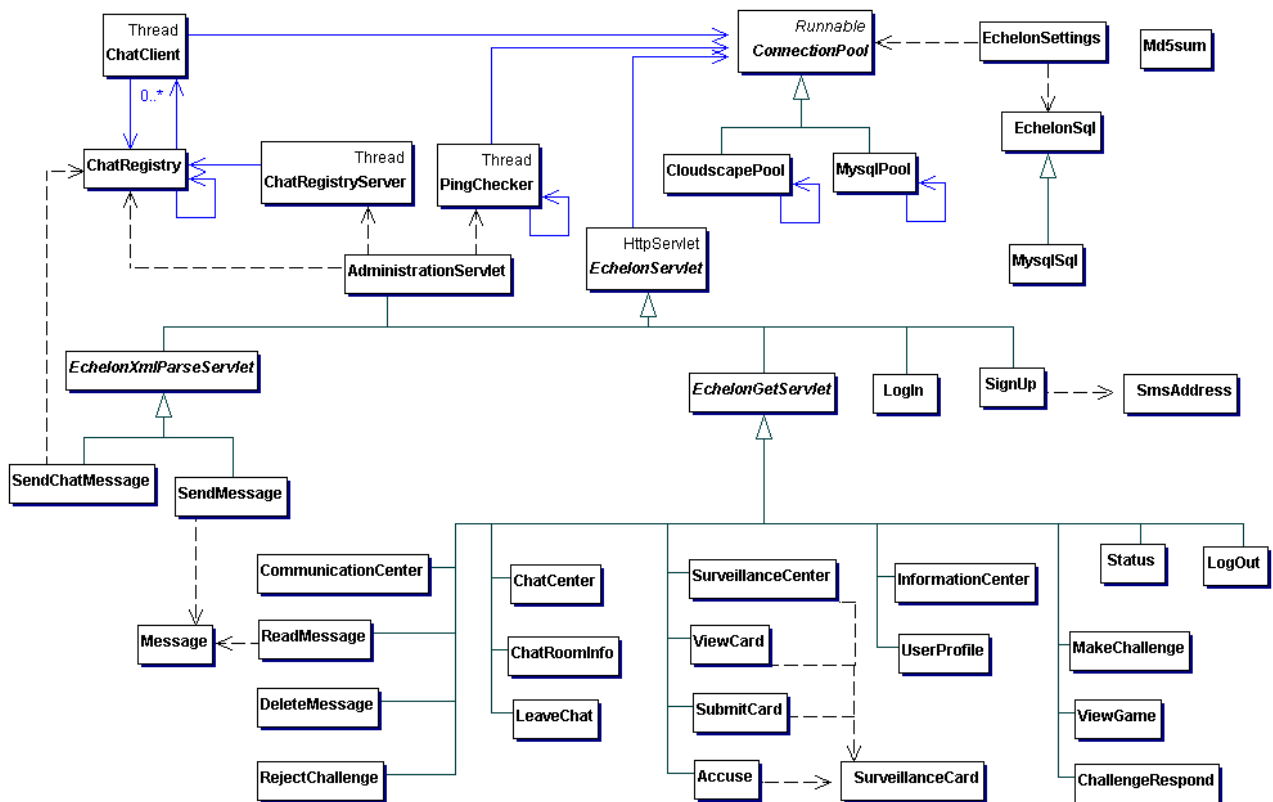


Figure 9.4: Class diagram.

<sup>172</sup> Gamma et. al (1995:2-4).

The test-classes, inner classes and details that would confuse the picture (such as, that almost every classes uses EchelonSql) are left out. The squares are the classes of the Web game. The triangle-like arrows mean “extends”, the normal arrows mean “has a field that references...” and arrow with the “0.\*” at the end means (in our context) “has a map with...” The Dotted arrows are a bit more vague. They mean “uses” in the sense “has a reference to at some point...” or “creates”. The diagram does not show, which packages the classes belong to.

The 25 regular classes of the **edu.it.echelon.servlets** package are servlets and are used to handle http-request from the Flash clients.

The **edu.it.echelon.util** consists of classes that support the servlets in handling their requests, handles socket connections and database connections, or carries out other system tasks.

The classes of **edu.it.echelon.adm** are also servlets, but they do not handle requests from the Flash clients. Instead they are used for administrative purposes such as making queries directly to the database, starting the **ChatRegistryServer** or the **PingChecker** from a browser (more on this later).

To build the application (compile and place in the right folder, plus execute some tests) we have used the build tool Ant. The build file, build.xml, can be found as a part of appendix XII. The folder structure for the source files does not exactly reflect the package structure. It was of greater importance that the folder structure supported our working process, than that it actually matched the organization of the class-files. The differences are, that all classes concerning database connectivity are placed in a folder called “jdbc” and that some of the test classes a in a separate folder “test”.

The source code is fully documented in appendix X–XIII, but in the following we will discuss the overall design of the middle tier and a few selected design decisions.

## 9.5.1 The Servlet Hierarchy

All servlets in the **edu.it.echelon.servlets** package extends the abstract class **EchelonServlet**. **EchelonServlet** in turn extends **HttpServlet**, which is implemented by the Web server to provide basic servlet functionality. **EchelonServlet** provides a number of common services in the form of methods that the inheriting classes can make use of. This includes:

Database services such as:

Getting a connection to the database

Returning a database connection with an instruction to either ‘commit’ or ‘rollback’

Update the user session’s ping-time.

Output services such as:

Converting illegal XML-characters to XML escaped characters

Wrapping content with standard Echelon XML

Creating an XML-error page  
Input data services such as:  
Creating a **StringMap**<sup>173</sup> of the parameters sent with the request  
Getting the user name associated with a **usersessionid**  
Check whether a user session is active and valid  
Find out whether a user exists.

These functions are heavily used throughout the system, and by placing them at the very top of the inheritance hierarchy the sub-classes can make use of them without having to define them themselves.

Two other abstract servlets are defined, both extending **EchelonServlet**: **EchelonGetServlet** and **EchelonXmlParseServlet**. These servlets are used as super-classes for creating servlets that serves requests from the Flash clients. They override the service methods **doPost()** and **doGet()** inherited from **HttpServlet** via the **EchelonServlet**.

The **doGet()** method of **EchelonGetServlet** handles request sent from the Flash clients using the **XMLdoc.load()** feature. This resembles a typical use of http GET, where all parameters sent along with the request appear directly in the URL. The majority of the servlets (18) extends **EchelonGetServlet**. The **doGet()** method performs the tasks common to all the extending servlets. For example it sets the MIME-type, checks whether the **usersessionid** is valid and updates the ping-time. Then it calls an abstract method, **doIt()**, with parameters containing the entire http GET parameters and a database connection. When **doIt()** returns, it wraps the result up nicely in the Echelon standard XML headers and footers and return the resulting XML to the client. It is then up to the sub-classes to implement the **doIt()** method, where actions specific to the single servlet is initiated. **doPost()** simply returns an XML-formatted error page, as Flash uses http GET to fulfill calls to **XMLdoc.load()**.

The **doPost()** method of **EchelonXmlParseServlet** does very similar work, but handles request from Flash clients using the **XMLdoc.sendAndLoad()** feature. In this variant the data from the Flash client is included in the body of the request as XML-formatted character data. The **doPost()**-method takes actions to read the characters from the request and parse it as an XML document **Node**<sup>174</sup>. Then it retrieves the **usersessionid** from the **Node**. From hereon it takes the same actions as the **EchelonGetServlet** with the difference, that where the **EchelonGetServlet** wraps the parameters in a **StringMap** for the **doIt()**-method, the **EchelonXmlParseServlet**

---

<sup>173</sup> A StringMap is a simple wrapper class that wraps the HashMap class of java.util to make it more type safe: It only accepts and returns objects of type String instead of objects of type Object. This is to somehow compensate for Java's lack of parameterized types and a parameterizable Collection-API.

<sup>174</sup> A class from the org.w3c.dom framework representing an XML node. See [http://java.sun.com/xml/xml\\_jaxp.html](http://java.sun.com/xml/xml_jaxp.html) for details.

simply sends the XML `Node` object (and the `usersessionid` as a `String` for convinieny).

Another import function of the `EchelonGetServlet` and `EchelonXmlParseServlet` are to obtain database connections in the proper manner and ensure transaction isolation, but more on that in the following section.

A few servlets extends `EchelonServlet` directly. These are the administration servlets, which serve entirely different purposes than the other servlets, and the two servlets receiving requests from Flash clients that do not yet have an associated `usersessionid`: `Login` and `SignUp`. It would not be practical to let `Login` and `SignUp` extend either `EchelonGetServlet` or `EchelonXmlParseServlet`, as a lot of the work these abstract servlets automates is about working with the `usersessionid`. Thus `Login` and `SignUp` has a greater responsibility than the servlets inheriting from `EchelonGetServlet` or `EchelonXmlParseServlet`, as they have to do more work for themselves.

## 9.5.2 Database Connections and Transactions

With the exception of the objects of the chat classes, the Java objects of the Web game store no data on the individual users. Take out the database connection pools as well and the entire object system is essentially stateless. The servlets works as described in the chapter ‘Choice of Technology’ and the objects of the supporting classes are instantiated and destroyed within the serving of the atomic http request. This places the database connection mechanism and database operations at the heart of the system. The whole game unfolds according to the data in the database.

There is still, however, good reason in separating the connection- and query/update-mechanisms from the rest of the system. Taking the abstraction of the data access a step further than the JDBC, makes it easier to code and change the rest of the system without introducing database inconsistency. This also prevents us from having to change the entire system if we want to change database, and as the design is now we can even change database by changing an integer one place in the system (this could theoretically even be done at run-time). This only works for databases for which the system has already been prepared, but adding a new one only requires two new classes and modification of one existing class. Admitted, one of the new classes has to provide 70 methods, but most of them can be inherited, or implemented by slightly changing methods, from an existing class.

The database actions of the system can be divided into two subparts:

- 1) The connection handling mechanism, which is responsible for obtaining a database connection, making sure it is reserved for one client at a time, issue ‘commit’ or ‘roll-back’ and releasing the connection again.
- 2) The data handling mechanism, which is responsible for retrieving, updating and storing data in the database.

When working in an environment that supports plug-and-play switching between different database it is imperative that the database switch is reflected throughout the system, and that a connection handling mechanism of type A is always used in relation with a type A data handling mechanism.

## The Connection Handling Mechanism

In the Echelon Web game the connection handling mechanism takes the shape of an object of the type **ConnectionPool**. At present two subtypes exist: **CloudScapePool**, for the Cloudscape database, and **MysqlPool**, for MySQL. Their common super-class, **ConnectionPool**, is declared abstract, as it should not be instantiated in the Echelon system.

The **ConnectionPool** objects are responsible for handing out connections of the proper type to client objects, on their request. The clients in turn are responsible for committing or rolling back their transaction and returning the connection to the **ConnectionPool** when done with it.

The concrete **ConnectionPools** of Echelon are implemented as Singletons<sup>175</sup>. This design pattern ensures that only one instance per virtual machine is ever created, and that all client objects communicate with this object. With the Singleton pattern follows, that the state of the **ConnectionPool** is shared among all threads running in the system.

When the single instance of **ConnectionPool** is instantiated it creates a number of database connections in the way the specific implementation subscribes. From here on the same connections are rotated among the different clients, avoiding the time consuming operation of creating connection anew every time one is needed. If the system is under serious strain and all the database connections are in play, the threads operating on the client objects might have to wait for a connection to be freed. This waiting makes perfect sense, as most databases have a limit on the number of simultaneous connections it can handle, and furthermore the purchased database license might also restrict the numbers of connections available.

To make it easy to change subtype of **ConnectionPool**, and thus change database, the client objects obtain a reference to the single instance by calling the Factory method<sup>176</sup> **getConnectionPool()**, located on the **EchelonSettings** class. The type of Factory method used for **getConnectionPool()** is a variant of the Parameterized Factory method, in that it decides which sub-type of **ConnectionPool** to return on the basis of an integer, **DB\_CHOICE**, set in **EchelonSettings**.

The clients in turn do not have to worry about which subtype of **ConnectionPool** they are handed, as they only call methods of the supertype. Their responsibility lies in

---

<sup>175</sup> Gamma et. al (1995:117-126).

<sup>176</sup> Gamma et. al (1995:107-116).

committing or rolling back, and then return the connection to the **ConnectionPool**. It only takes one servlet, which systematically does not return the acquired database connection, to end up blocking all the connections.

That's why this is a feature of the **EchelonGetServlet** and **EchelonXmlParseServlet** classes. They place their own database access and the call to **doIt()**, which initiates all the subclasses database access, in the same **try-catch** block. All **SQLExceptions** thrown further down in the hierarchy is thrown upwards until they reach the initial **try-catch** block of the **EchelonGetServlet**'s **doGet()** or the **EchelonXmlParseServlet**'s **doPost()** methods. If no **SQLExceptions** are caught the **EchelonGetServlet** or **EchelonXmlParseServlet** issues commit on the connection; if an **SQLException** is caught they issue rollback and all the SQL-statements included in the **try-catch** block are rolled back.

That is: the described **try-catch** blocks actually constitute a single transaction. We use the transaction features of the database and of JDBC to construct the transactions of the Web game, so that all actions initiated by one servlet request forms one transaction.

This, however, does only work if the database supports transactions. This is the case for CloudScape, but not for MySQL. The consequences of running the Echelon Web game on a non-transaction safe database can mean that operations that should be atomic, such as taking 12 points from user A and giving them to user B, might be conducted only in part. With our point example we could experience that user A has his points taken, then some database or application error occurs and user B is never given A's points; they are lost in cyberspace. Or put in another way: MySQL does not ensure atomicity of transactions. But as we shall see later, the bad performance of the CloudScape database left us no choice but to try out another one.

## The Data Handling Mechanism

All data retrieval and manipulation of the Web game goes via an object of type **EchelonSql**. Currently two classes can be used to produce objects of type **EchelonSql**: **EchelonSql** and **MysqlSql**, which extends **EchelonSql**. The objects of this type have about 65 methods for selecting, updating or inserting data in the database. To maintain the transaction design described above, all the methods take as one of their arguments a database connection, an object of type **java.sql.Connection**. In this way all database access issued by a client can be handled within the same connection, which can provide transaction security if the database supports the transaction feature.

The implementation of the **EchelonSql**-type object must, as mentioned, fit the database from which the connection originates. To ensure this, also the **EchelonSql** objects are obtained from a Factory method on **EchelonSettings**, **getSqlClass()**. This method uses the same field to determine which database is in use as **getConnectionPool()**, so these two will always relate to the proper sub-type of the other. The implementations of **EchelonSql** and **MysqlSql** are both stateless, so every client could share the same

object or a new one could be created at request. It would not have any impact on the functionality<sup>177</sup>. The latter solution is used for the `getSqlClass()` method.

### 9.5.3 The Design of the Chat

The chat framework of the Web game is built in a different way than the rest of the system, because we want to provide the user of the chat with a sense of immediacy.

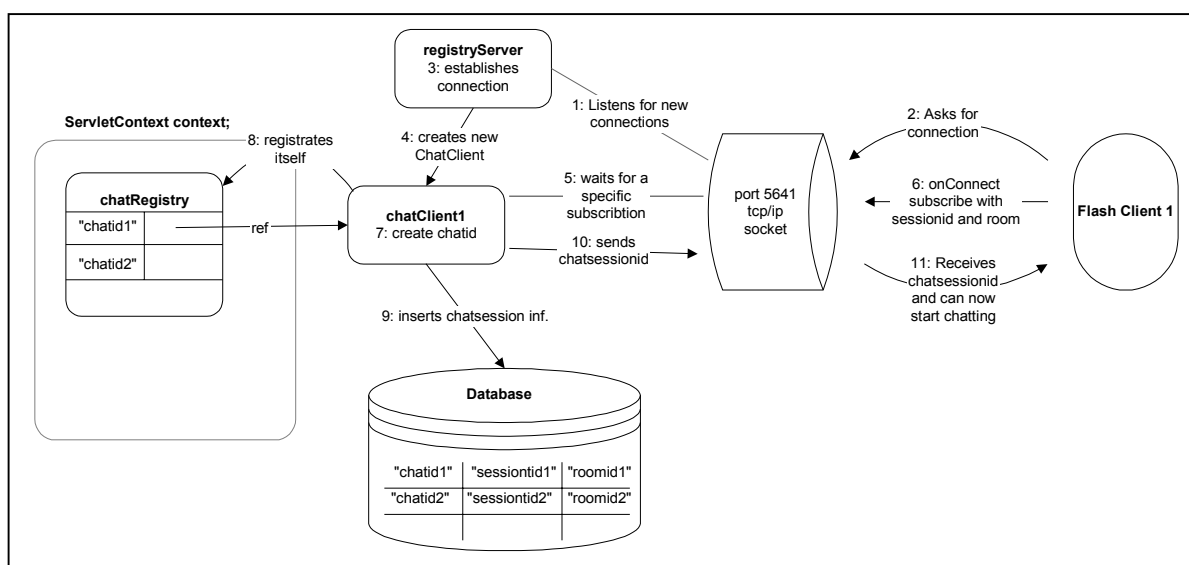
To do this, we need to push the messages out to the Flash clients as they arrive at the server. We could have made a design where the Flash client polled the server for the content of the chat room on a regular basis via http. But if the intervals are made too long, the conversation's real-time feel will be destroyed, and if they are made shorter, a lot of unnecessary network traffic is introduced. Instead we establish a TCP/IP socket connection, on which we can push the new messages out to the clients.

Socket communication is only necessary when clients are receiving messages, not when they are sending. For sending, the clients might as well use the normal http-mode (`sendAndLoad()` in Flash terms), and they do in the design we have developed.

The chat situation involves two different situations:

- Entering a chat room, which involves the establishing of a socket connection between the server and the client, and the registration of the client (at the server) as being in a specific chat room
- Communicating in a chat room, which involves sending messages and broadcasting them to the proper clients.

Figure 9.5 illustrates what happens in the system when someone enters a chat room from a Flash client.



<sup>177</sup> Maybe there's a *little* overhead in creating a new instance on every request.

Figure 9.5: The log on to a chat

The rounded rectangles are Java objects. The arrows indicate some kind of communication, except the one labeled “ref”, which is an object reference. The no-arrow-head lines indicates “listens on...”. Details of the Flash implementation are left out as they have been covered in the section on the front-end implementation. A user enters a chatroom involves the steps, starting with the actions prior to the situation sketched in the figure above (step 0):

0. From the **AdministrationServlet** the administrator presses the “startregistry” button. This initiates a series of actions: A **ChatRegistry** (**chatRegistry**) is obtained<sup>178</sup> and placed as an attribute on the **ServletContext** (**context**) to make it available for all servlets. Then a **ChatRegistryServer** object (**registryServer**) is created and a **Thread** is started in it, which listens on a specified port (5641). Using a servlet from the same Web application (echelon) to start these procedures ensures that the **context** object is the same instance as used by the other servlets, and that the **ChatRegistryServer** runs inside the Web server’s virtual machine.
1. This brings us to step 1 of the figure: The **registryServer** listens at port 5641 for clients trying to connect.
2. A Flash client tries to connect at port 5641
3. The **registryServer** “hears” the attempt to connect and establishes a socket connection and in that creates a **Socket** object (**\_socket**).
4. The **registryServer** creates a new **ChatClient** (**chatClient**), which stores a reference to **\_socket**. Then the **registryServer** calls **waitForSubscription()** on the **chatClient**, and starts listening for new Flash clients trying to connect.
5. The call to **waitForSubscription()** makes a **Thread** in the **chatClient** listen on the **Socket**.
6. The Flash client sends an XML-formatted subscription, containing a usersessionid and a room-id, to the **chatClient**.
7. The **chatClient** parses the XML to get the usersessionid and room-id, and creates a chatsessionid.
8. The **chatClient** registers itself in the **chatRegistry**, using as index the chatsessionid.
9. The **chatClient** inserts row in the database table, **CHATSESSION**, containing the chatsessionid, user session id and room-id.
10. The **chatClient** sends the chatsessionid (XML-formatted) to the Flash client, and let the thread currently running in it die.
11. The Flash client receives the chatsessionid and is now ready for chat communication.

---

<sup>178</sup> Via a **getInstance()** method, as it is implemented as a Singleton, Gamma et. al. (1995:127-134).

With the preconditions all setup we are now ready to chat, which is illustrated in figure 9.6:

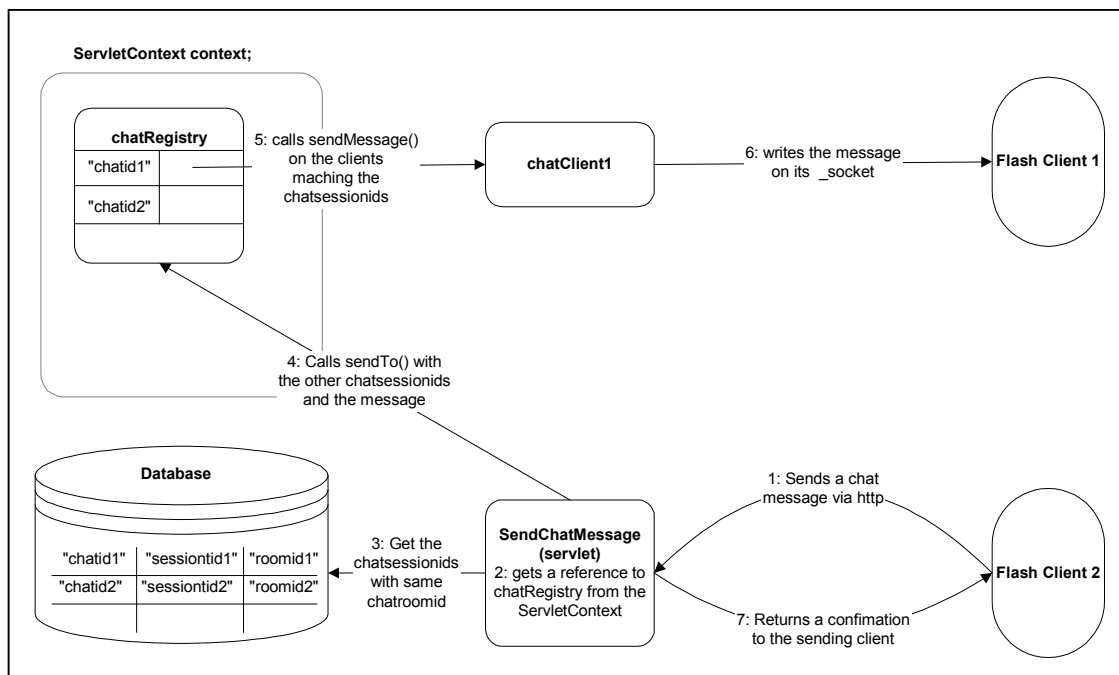


Figure 9.6: The chat situation.

The notation is the same as for figure 9.5. The situation is that Flash Client 1 and Flash Client 2 are in the same chat-room, and Client 2 sends a chat message:

1. Client 2 calls **sendAndLoad()** with an XML-formatted chat-message to the **SendChatMessage**-servlet which receives the request. The Flash client's chatsessionid is included.
2. **SendChatMessage** gets a reference to the **chatRegistry** via the **ServletContext**.
3. **SendChatMessage** looks up (in the database) the active chatsessionids with the same chat-room attribute as the one sent from the Flash client. Among them is Client 1's chatsessionid.
4. **SendChatMessage** calls **sendTo()** on the **chatRegistry** with the other **chatsessionid** and the message as arguments.
5. The **chatRegistry** looks up **ChatClients** associated with the ids one by one, and calls **sendMessage()** on each of them, with the message as argument.
6. The individual **ChatClients** write the message to their **Socket**, which is connected with a Flash client each. Among them are Client 1, that receives the message and displays it on its screen.

The area of socket connections can be quite error prone. Network errors can occur or the client with which there is a connection can crash or go off-line etc. As we regularly check for dead usersessions and chatsessions, the danger of having sockets stalling is limited to the time span ranging from the opening of the socket (figure 9.5, step 3) to the insert in the database has been executed (figure 9.5, step 9).

One error is, if the Flash client never sends the subscription as it is supposed to do (because of network errors or a client crash). We have compensated for this by setting a timeout on the socket, which makes it throw an Exception, if nothing happens for one whole minute.

And another (theoretical) problem: What happens if the Flash Client sends its subscription before the **ChatClient** object is ready? We have been informed that that the data sent to a socket prior to any **read()**-operations is actually cached in the sockets buffer, and thus can be read later. If this is the case, we do not have a problem. However, if it is not the case, the circumstances in which the client (acting over a network) is faster than the servers setting up the **ChatClient**-object, are probably extremely rare.

### 9.5.4 Cleaning up the Sessions

The **PingChecker** class, which extends **Thread**, is created and started via the **AdministrationServlet** to make it run inside the Web server's virtual machine. Every 10<sup>th</sup> second it sweeps the database for usersessions that have expired and their associated chatsessions. If it finds any, it shuts them down by setting their end-time with a **current\_timestamp**. If it shuts down any chatsessions it also finds their **ChatClient**-objects in the **chatRegistry**, closes their socket and removes them from the **chatRegistry** for garbage collection.

Upon every login it is checked if the user has other active usersession. If so, they are considered expired and same actions as sketched above is taken. Every time a user enters a chat room a new chatsession is created. When that happens, all other chatsessions associated with the sessionid currently held by the user are terminated in the manner described above.

### 9.5.5 Helper Classes

Advanced features, or features used by multiple servlets, are extracted as separate classes, rather than being repeated in the single servlets. In addition to the database mechanisms and the chat design, these are the classes:

**EchelonSettings**, which is a class with only static fields and methods. Used for setting the general properties of the system, such as database settings, the point values and the number of surveillance cards and assignments a user gets. Furthermore it provides Factory methods for the database mechanisms, a method to get random integers, and id generation methods.

**Md5sum**, which is used for creating hard-to-forge usersessionids and chatsessionids.

**Message**, which models a message send from one user to another.

**SmsAddress**, which is used to generate an SMS-address from a mobile phone number.

**StringMap**, which is a simple wrapper class that wraps the **HashMap** class of **java.util** to make it type safe: It only accepts and returns objects of type **String** instead of objects

of type **Object**. This is heavily used for parameter passing and for wrapping up results of database queries.

**SurveillanceCard**, which models a surveillance card held by a user. It contains nine inner classes of type **Assignment**, which represent the different types of assignments a card can contain. They all implement the method **completed()** which can be called in a polymorphic manner by **SurveillanceCard** to find out which assignments are completed. **SurveillanceCard** also contains static methods for creating new surveillance cards and adding random assignment to them.

**EchelonSettings** and **Md5sum** are never instantiated. Objects of the remaining helper classes only live during the handling of a single http-request. Their creation is initiated by a **doGet()**- or **doPost()**-method, and when that method returns the objects can be garbage collected.

## 9.6 Front-end Development and Design

In this section we will briefly examine Flash 5 and Action Script from a programmer's perspective in order to provide a foundation for the documentation of our Flash client-side code. We will then explain the structure and logic behind our implementation of the Echelon front-end technology.

Flash was originally designed as an animation program for the web, and as a result of this, the structure of Flash is based on a movie metaphor with a *stage* and *frames* placed in a *timeline*. The programmer inserts frames and *key frames* in the timeline and places content, in the form of graphics, text, buttons, *movie clips*, and *Action Script* in these frames. Unless coded to do otherwise, a Flash movie will begin playing in frame one and continue through each successive frame (at a default rate of 12 frames per second) until it reaches the final frame.

### Controlling the Flow

The implementation of Action Script found in Flash 5 (released fall of 2000), which has many similarities to JavaScript/ECMA Script gives the programmer the ability to leave the "movie metaphor" to a large extent and control the flow of events via code. Theoretically, the main timeline of a Flash movie could consist of a single frame, from which the programmer could call a number of events and actions. Typically however, in order to maintain a better overview, the programmer will use a new frame to represent each new segment in the site. In the case of Echelon, for example, the "sign up" and "log in" processes and the "main" section (see diagram below) each have their own frame (**sign\_up**, **log\_in** and **main**).

The flow of the movie is then as follows<sup>179</sup>. After the introduction sequence, the movie stops at the **log\_in** frame. If the user pushes the "sign up"-button the movie then goes

---

<sup>179</sup> This is a simplification of the actual flow, which will be presented in full later.

to the **sign\_up** frame. When the user signs up and pushes “submit”, the movie waits for confirmation from the server and then returns to the **log\_in** frame. Here the user logs in, and with confirmation from the server, the movie progresses to the **main** frame. This structure is utilized only to achieve a clear order and overview. Had we chosen, we could have placed all three in the same frame and called the relevant windows into view with Action Script.

## Understanding Movie Clips

Action Script is a class-less object based scripting language that is interpreted rather than compiled. The objects in Flash exist in the form of movie clips, and build-in objects you can instantiate. The movie clip in its most basic form is a movie (with its own timeline), placed within a larger movie. An example of this is seen in the introduction sequence where the Bar Code turns into the Echelon logo. This Bar Code movie is an instance of a simple movie clip consisting of 50 frames, which has been placed in the first frame of the main timeline, or at the **\_root** level. In this case, frame one of the main movie contains the script: **stop()**; which stops the main movie. The Bar Code movieclip then plays to its frame 50 where the code, **\_root.gotoAndStop ("login")**, instructs the Flash player to progress to the frame called **log\_in** in the main timeline and stop there.

This is a very basic implementation of the movieclip principle. Movie clips can also be placed within other movie clips, and one can theoretically have an endless hierarchy of movie clips. Even more important is that movie clips can also be utilized in a more object oriented way. For example several instances of a single movie clip can be placed in the main timeline. This is seen in the little green cursors that scan the background text when the user first enters the "main" frame. These cursors are all distinct instances of one movie clip. This movie clip has code at its own root level that controls its motion across the screen. In this case we essentially have code that says: **this.\_x ++**; and so **this.\_x** refers to the specific x value in that movie clip instance. In this example, all the instances behave according to the same shared script. We could, however, write unique code in each instance of the movieclip. For example we could let all instances of the cursor movie obey the action script of the base clip, but tell one of them to stop at a certain point. If at the base level we make the motion of the clip conditional, for example if within the base movie clip we initiate a variable called **\_move**, and only let the movie clip move if the variable **\_move** is true, we can then write the following script on an instance of the movie clip<sup>180</sup>:

```
if (_x >= 200){  
    this._move= false;  
}
```

---

<sup>180</sup> Here, when we say write the code "on" the instance, it is perhaps helpful to understand that in Flash, one drags a movie clip instance from the *library* and onto the stage. Programmers can thereafter select the instance and via the *Actions Window* write scripts that are then associated with that clip. The same process can be done with *buttons* and key frames.

```
}
```

We could also control this instance from other places as well, for example, from frames in the main timeline, from other movie clips or from *buttons*. In order to do this, we simply have to refer to the appropriate variables via the correct path. In the case of the instance of the single cursor above, we could control it from a button placed at any level (either at the `_root` level, or buried deep within a hierarchy of movie clips) simply by writing the following script:

```
on (press) {  
    _root.theCursorsInstanceName._move = false;  
}
```

Thus, by using instances of movieclips, the programmer can control events simply by referring to the appropriate instance via its path. This is the primary technique we use in controlling the Echelon movie. For example, each drop-down window is an instance of the same base movie. In this case the base movie has no script attached to it but only contains graphics (changing the graphics on the base movieclip of course affects all of its instances). Each instance of the movie clip, however, contains its own scripts that control its own actions. For example, the "Communication Center" instance has all of the necessary functions for communicating with the server, and parsing XML documents. Furthermore, the Communication Center has movie clip instances within it that communicate with the Communication Center itself. For example, the message pane where users compose messages is a movie clip (placed within the Communication Center instance) that contains two *input* text fields and a button<sup>181</sup>. The first text field is set equal to the variable "username" and the second to the variable "message". These variables belong to the messagepane movie clip. When the user writes a message and pushes the send button, the send button calls the appropriate function in the "Communication Center" by using the full path:

```
on (press) {  
    _root.comm_center.sendMessage(username, message);  
}
```

In this case, "comm\_center" is the instance name, "sendMessage()" is the function which is located in the "comm\_center" instance, and "username" and "message" are the variables taken from the input text fields of the messagepane movieclip. The sendMessage function then performs the necessary procedures and calls the necessary functions to send the message and receive the information returned from the server. If

---

<sup>181</sup> Flash has *static*, *input*, and *dynamic* text fields. The latter two can be associated with variables by referring them to the path of that variable.

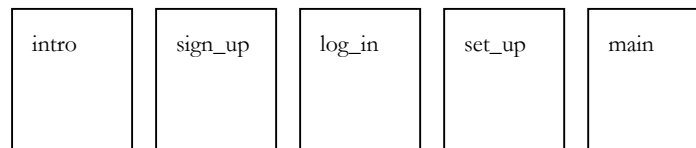
required it could communicate with the messagepane movie clip by referring to its path; for example:

```
_root.comm_center.comm_centerbase.messagepane.message = "your message has been sent";
```

Here we see that the "messagepane" is actually an instance located on the movieclip instance called "comm\_centerbase" which in turn is located on the "comm\_center". The text field, which has been set to equal the variable "message", will now display the string "your message has been sent". (Note: this is not the procedure we use to return confirmation to the messagepane, but is only used to illustrate how movie clips can communicate with each other).

### 9.6.1 The Front-end Structure of Echelon

The Echelon Flash movie consists of 5 frames, and as mentioned above, this structure is primarily chosen to enable us to maintain order in the movie.



The movie stops in the "intro" frame where it plays the barcode movie, which then instructs the root movie to jump to the "log in" frame (frame 3). After the log in process is complete the login movieclip instance calls the following script:

```
_root.gotoAndStop("set__up");
```

Here, another intro movieclip plays which when finished tells the main movie to continue to the "main" frame:

```
_root.gotoAndStop("main");
```

Unless the user logs out or loses his connection, the movie will stay in the main frame for the remainder of the session.

Below we will briefly discuss the primary purpose of each frame.

#### The Intro Frame

In the "intro" frame we initialize a number of variables and functions so that we have access to them throughout the remainder of the movie. One primary function here is the `convertXML ()` function. That initially handles most of the XML documents sent from the server. The path to the first frame (and all other frames on the main timeline) is `_root.functionname ()`, or as we see often `_root.convertXML ()`. This frame also contains

an error panel movie clip, which is present throughout the following frames, and is called into view by `_root.convertXML()` when an error is received from the server.

## The Signup and Login Frames

The "signup" and "login" do what their titles indicate. In each case there is a movieclip in the frame that has the necessary functions for communicating with the server and handling the response.

## The Setup Frame

The "setup" frame has the primary function of double-checking to make sure the user has actually logged in (when viewing a Flash movie, if the user right clicks on the movie they are given the option of advancing to the next frame). The frame was also created as a place to initialize variables, but as it turned out we did most of the initialization in the first frame.

## The Main Frame

The "main" frame is the primary stage for the site. Here we have 5 movie clips in the form of dropdown windows that present the user with all of the interactive elements of Echelon. These windows are called "Chat", "Games", "Surveillance Center", "Communication Center" and "Information Center". As discussed above, each movie clip, or drop-down window contains the functions that control its own actions and its own communication with the server. Essentially what happens is that a movie clip requests an XML document, and after receiving it, it sends it to the `_root.convertXML()` function which is located in the first frame.

This function then checks to see that the *usersessionid* sent from the server matches that stored in the Flash client. Furthermore, it checks to make sure the server has not sent an error message. If it has, or if the *usersessionid*'s do not match, then the error panel movie clip is called into view it via the script `_root.error_panel.show()`. If this is not the case, and every thing is in order, then `_root.convertXML()` parses the document until it finds a unique *tae*. It then sends that *node* and its *children* back to the appropriate function, which is located in the movie, clip that initially called `convertXML()`. From this point, the movie clip parses the node and its children and sends the relevant information to the appropriate movie clips, where, in most cases it will be displayed.

An example of this is the Chat window (`_root.chat_center`) (see appendix XIII). When the user clicks on the button to open the Chat window, the button, among other things, calls the function in the Chat movie clip `_root.chat_center.getchatrooms()`. This function requests information from the server about the available chat rooms (i.e. their names and the number of people in each room). The document received from the server is then sent to `_root.convertXML()` function. As explained above, this function parses the document until it finds a unique tag. In this case, with the exception of an error, the tag will be `<chatcenter>`. The `<chatcenter>` node and its children are then sent back to

the Chat movie clip, by calling the function `_root.chat_center.convert_chatroomsXML(doc)`. This function then parses the node, looking for the following *attributes* for each: id, name, users, and description. As the document is parsed the information is then sent to the appropriate movie clips located in the `chat_center` movie clip. In this case, each chat room has its own movie clip, and the information is sent to these movie clips via their variables. For example, the script that sends the chat room name to the first chat room is:

```
room.roomname = elementTag.attributes.name;
```

Here "room" is a variable that is equal to `_root.chat_center.chatbase.chatcenter.room1`.

## 9.6.2 Communication with the Server

The three build-in functions from the Action Script API are needed to communicate with the server.

### XMLdoc.load().

The function used in the majority of client requests to the server is `XMLdoc.load()`. The functions in the Flash client that utilize the `XMLdoc.load()` function begin by creating a new XML object. When this is done, `load()` is then called on this object, for example: `newXMLObject.load(url + parameters)`. Flash then sends a standard http GET request, with the url and parameters. The information returned from the server is loaded into the `newXMLObject`. An *onload* event handler attached to the XML object listens for a response from the server. When it has received a reply from the server the event handler then calls `_root.convert_XML`. This is seen in the following example:

```
newXMLObject.onLoad = _root.convert_XML
```

The `XMLdoc.load()` function is used for all simple requests, where it is not necessary to send more than few parameters to the server. For example, when reading a message the parameters being sent are limited to the `usersessionid` and the *messageid*. In this case, as well as with the majority of the other transactions, a simple http GET request suffices.

### XMLdoc.sendAndLoad()

The `XMLdoc.sendAndLoad()` function is used in the transactions where it is necessary to send larger quantities of data to the server, for example when Communication Center messages or Chat center messages are sent. In this case, both the request and the response are XML documents. In functions that utilize `sendAndLoad()` we begin by creating a string variable where the information being sent is assembled along with the XML tags. We then create a new XML object, and parse the string (with Flash's built in `parseXML()` function) into an XML document, which does the new XML object hold, for example: `newXMLObject.parseXML(theStringToSend)`. When this is done we create

a second XML object that will receive the reply from the server, and call `sendAndLoad ()` on the first XML object that holds our document. In this case, the script will be:

```
newXMLObject.sendAndLoad (url, receiveXMLObject);
```

The `sendAndLoad ()` function uses a standard http post request to send the document to the server. The reply is then loaded into `receiveXMLObject`, which we can then send on to `_root.convertXML ()` with the same procedure as above:

```
receiveXMLObject.onLoad= _root.convert_XML;
```

## XML Socket

The final way we communicate with the server is via an XML socket. This is used exclusively in the Chat center. Here we will only briefly describe the procedure for logging into a chat room, receiving and sending chat messages. In the section on the middle tier design we will explain the rationale for the procedures used, and discuss in more detail the way the sockets are implemented.

The chat communication uses different procedures for logging into a chat room, receiving chat messages, and sending chat messages. The procedure for logging into a chat room opens an XML socket and connects to a port in the server, which is a standard TCP/IP socket. This is done first by creating a new socket object: `mySocket = new XMLSocket()`, and then calling the `connect()` function on that object: `mySocket.connect(host, port)`. We then attach an event handler to the socket `mySocket.onConnect`. When a connection is made, the handler then calls a function, which confirms the connection and thereafter calls the `send ()` function on the socket object. Here we send an XML document via the socket to the server. This document contains the `usersessionid` and a `chatroomid`, which tells the server which chat room the client would like to subscribe to. This is the only information the client actually sends via this socket. When the client has successfully subscribed to the chat room, the server sends a confirmation to the client, via the socket, that contains a `chatsessionid`. From this point on, the client listens to the socket, using it only to receive chat messages.

The client receives information from the server via the event handler `onXML`. The first data being received is the subscription confirmation followed by the incoming chat messages. The `onXML` event handler is attached to the socket object: `myXML.onXML`, which calls the function `handleIncoming`. This function then parses the XML document and displays the message in the chat window (note: because the chat XML received from the server differs from the other XML documents we receive, we do not first send the document through `_root.convert_XML()`).

In sending chat messages, the client uses the `XMLdoc.sendAndLoad ()` function as it is described above. Here the `chatsessionid` and message are parsed into an XML object that is sent to the server. In this case the returned document, is sent through

`_root.convert_XML()` only to check for error messages, as all other chat communication is received via the socket.

## 9.7 Test of the System

The automated, systematic testing of the prototype has been quite limited. We started out working with unit testing, and as we shall see a full set of automated tests of the original SQL has been developed. But as the system is essentially stateless, the rest of the middle tier also relies heavily on results from the database; and as the whole concept of unit testing is to test the program units in isolation, we would have had to build an entire test set of dummy methods resembling the methods on the SQL-class in order to test the rest of the system independently of the SQL-class. That could have proven worth the effort, if the development period had been longer and the application more extensive, but in our case the time spend probably wouldn't be worth the while. So we didn't unit test the rest of the system.

Instead we made sure to get around in all the corners of the system on a regular basis, and finally we conducted a multi user test that in part had a technical focus. The technical consequences of the user test will be discussed in the end of this section.

### 9.7.1 Systematic Test of the SQL Class

The **EchelonSql** class, responsible for writing and reading from the database, has been tested systematically in order to make sure that the received data are correct and that the methods work as intended. Unit testing is a way of testing the program while coding and it is part of the "Extreme Programming" approach described by Kent Beck<sup>182</sup>. The unit test is written before the method and it is emphasized that it should fail in order to prove that it is a valid test<sup>183</sup>. The test suite (in the case of the Echelon prototype, the **TestEchelonSql** class) should be run every time a part of the class has changed. This is done to make sure that the methods never influence the implementation of another one and ensures that the latest version of the class is working properly. The fact that the test has to be written first also ensures that the programmer knows the exact purpose of the method; when a test is written it specifies both the values that the method needs for carrying out the task as well as what it should return.

The unit test's structure is the same as the echelonSql class, meaning that the methods are tested in the same order as they appear in the class. The test requires the load of specific test data that it can test the methods on. It would be a hassle to insert data in each test, because of the large number of tables that rely on each other; therefore the test data is necessary. The test database inserts are then rolled back at the end of the whole

---

<sup>182</sup> Beck (1999).

<sup>183</sup> Beck (1999:117).

unit test in order to make the next work. The test data and TestEchelonSql class are available in appendix X and XI.

The unit test is made for the **EchelonSql** class only, because it is at the bottom level of the method hierarchy. The methods in all the other classes are relying on other methods, which, in the end depend and call the database related methods. It is therefore most important to make sure the bottom methods are working correctly. Moreover the other classes depend highly on the situation and unpredictable factors such as randomly created surveillance cards and current time. It would therefore be virtually impossible to create a unit test for these classes without an occasionally build-fail due to the wrong current situation in the game and not due to an actual non-working method. One way of creating a unit test for the other classes would be to build a testEchelonSql class that always returned the same data and did not have any queries in the database. This way the methods in the other classes would be certain always to receive the same data despite time and randomness. However, this would require a huge amount of time and the test of the **EchelonSql** class is therefore prioritized in the prototype development.

The unit test is created with JUnit, which is a Java framework for creating, organizing and running the unit tests. It lets the programmer assert that the assumed results are equal to the actual output that the methods return. It makes it possible to separate test code from test data, which makes it especially good for database applications such as the Echelon prototype. Furthermore Ant, a build tool that makes it easy to re-compile and define class paths once for the whole programming process, is used to develop the prototype. This tool makes it possible to compile and test all documents by providing one keyword for the compilation and one for the test preceded by the compilation.

## 9.7.2 Technical Issues of the User Test

On the 30<sup>th</sup> of May we conducted a user test with 25 participants. As stated in the methodology chapter the test had two main purposes: 1) A technical test of the system under the strain of multiple users and 2) to collect input from the target group considering the atmosphere, game-play, usability etc. But as it turned out, the system at that stage performed so badly, that no real game could be played, which meant that no real reactions to game-play and usability could be obtained. But technical we learned a lot: We isolated the problem (the database performance) and solved it.

### The Course of Events

We started out having all the participants sign up as users of the Web game, which went ok. But already during the login phase and the system started to stall a little. A few minutes later all the database connections from the ConnectionPool was handed out to various servlet threads and their respective database transactions had blocked each other. We tried a few restarts but the general picture was the same: In a matter of seconds, all database connection was handed out, and deadlocked. Later on we tried with a limited number of participants, which made the system run for a little while before it blocked.

Two closely related problems was identified:

- 1) The response to the isolated database query were to bad on more complex queries
- 2) The transactions deadlocked each other

## Sources of Error

In our pursuit of the source of error we examined a few possibilities. It was evident from the server log and course of events, that the problems were related to the database: The use and/or the performance of the database.

To rule out any hardware problems we started out by observing the memory and CPU usage. We put the system under so much pressure that it deadlocked, but at no time was the memory or CPU usage anywhere near critical.

The next step was to try dissolving all the transactions. Prior to this, a transaction could include several database queries. After reworking the Java code, the single transactions included only one query each. This was done in two ways: By setting the database in auto-commit-mode and by letting each method of EchelonSql get its own database connection. None of them did much good, as the database response on the individual query still was so bad, that the system seamed very slow and eventually deadlocked.

A number of steps were taken to tune the database performance: The most complex queries was reworked for optimization, the tables were indexed on all join attributes, the transaction security was first maximized, then minimized, and different types of JDBC connectivity schemes (embedded connections, RMI-connections, pooled connections) was tried out. Nothing helped.

## The Solution

What finally solved the problem was a change of database from CloudScape to MySQL. The change took some time to implement, as we had to override a good deal of the methods in EchelonSql to get the system running on the new database. But once implemented the system ran a lot faster.

But in changing to MySQL we did not only get increased performance. We also got a database that didn't support transaction (also). This, of course, has the consequence that the database never deadlocks. But as discussed in a subsection of this chapter (Middle Tier Design - Database Connections and Transactions), we also loose the transaction facility of the Web game as a whole, as the strategy of the transaction design, is to remove the responsibility to the database. But in our case, a prototype for a Web game, we can live with it.

The consequence is, that we at present time cannot *guarantee* that the system will not deadlock on a transaction secure database, although the severe problems with CloudScape seamed to stem from the bad performance we got out of it. It is our

qualified guess, though, that backed by a high performance database with an intelligent transaction mechanism (such as Oracle) the system should not only run smoothly (as it does now), but also be transaction secure.

## 9.8 A Winning Combination

The cocktail of Java – XML – Flash proved to be very promising: Java offers power, ease of development, easy of database connectivity, and safety of development; and a good deal of programmers today feel comfortable with Java. The game could also, with little effort, be implemented as a Web component to fit into the J2EE component server framework that seems to be gaining popularity.

With Flash you get the accessibility offered by a powerful browser plug-in with high penetration, that displays content in unified manner independent of browser and operating system differences. It also provides a sophisticated tool for easily creating rich, intelligent user interfaces. Furthermore the ease with which it can communicate via an XML interface makes it an ideal front-end technology for developing highly interactive services.

You get the flexibility, the generality, the standardization, a range of tools as the build-in XML-parsers of Java and Flash, not to mention the hype, of XML. Furthermore XML provides a thorough de-coupling of the elements it bridges: Flash knows nothing of the back-end implementation; not even that Java is used. The Java application could, for all it knows, be talking to an XSL-engine, that formats everything into HTML or WML.

The Web game prototype as it is, provides a good feel for the overall atmosphere we wish to create in the Echelon format as a whole: “I am on. Right now. Live. If I don’t act, someone else will, and it’ll be too late. Am I under surveillance or am I being coned?” We have developed a graphic style that creates a compelling site for communication with a high-tech feel. We have yet to collect systematic reactions from the target group on the game-play, but the elements are easy tunable. So if one strategy is too easy and another too hard, the point rewards can be adjusted. The prototype is ready for testing, and can play a strong role in the evaluation of the Echelon format’s likeliness to succeed, and with a small amount of work constitute the first version of the Echelon Web game.

## 10 CONCLUSION

---

This thesis began as the result of a shared interest in the possibilities offered by new media. What particularly excited us is the potential that lies in these media to be combined with one another. From this we began to play with the idea of creating a totally new entertainment format that draws on the strengths of several media at once. We discovered very early on, that to truly test the viability of this idea, it would be necessary to approach the topic from several different perspectives. What new technologies such as WAP have shown, is that nothing exists in a vacuum. The technology may work, but there are several factors at play in the success or failure of anything. Because our concept involves several different media, and one as well established as Television, the factors involved were numerous.

The relative ease with which content can be produced and distributed on the Internet lends itself to cavalier experimentation. Television however is a different matter. Content is expensive, the budgets are large, and the market competitive. Yet it is exactly the experimentation on the Internet that has proved it such a popular medium, and enabled it to steal viewers from the TV. It was not the intention when we began this thesis, to win those viewers back. (Though we feel now that we may have proposed a format that can do just that). What we set out to do was to create something new, perhaps even radical, yet viable. We wanted to experiment, to send up a probe, but not in a cavalier way.

Because television is a central part of our concept, we understood that regardless of how radical we were in our experimentation, we had to be serious in our approach. Television cannot be created without the broadcaster, and we therefore had to think very critically about the criteria for success that the broadcaster demands. Our task was not made any easier because we were dealing with an entertainment format. On the contrary. We realized that though on the surface it was entertainment, in truth what we were working with was a product. A product like any other that had to be accepted by the consumer. Yet the reason why one form of entertainment is chosen over another isn't as easy to define as say why one car is chosen over another. Ultimately, entertainment is consumed for enjoyment, which is a fairly intangible thing to measure. It was obvious from the start that not only would the format need to be created for the enjoyment of the consumer (or target group) it had to be implemented with technologies that would make it easy for the target group to participate. This brought us to the obvious question of the implementation. Can the relevant technologies in the hands of the target group be made to communicate with one another? And if so, how can this be done in the most efficient and flexible way?

With these three perspectives established, we felt it important to take a fourth approach. To simply look at the format from the perspective of those who would be creating it. To plunge ourselves into the process of development and implementation to see what that would bring. We did this both because we were excited by the challenge of it and because we knew it would give us a tremendous insight if we could carry the concept through the

early stages of development. We decided then to develop both a concept for the format we proposed and a working prototype of this concept. We realized if we did this we could use the prototype as a kind of probe, to analyze our own analysis; to check for things we may have overlooked in our theoretical and practical approach. Most importantly, throughout our thesis we help our analysis up against the prototype in order to highlight examples, and clarify meaning.

This thesis began with a description of a concept that we believe could be developed into a successful and exciting new format. Echelon is designed with a number of elements that we feel would be essential for the success of any television based interactive cross-media format: A story that can carry the drama from the TV to the web and back again. An atmosphere that in itself gives a sense of drama and excitement. A tangible reward in the promise of getting on TV. And most importantly a wide array of interactive and even participatory functionality, both for the TV and Web, that gives the participant the very strong sense that they are part of controlling and creating something.

Next, in order to test the viability of Echelon, we examined the target group and discovered that they not only have access to the technologies necessary to participate in a format like Echelon, but that they very likely are a group who is willing to and may even desire to participate in an interactive television format. Many in the target group are excited by a concept or technology simply for the novelty of it.

As the idea for this thesis grew from rapid changes in the media landscape, it would be foolish to develop the concept without in some way accounting for continued change. We therefore analyzed the current media landscape in Denmark to further test the viability of Echelon and then looked five years down the road to see what changes that may bring for the format. We found, as we had suspected, that the media we propose as relevant to the format, have a high penetration within the target group, lying nearly dormant, ready to be used. Furthermore, if our forecast proves correct, it seems that coming media will only work to enhance the concept.

In an attempt to get closer to understanding the concept of enjoyment as the means which people select their entertainment format, we took a theoretical approach in the chapter on Media Analysis. Here we tried to understand and present the ways in which participation can affect the user's perception of a format. In doing this we showed that participation can be used to give the user an enhanced experience that will surely contribute to their level of enjoyment. We also discovered enjoyment is not the only element at play, but that communities of all sizes use entertainment as a mode of communication, and that in many cases this can have the effect of creating what is perceived as viewer loyalty toward an entertainment format. This chapter showed us that the participatory elements of a format like Echelon could offer the target group much in the way of enjoyment, and have the added bonus of directing the viewers' loyalty toward the program.

To put Echelon in perspective with the television market in Denmark, we analyzed the positions of both public service and commercial broadcasters. We showed that though

the two types of broadcasters work under different regulations and with different goals in mind, they both share a keen interest in capturing the viewer. We then explain how Echelon would enable either broadcaster to achieve this common goal, and at the same time give either the potential to reach their independent goals. Echelon, is a "positive" yet potentially very popular program that would fit well with the style of programming, and ethical standards at either public service broadcaster. A format like Echelon is also, however, rich with commercial potential that could create generous revenue streams for a commercial broadcaster.

From this point we turned to the technical aspects of the prototype and explained the rationale behind the selection of technologies used to build Echelon. We chose Java, XML, Flash and a relational database as the technologies to base our development on. These technologies have been chosen in part for their suitability to solve the task at hand and in part for the potential they offer in opening up for extensions and communication with external systems. Here, with a look to the future, we have tried to take account for the potential importance of dTV systems in relation to Echelon.

The Web game is designed with a three tier architecture. By using XML to interface the presentation tier and the middle tier, we strove to de-couple these elements as much as possible, making the system flexible for changes and add-ons. The combination of Java, XML and Flash proved to be a very promising combination, that can be expanded to meet the needs of the target group and account for the success of the format.

The result of our work is the production of a functioning prototype to a radically different cross media concept called Echelon. But it is much more than that. Our goal in this thesis is not to prove Echelon a successful concept; It is to have successfully used Echelon to show us the way to what could very well be a realistic and exciting new entertainment format. To do this, we have come the long way around and tried to cover all the bases, theoretical, practical and technical. If nothing else, we have shown that the technologies chosen are in the hands of the target group and ready to be implemented into something larger. That if used in combination with the right concept, one that draws on the strengths of each medium, they can create a level of enhanced entertainment today that is only dreamed about in discussions of tomorrow.

# 11 BIBLIOGRAPHY

---

Abrams, M.H: *A Glossary of Literary Terms*, Cornell University: Harcourt Brace College Publishers(1993).

Aristotle: *Rhetoric and On Poetics*, The Franklin Library (1981).

Beck, Kent:*Extreme Programming Explained, Embrace Change*, Reading, Massachusetts: Addison-Wesley (2000).

Bordewijk, Jan L. & Kaam, Ben van: *Towards a new classification of tele-information services*, in *Intermedia* vol 4 no.1 (1986).

Christensen, Lars Holmgaard: *Interaktivt TV: mediakonvergens og Cross-Media Consumption* in CFJE's Vidensbase, Center for Journalistik og Efteruddannelse (2001).

Christie, Paul Di Senso; Fergusson, Philip; Gold, Michael; Medina, Claudia; Rader, David;David Tee (Eds.): *New-media worldview*. USA: SRI Consulting (1997).

Corneliussen, Carsten; Johansen, Uffe T.: *Time & Space – En analyse af de teknologier og modeller der er grundlaget for bredbåndende i morgendagens interaktive kommunikationsamfund*. Denmark: A/S Brandts.com (2001).

Drotner, Kirsten; Bruhn Jense, Klaus; Poulsen, Ib; Schrøder, Kim: *Medier og kultur – en grundbog i medieanalyse og medieteor*. Copenhagen: Borgens Forlag (1998).

Eckel, Bruce: *Thinking in Java*. Upper Saddle River: Prentice-Hall, Inc. (2000).

Enderud, H (red.): *Hvad er organisations-sociologiske metode? – Den 3ide bølge i metodelæren*. Samfundslitteratur. Volume 1: p. 30-48 Volume 2: p.154- 179 (1984).

Fowler, Martin: *Refactoring, Improving the Design of Existing Code*. Adisson Wesley Longman, Inc. (1999).

Gamma, Erich; Helm, Richard; Johnson, Ralph; Vliddides, Joha: *Design Patterns, Elements of Reusable Object-Oriented Software*. Upper Saddle River, NJ: Addison-Wesley (1995).

Greenspun, Philip: *Philip and Alex's Guide to Web Publishing*, San Fransisco: Morgan Kaufmann Publishers (1999).

Hall, Marty: *Core Servlets and Java Server Pages*. Upper Saddle River: Prentice-Hall, Inc. (2000).

Jensen, Jens F.: "Interaktivitet og Interaktive Medier" in Jensen, Jens F. (red.). *Multimedier, Hypermedier, Interaktive Medier*. Aalborg: Aalborg Universitetsforlag (1998).

Jones, Steven G.: "Understanding Community in the Information Age" in Steven G. Jones (ed.): *Cybersociety. Computer-mediated Communication and Community*. Thousands Oaks, California: SAGE Publications (1995).

Lauesen, Søren: *Design af brugergrænseflader*. Unpublished notes. Copenhagen: IT University of Copenhagen (2001).

Lund, Anker Brink: *Det ukendte publikum* in Else F. Jensen & Ralf Pittelkow (red.). København: C.A. Reitzels Forlag. p. 28-39 (1986).

Morrison, Michael et al.: *XML – Unleashed*. USA: Sams Publishing (2000).

Negroponte, Nicholas: *Being Digital*. New York: Vintage (1995).

O'Driscoll, Gerard: *The Essential Guide to Digital Set-Top Boxes and Interactive TV*, Upper Saddle River, New Jersey: Prentice Hall (2000).

Reid, Elizabeth M.: *Electropolis: Communication and Community On Internet Relay Chat*. Honours Thesis for University of Melbourne Department of History (1991). <http://home.earthlink.net/~aluluei/electropolis.htm> [June 12 2001].

Rogers, E.M.: *Diffusion of Innovations*. New York: Free Press (1983).

Rosenberg, Doug and Kendall Scott: *Use Case Driven Object Modeling with UML, A Practical Approach*. Upper Saddle River, New Jersey: Addison-Wesley (1999).

Sestoft, Peter: *Java Precisely*. Version 1.05 <http://www.dina.kvl.dk~sestoft/javaprecisely> [May 1 2001].

Silberschatz, Abraham; Korth, Henry F.; Sudershan, S: *Database System Concepts*. Singapore: McGraw-Hill (1996).

Stone, Allucquere Rosanne: "Will the Real Body Please Stand Up? Boundary Stories about Virtual Cultures" in Paul A. Mayer (ed.): *Computer Media and Communication: A Reader*. New York: Oxford University Press (1999).

Tvede, Lars; Pircher, Peter; Bodenkamp, Jens: *Data Broadcasting – The Technology and the Business*. West Sussex, England: John Wiley & Sons Ltd. (1999).

van Dijk, Jan: *The Network Society: Social Aspects of New Media*. London: SAGE Publications (1999).

## 11.1 Reports and Regulations

Barkhuus; Louise; Cauchi; Mikkil; McLean, Kevin Cook; Norberg, Henrik and Pruzan, Rebecca: *Tranzmobile*. Copenhagen: The IT University of Copenhagen (2000).

Bekendtgørelse af lov om radio- og fjernsynsvirksomhed (lovbekendtgørelse nr. 203/2001). (www.kum.dk [May 18 2001]).

Bekendtgørelse om radio – og fjernsynsvirksomhed ved hjælp af satellit eller kabel, (lovbekendtgørelse nr. 874/1998). (www.kum.dk [May 18 2001]).

Bekendtgørelse om reklame og sponsorering i radio og fjernsyn, (lovbekendtgørelse nr. 1348/2000). (www.kum.dk [May 18 2001]).

Bekendtgørelse om vedtægt for DR (lovbekendtgørelse nr.1345/2000) (www.kum.dk [May 18 2001]).

Bekendtgørelse om vedtægt for TV2 (lovbekendtgørelse nr.1346/2000) (www.kum.dk [May 18 2001]).

*DR Programregnskab 1999*, DRs Informationsafdeling (2000).

*Fremtidens tv og radio – Resumé og redigeret udskrift af høring i Folketinget den 1. februar 2000*, København, Teknologirådets rapporter 2000/1 (2000).

*Konvergens i netværksamfundet*, København, IT- og Forskningsministeriet (2001).

*Public service beretning 1999*, Odense, TV2/Danmark (2000).

*Telestatistik 2. halvår 2000*, Telestyrelsen [<http://www.tst.dk/>] (2000).

## **11.2 Interviews**

Anne Langkilde, TV2 Analysen. Telephone interview (June 7 2001).

Charlotte Holm, Metronome. Telephone Interview. (June 11 2001).

Christian Muff, Bredbåndsbolaget. Telephone interview. (March 2001).

Christina Rithfeldt, TV3, Mediaresearch. Telephone interview (June 7 2001).

Hanne Bolbjerg, Legal Advicer DR, DR. Personal Interview. (May 21 2001).

Maz Spork, Agency.com, Personal Interview. (May 8 2001).

Marie Louise Jersild, DR-Online. Personal Interview. (May 21 2001).

Marianne Borker, Legal Advicer DR, DR. Telephone Interview. (May 9 2001).

Sofus Midtgaard, DR. Personal Interview. (May 8 2001).

Torben Haugaard, Wapportal.dk. Telephone interview. (February 27 2001).

## 11.3 Articles

- Boserup, Johan, *Tv-stationer leverer færre seerhits*, Børsen, Media Marked, (May 2 2001).
- Carstensen, Niels H.; Rasmussen, Knud Teddy: *Den mobile fremtid humber afsted*, Børsen (June 14 2001).
- Engell, Christian; Jessen, *Bodil: Læsebeste eller spillefugle*, Berlingske Tidende, 1- sektion (May 29 2001).
- Grønnegaard, Michael; Høivang, Kaj: *Big Brother massivt dækket af dagblade*. Børsen (May 16 2001).
- Ilsoe, Trine Maria: *Det minder om os selv*, Politiken, Media (May 15 2001).
- Ilsoe, Trine Maria; Mørch, Tonie Yde: *Bornekanal stormer fremad*, Politiken, 1. sektion (May 27 2001).
- Ilsoe, Trine Maria: *Mere reality på vej*, Politiken, Media (May 15 2001).
- Ilsoe, Trine Maria: *Pressen var med til at skabe Big Brother Succes*, Politiken, Media (May 20 2001).
- Ilsoe, Trine Maria: *TvDanmark sendt til tælling*, Politiken, Media (May 13 2001).
- Jensen, Flemming: *Zappernes reklametræthed kan overvindes*, Mediawatch nr 11. (June 1 2001).
- Hüttemeier, Christian: *'Big Brother' en kæmpesucces*, Politiken, 2. Sektion. (May 11 2001).
- Laursen, Per Fanefjord; *Konkrete planer for fremtidens TV-slagmark*, Mediawatch (April 20 2001).
- Møller, Jan: *Udenlandske tv-stationer på spring*, Børsen, Media Marked (May 30 2001).
- Ottenheim, Freddie: *Køb ind via TV og fjernbetjeningen*. Berlingske Tidende, 4. sektion (April 22 2001).
- Rasmussen, Knud Teddy: *Et slag for den personlige tv-frihed*, Børsen, Media Marked (May 30 2001).
- Pilegaard, Lars Raabye; *Annoncemarkedet har kig på digital TV*, Mediawatch (May 18 2001).
- Pilegaard, Lars Raabye; *MediaGateway satser på t-handel*, Mediawatch (May 18 2001).
- Rohde, Jens; *Afskaf Licensen* (Feb. 2 2001). [<http://www.venstre.dk>].
- Rosenkrands, Jacob: *Ny Undersøgelse: Teenagere zapper væk fra fællesskabet*, Ugebrevet Mandag Morgen nr. 18 (May 14 2001).

Rømer, Anette: *Mere Reality på vej*, Politiken (April 15 2001).

Seeberg, Kenan, *Big Brother vader i millioner*, Ekstra Bladet (May 10 2001).

Seidelin, Michael, *Tyske, franske, spanske.....*, Politiken, 2. Sektion (May 11 2001).

Staun, Jørgen: *Mobildanmark i anden division*. Børsen Informatik (June 5 2001).

## **11.4 WWW**

(most frequently used through out the thesis)

<http://java.sun.com/>

<http://www.aim.dk/> (ACNielsen AIM)

<http://www.boersen.dk/>

<http://www.computerworld.dk/>

<http://www.dr.dk/>

<http://www.gallup.dk/> (Gallup TV-Meter)

<http://www.kulturministeriet.dk/>

<http://www.mtg.se/> (Modern Times Group)

<http://www.mediawatch.dk/>

<http://www.retsinfo.dk/>

<http://www.tst.dk/> (Telestyrelsen)

<http://omtv2.tv2.dk/>

<http://www.venstre.dk/>