Integrated news publishing – Technology and user experiences

Report of the IMU2 project

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Edited by

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VTT Information Technology

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Keywords integrated publishing, integrated delivery, news services, multiple media, personalisation, IMU

Abstract

Fast networks and multipurpose terminals enable the integrated delivery and use of media content originally targeted at different media. The emerging multiple media portals accessed by a variety of terminals require semi- and fully automatic procedures for managing the content. News services benefit from an integration of news sources that goes deeper than mere listings of links provided by many current Internet portals. This deep integration groups news articles from different sources and media into common and personal categories as well as interlinks the articles.

The integrated media publishing system, IMU, developed in this work, automates parts of the news content acquirement and processing work of the portal web master. The IMU active proxy server extracts the metadata from news web sites and also – through video analyses – from television news broadcasts. This makes an automatic classification and linking of related articles and TV clips possible. The deeply integrated material is partitioned into news composites called channels, which can be personalised by the user. The automatically computed event and media calendar allows for a new type of integration of news and information about up-coming events. The news content is further utilised by setting up personalisation procedures for monitoring the business environment. Through the interfaces for PC, TV, WAP and MP3 terminals, the user accesses the same news content at work, at home in the living room and on the move. To balance the automatic procedures with journalistic judgement, we created web tools for human editors to control and override the automatic operations and for creating new content. The community feature enables groups to produce and share their own news and to discuss topics internally.

The trial included households with fast network connections through cable modems, ADSL or campus networks. The trial users tested the service over a 6-month period. In addition to the PC users, several households used the service through their TV sets. Some used the service from their WAP phones. The online inquiry showed that the service was appreciated; one in five users could even imagine using it as their primary news source. The interest in the service was fairly steady over the test period; the average use was a 7-minute session once a week, whereas the heavy users viewed it every day. Most users praised the integration of news sources, because it saved time and gave complete information – this was also reflected in the fact that one in four articles was retrieved through the automatically computed links. Only one in five users personalised channels – however personalisation showed clear potential, because the personalised channels were used often and the heavy users created many channels.

Even though television set users retrieved more material than the PC users, they thought that the PC service was more convenient. The use of WAP and the environment monitoring was marginal. Television content interested most users, both television news and program schedules. News packages made explicitly for IMU, interested users, but did not initiate discussions. Navigating in the TV-IMU application with the remote control was felt to be a bit cumbersome.

The users thought that the service would benefit from adding more news publications as sources. Some of these sources – but not all – should provide news in real time. A targeting of the content towards well-defined interest communities would be appealing. With these enhancements, there should be possibilities to bill for the integrated service.

Södergård, Caj (toim.). Integrated news publishing – Technology and user experiences. Report of the IMU2 project [Uutisten integroitu julkaiseminen – Tekniikka ja käyttökokemukset. IMU2-projektin raportti]. Espoo 2001. Valtion teknillinen tutkimuskeskus. VTT Publications 441. 206 s. + liitt. 26 s.

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Tiivistelmä

Nopeat verkot ja monikäyttöiset päätelaitteet mahdollistavat sellaisten media-sisältöjen siirtämisen ja käytön, jotka on tarkoitettu alun perin eri medioille. Syntymässä olevat monimediaportaalit, joihin kytkeydytään erityyppisillä päätelaitteilla, vaativat puoli- ja täysautomaattisia proseduureja sisällön hallintaan. Uutispalveluissa on tarve yhdistellä lähteitä tavalla, joka menee syvemmälle kuin nykyisten Internet-portaalien tarjoamat linkkilistat uutisjulkaisuihin. Tällainen syvä integraatio ryhmittelee artikkeleita eri lähteistä ja medioista sekä yhteisiin että henkilökohtaisiin luokkiin ja linkittää artikkelit keskenään.

IMU-järjestelmä, joka on kehitetty tässä hankkeessa, automatisoi osan verkko-palvelun ylläpitäjän suorittamasta uutisten hankinnasta ja käsittelystä. IMUn aktiivinen välipalvelin irrottaa metadataa verkkojulkaisujen palvelimista ja videoanalyysin avulla myös television uutislähetyksistä. Tämä mahdollistaa artikkelien ja TV-uutisaiheiden automaattisen luokituksen ja keskinäisen linkityksen. Syvästi integroitu aineisto on jaettu uutisyhdistelmiin – kanaviin – joita käyttäjä voi personoida itselleen. Automaattisesti muodostettu tapahtuma- ja mediapäivyri mahdollistaa uudentyyppisen integraation uutisten ja tulevien tapahtumatietojen välillä. Uutissisältöä hyödynnetään myös muodostamalla personointimekanismeja liiketoimintaympäristön luotaamiseen. Hyödyntämällä kokeilujärjestelmän liitäntöjä PC-, TV-, WAP- ja MP3-päätteisiin käyttäjä voi hakea samoja uutisia työssä, kotona television ääressä ja liikkeellä ollessaan.

Saadaksemme aikaan tasapainon automaattisten proseduurien ja toimituksellisen arvioinnin välillä loimme toimittajille välineitä automaattisten operaatioiden valvomiseen ja korjaamiseen sekä uuden sisällön luomiseen. Yhteisöpiirre mahdollistaa sen, että ryhmät tuottavat ja jakavat omat uutisensa ja keskustelevat uutisista sisäisesti.

Kokeiluun osallistui kotitalouksia, joilla oli nopeat tietoliikenneyhteydet kaapelimodeemien, ADSL-modeemien tai yliopistoverkkojen kautta. 335 koekäyttäjää testasi palvelua puolen vuoden aikana. PC-käyttäjien lisäksi muutama kotitalous käytti TV-IMU-palvelua TV-vastaanottimiensa kautta. Muutamat käyttivät palvelua WAP-puhelimiltaan. Käyttäjähaastattelut osoittivat, että palvelu otettiin hyvin vastaan: yksi käyttäjä viidestä katsoi jopa voivansa käyttää sitä pääuutislähteenään. Kiinnostus palveluun oli aika stabiili testikautena. Keskimääräinen istunto oli seitsemän minuuttia kerran viikossa, kun taas aktiivikäyttäjät katselivat IMUa joka päivä. Useimmat käyttäjät pitivät uutislähteiden integraatiota hyvänä piirteenä, koska se säästi aikaa ja antoi monenlaisia näkökulmia; tämä näkyi myös siinä, että yksi neljästä artikkelista haettiin automaattisesti luotujen linkkien kautta. Ainoastaan 22 % käyttäjistä personoi omia kanavia – toisaalta personointiin osoittautui olevan halukkuutta, koska personoituja kanavia käytettiin paljon ja aktiivikäyttäjät personoivat ahkerasti.

Vaikka television käyttäjät hakivat enemmän artikkeleita kuin PC:n käyttäjät, he pitivät PC-palvelua kätevämpänä. WAPin ja ympäristöluotauksen käyttö oli marginaalista. Televisioaineisto kiinnosti eniten – sekä televisiouutiset että ohjelmatiedot. IMUlle tuotetut uutispaketit kiinnostivat mutta eivät synnyttäneet keskustelua. Navigointia TV-IMU-sovelluksessa kaukosäätimellä pidettiin jonkin verran monimutkaisena.

Useimmat haastateltavat olivat sitä mieltä, että palvelu paranisi, jos siihen lisättäisiin useampia uutisjulkaisuja – mahdollisesti myös kansainvälisiä. Joidenkin lähteiden – ei kuitenkaan kaikkien – pitäisi tarjota uutisia reaaliajassa. Syvällistä tietoa tietyistä aiheista on oltava tarjolla. Myös uutissisällön räätälöinti hyvin määritellyille kiinnostusryhmille voi olla aiheellista. Näillä laajennuksilla voitaneen myös laskuttaa integroidusta palvelusta.

Preface

This publication contains the results of the project "Applications of Integrated Publishing (IMU2)". The two-and-a-half year project was part of a research program in User-Oriented Information Technology USIX run by the National Technology Agency, Tekes. The aim of the project was to *develop and test in user trials* software methods for the gathering, integration, personalisation and multiterminal distribution of newspaper, web and TV news. This publication compiles the main findings that have already been partly presented in lectures, articles, working papers and demonstrations. The most important result is a prototype system that has been tested in hundreds of households over six months.

Besides Tekes and VTT, eleven companies and organisations financed the project and were represented in the project management group. The group comprised at the end of the project Tommi Vihavainen (*Observer Finland*, Chairman), Jarmo Ahonen (*University of Jyväskylä*), Jan Enlund (*Elisa Communications*), Pirkko Haapakka (*TS Group)*, Ari Heinonen (*University of Tampere*), Marja Heinonen (*Alma Media)*, Heikki Hänninen (*SanomaWSOY*), Hannu Iivonen (*Nokia Mobile Phones*), Ari Korpelainen (*Tikka Communications*), Raimo Launonen (*VTT*), Matti Mäkijärvi (*Pohjois-Karjalan Kirjapaino*), Otto Mört (*Finnish Federation of the Visually Impaired*), Harri Palviainen (*Satama Interactive*), Hannu Sola (*Finnish Broadcasting Company*), Caj Södergård (*VTT*) and Satu Toivonen (*Tekes*). The group has made a great effort on behalf of the project.

The project was carried out by VTT Information Technology (VTT), the University of Jyväskylä (UJ) and the University of Tampere (UT). The project group members that have contributed to this publication are Caj Södergård, VTT, (sections 1, 2.1, 2.2, 4.1, 8), Matti Aaltonen,VTT, (3.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.5, 4.9.2), Christer Bäckström, VTT, (4.7), Ari Heinonen, UT, (2.4), Marjo Huusko, UT, (2.5), Timo Järvinen, VTT, (3.3, 4.6), Timo Kinnunen, VTT, (4.5), Pauliina Koivunen, UJ, (2.6, 2.7, 3.7, 3.8, 4.2.6, 5.4, 6.1, 7.4, 7.5), Mikko Kojo, VTT, (4.3.2), Sari Lehtola, VTT, (2.3.2, 5.1.2, 5.1.3, 6.1, 7.1.2, 7.1.3, 7.1.4, 7.1.8), Ville Ollikainen, VTT, (4.3.1, 4.4), Katja Rentto, VTT, (2.3.1, 3.1, 5.1.1, 5.1.4, 7.1.1, 7.1.5, 7.1.6, 7.1.7), Mikko Villi, UT, (2.4, 3.4, 3.5, 3.6, 4.2.1, 4.8, 4.9.1, 4.10, 5.2, 5.3, 6.2, 7.2, 7.3) and Antti Tammela, VTT,

(2.3.1, 3.1, 4.2.1). In addition, Eija Ruotsalainen, Minna Suovirta and Antti Väätänen, all from VTT, have participated in the project. Juha Sylberg, from the Finnish Federation of the Visually Impaired, took an active part in the technical work.

Integrated publishing in multiple media is a new and very fast developing technology. Hopefully, this publication will give the readers some new ideas and guidance in this fascinating field.

Espoo 20.6.2001

Caj Södergård
Project leader
VTT Information Technology

Contents

1. Introduction

The various media – print, radio, television, storage media and telephone – have traditionally existed in their own worlds separate from each other. The value chains – creation, packaging, distribution and terminals – have been and still are very much media-specific. This means that media are traditionally vertically integrated. The Internet, the net of globally interconnected servers and PC computers, came first as one more medium in addition to the traditional options. However, the Internet, especially with fast connections, is a metamedium that has the potential to embrace all the traditional media (Figure 1). Today we witness downloadable electronic books, net newspapers, net radio and television, as well as downloadable MP3 music, movies and Internet telephony.

This digital convergence causes the traditional vertical media-specific integration to turn increasingly horizontal. This means that various functions of the value chain converge over the media barriers – the same content is produced for several media, the same delivery network and terminal is used for several media. Several factors enable convergence in addition to the Internet: deregulation, open standards, digital production synergies, databases, metadata technologies and digital terminals. This development is reflected in the mergers between companies working in different branches of the media, distribution and terminal system businesses.

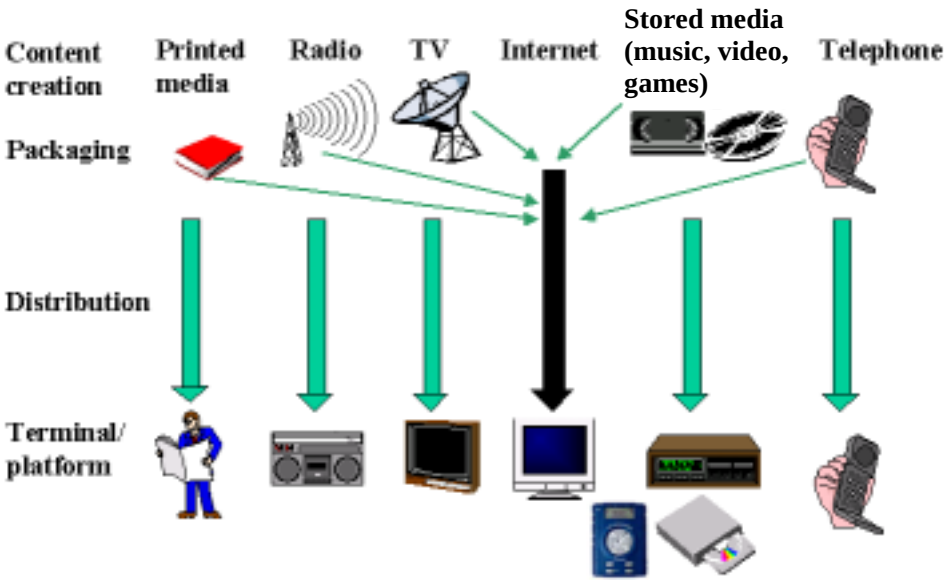

Figure 1. The development from media-specific vertically integrated value chains towards horizontally integrated functions (creation, packaging, distribution, terminals) across media borders.

The first – and major – research topic of this work is to investigate by practical user trials, which new services will arise from this convergence, where fast networks bring various media content to the user. Will it, for example, give rise to new combinations of television and newspaper content?

Portals, such as Yahoo[1] and MSN[2], are common entry ports into the WWW. As such, they have a key role in the multiple media development. To gain in popularity, they are increasingly adding audio and video content creating *multiple media portals* [Picard 2000] They are also including more and more features such as common and localised news, search engines, chat, communities, calendars, personalisation and e-commerce. In this environment, content – even if primarily intended for a certain medium – is reformatted for a multiplicity of distribution channels and receiving terminals. One goal is that the media consumer can receive content versions independently of the terminal device in

[1] http://www.yahoo.com/
[2] http://www.msn.com/

use at the moment, be it a PC, TV, WAP telephone or a PDA.This reformatting of content for various terminals – multiple media – is the second research topic of this work.

News services benefit from an integration of news sources that goes deeper than mere listings of links provided by many current Internet portals. This deep integration groups news articles from different sources and media personalisable content aggregates – channels – as well as interlinks the articles (Figure 2). Personalised deep integration is the third topic studied here.

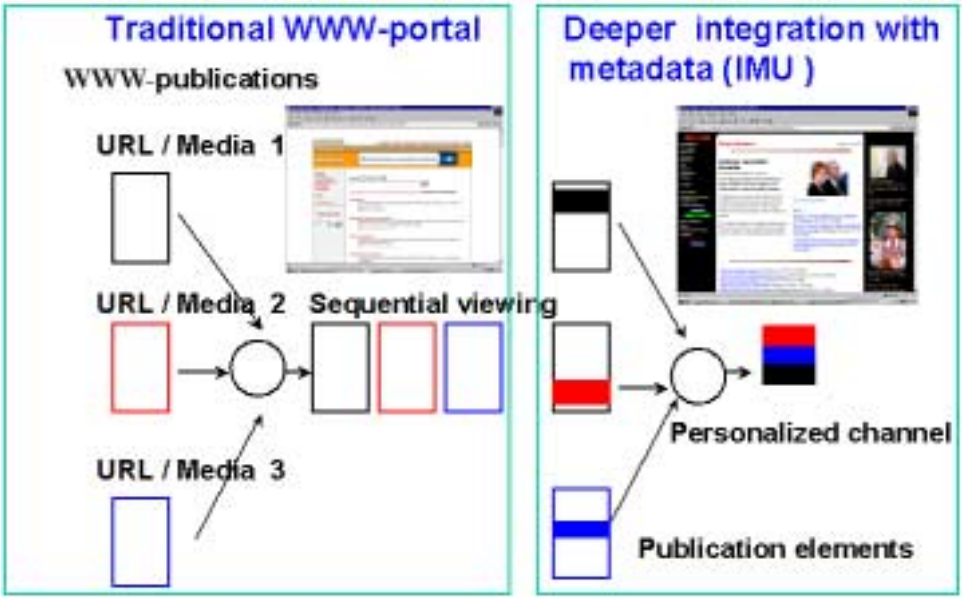

Figure 2. Whereas traditional portals contain mere lists of links to web publications, IMU links together single articles of the publications.

The management of these multiple media and personalisable portals poses a significant challenge. The editors and web masters must use a wide variety of semi- and fully automatic procedures. These automated techniques are a fourth starting point for our work.

In the previous phase of our work, reported in Södergård et al. 1999, we created the IMU1 trial system[3] to study these topics. IMU1 integrated newspaper and television news into personal channels. It used a so-called active proxy technology to interface between the content source and the user in an automatic way [Barret & Maglio 1998]. The content was downloaded from the sources into the proxy, where it was further processed and interlinked. In the user studies of the IMU1 system, the value of this deep source integration was clearly recognised and an even broader integration with more – and fresher – information sources was desired. Editorially prepared feature articles interested the readers significantly more than ordinary news and more editorial touches were in general hoped for. The television set was seen by many – especially the media in-house people – as the preferred terminal for this type of content.

In the second IMU2 phase[4] of the work reported here, we have addressed these observations by including constantly updated news sources as well as an editorial system for human editors. A journalistic team was established for carrying out the editorial work. The television set is included as a terminal on an equal footing with the PC. WAP phones, as well as MP3 players, were added as new terminals. Personalisation is applied a more professional application for scanning of the business environment. In addition, communities have been included in the service by creating a link between the large-scale news creation in major media houses and the small-sized content production and discussions in local communities.

Maintaining an event calendar is a tedious job for the web master or other service providers. In this work, we have created an automatic procedure for setting up event calendars including radio and television program schedules, theatre and cinema offerings and other events. When using the trial service from television sets, the media calendar can be used to set the recording times of television programs.

[3] http://www.vtt.fi/imu/
[4] http://www.vtt.fi/imu2/

As a summary, the goal of the work reported here was to *develop and test semiautomatic tools for gathering, integration, personalisation and multiterminal distribution of newspaper, web and TV news.*

2. IMU2 as a whole

2.1 The IMU1 project

The IMU1 project was undertaken during 1996–1998 as part of the Finnish research program in multimedia (KAMU) run by Tekes. The project results can be found in the end report “Integroitu julkaiseminen” (in Finnish) [Glödstaf 1999] that is also available online at http://www.vtt.fi/imu. In addition to Tekes, eight Finnish companies in the media and communication sector took part in the project.

The trial system already covered most of the IMU2 research topics: automatic gathering of content from various sources and media, deep integration of articles, and a first, but limited, attempt to deliver the same content to the television terminals in addition to the PC. However, the technical tools for implementing the trial system were not so developed as in IMU2 leading to reliability and speed problems.

The IMU1 trial was a fairly small trial with 62 users, of which 25 used it more than 10 times during the 16-week research period in spring and summer 1998. In IMU2, we had 335 users of which 100 used the system more than 10 times during the 11-week research period in autumn 2000.

The IMU2 project was launched in 1999, because the IMU1 partners wanted to develop the IMU1 themes further. Most of the IMU1 companies continued in the IMU2 project and a couple of new firms joined resulting in a total of 11 companies involved.

Another spin-off project was also launched in 1999 in the form of a commissioned work for an industrial partner applying the IMU1 results in wireless communication. This project was run in parallel with the IMU2 project.

2.2 Technical changes and additions

We made several significant additions to the trial system in IMU2. Firstly, we *added new terminals.* We built a PC-based set-top box for television with fast Internet access instead of the commercial dial-up iNET-tv terminal used in IMU1. That gives the television user access to the same content as the PC user including television clips. In addition, the set-top box user has some additional functions such as the recording of TV programs onto the local hard disk, showing TV movie trailers, and providing the media and event calendar. We added a service for WAP phones, which gives wireless access to the news texts. We created a service, mainly for the visually impaired, where news text is transformed into speech files, which are downloaded onto an MP3 player to be played track by track.

A *real-time news source* was added, namely the Web news site of the Finnish Broadcasting Company. IMU2 has four newspaper sources similar to IMU1, but the Finnish main daily, Helsingin Sanomat, replaced the evening newspaper, Iltalehti, and Karjalainen replaced the Keskisuomalainen.

To oversee the automated choices of the proxy server, an *editorial tool* was created for the human editors. By using this tool, the editors could e.g. change the order of articles, omit irrelevant links, create news packages and start discussions. This web-based tool uses Java applets and can be used from any PC connected to the net.

Discussion forums were introduced to give the users opportunities to comment on the themes of the news packages created by the IMU editorial team. It was implemented using standard web technologies.

The *Media Calendar* was added to give information about up-coming events and radio and television programs. It receives its information by automatically analysing the weekend supplements of Helsingin Sanomat and Aamulehti.

Environment monitoring was introduced to let company users utilise the personalisation feature in IMU to track changes in the business environment. It was implemented by extending the personalisation wizard applet of IMU1. The

extension is based on a model of the information needs of a sample of companies. Otherwise, the personalisation remained the same as in IMU1, except that the implicit personalisation based upon the user behaviour was omitted, because of its low reliability.

Pagination of the content into successive flippable pages was used in IMU1, but is used in IMU2 only for television and WAP terminals; in the PC version, we used normal scrolling. The *user interface* was also renewed in other respects – most notably we added a news banner with the top news stories of a particular channel on the right.

Automatic video analysis was added to segment the topics from the television newscast and to generate a representative still image of the news topic. Here, we utilised results from the MULTIKOMP project [5] at VTT. In IMU1, we had no video analysis. The results from the analysis are combined with the transcript extracted from the closed captions. In IMU1, we got the transcripts and topic timings from the storyboard of the broadcaster, which turned out to be an inaccurate solution. The television news is *coded* in the MPEG4-based Advanced Streaming Format .asf instead of the MPEG1-based Xing video streaming that was used in IMU1. This gave a clear improvement in the quality of the video.

Technically IMU2 is much more stable and faster than IMU1. Mostly, this is due to the limited use of applets – oversized applets clearly hampered IMU1. In IMU2, the processing is based upon XML with associated XSLT and DOM methods. We applied the XMLNews-Story DTD developed by the news industry, whereas in IMU1 we used a proprietary mark-up system. Servlets were used for database access instead of the cgi-scripts of IMU1. The ATM link between our media server and the cable television operator in IMU1 was not needed due to the general speed-up of the Internet.

[5] http://www.vtt.fi/tte/multiplemedia/

2.3 Usability and the technology acceptance model

The technology acceptance model (TAM) is one of the influential research models in studying the acceptance of different information systems. The objective of TAM is to explain and predict user acceptance of information technology by modelling system usage intentions and behaviour as a function of two constructs – perceived usefulness and perceived ease of use. In the IMU2 project, the usability concept included ease of use, and also appearance and readability, learning and navigation.

2.3.1 Usability

Usability has multiple components. For instance, according to the International organisation for Standardisation (ISO) standard 9241-11:1999, usability is defined as: *The effectiveness, efficiency and satisfaction with which specified users can achieve specified goals in particular environments*. [ISO 9241-11:1999]

Jakob Nielsen defines usability using the following attributes:

Learnability (the system should be easy to learn),
Efficiency (the system should be efficient to use),
Memorability (the system should be easy to remember),
Few errors (the system should have a low error rate) and
Satisfaction (the system should be pleasant to use) [Nielsen 1993].

Nielsen founded the "discount usability engineering" movement for fast and cheap improvements of user interfaces, and has invented several usability methods, including heuristic evaluation. The heuristics can be applied in expert evaluation, but they are also a good guideline and checklist for user interface designers. The heuristics can often be used together with platform-specific usability guidelines.

The list above was seen as a guideline in the IMU2 project when testing usability and making expert evaluation on PC and TV user interfaces. TV viewers, of course, differ from computer users. Remote control, navigation, leisure time use, resolution, colours, etc. have to be considered when designing

TV user interfaces. In Figure 3, the usability is seen as a part of context. Jakob Nielsen presents in his book, *Usability Engineering*, a model of a system's acceptability. In this model, the system's acceptability can be divided into practical acceptability and social acceptability. Again, practical acceptability can be divided into different categories such as cost, support, reliability, compatibility with the existing system, etc., as well as the category of usefulness. Usefulness is the issue of whether the system can be used to achieve some desired goal. Again, it can be divided into utility and usability. Utility is the question of whether the functionality of the system, in principle, can do what is needed, and usability is the question of how well users can use that functionality.

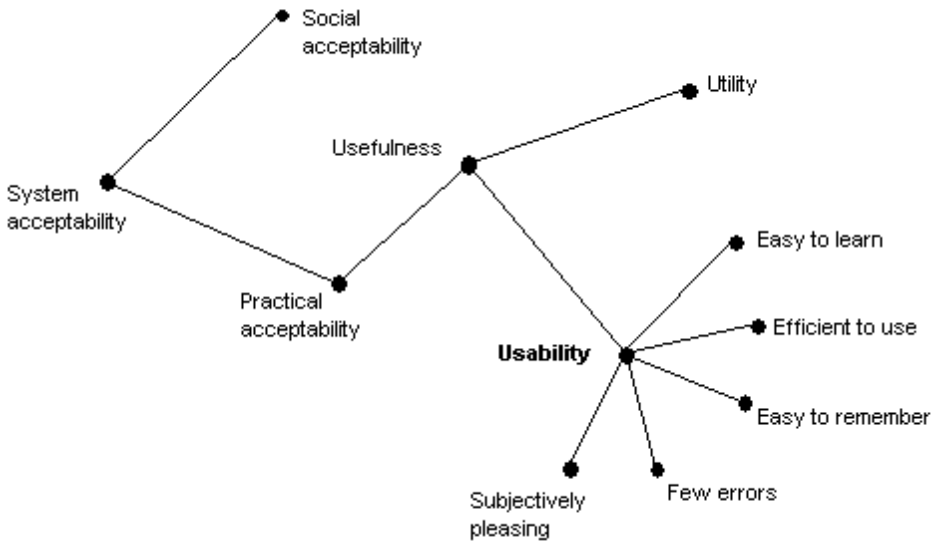

Figure 3. The simple model of system acceptability and usability of Jakob Nielsen [Nielsen 1993].

Nielsen's list of usability can also be used to some extent when considering TV user interfaces. However, the interrelationship between information structure and user interface also demands attention – both at the TV user interface and at the PC user interface. Movement on the screen is grounded in the system's

information structure. The best known structure is an information hierarchy, usually in the form of a tree with roots and branches. The other possibilities are sequence, grid, web, database and virtual 2D/3D space/virtual real world systems. Navigation among these concepts also includes the possibility to move freely between different levels, forward or backward. By selecting a link and following the path that is constructed behind the link one can access another level [MUSIST 2001]. In a TV interface the movement is typically step by step while in a PC the movement is faster, more direct and straight to the point.

WAP phone users are typically not browsing but quickly looking for specific information. Text entry is slow and cumbersome. Designing mobile Internet services demands new ways of designing information – not to make it look nice, but to make it work well. Designing in this concept is more about designing the interactions that the user has with the information rather than the layout. According to Mohages and Wagner [2000], the following five design factors are extremely important: consider the target domain, dedicated devices mean dedicated user interfaces, allocate functions appropriately, simplify, and design for responsiveness.

The screen in portable WAP phones is small and the resolution is still quite weak, so the graphics must be kept simple [Bergman & Haitani 2000]. Also, the status indicators should be prioritised so that not everything is shown at the same time [Marcus 1997]. It saves on screen space if only the most important items are visible at any time. The same goes with functions, only the most common functions should be displayed on the screen.

The use of a mobile phone should require as little concentration as possible [Väänänen-Vainio-Mattila & Ruuska 2000]. Moreover, because of the small screen size, several separate views are needed to display information that could be presented in a single screen on a large display (one way of fitting more information is to reduce the average font width, though not too much). Every time the user changes between views, he/she has to re-focus on the new information, and also relate it to the previous information to make sense of it. This difficulty in following and internalising the information can be reduced by giving different hints to the user: page numbers, headlines, subheadings and with

visual tools, such as embolding the font or changing the font size. If the screen is black and white, colours do not help the navigation, otherwise they should be used to differentiate the different modes. WAP phones do not offer too many buttons, and this raises the question of overloading of the buttons. This is a danger that can be minimised with soft buttons. Soft buttons usually get the user's attention more quickly, because when reading the screen the user's attention is already on the screen [Sinkkonen, 2000].

Technology acceptance model

The technology acceptance model, TAM, has gained popularity in assessing and predicting users' acceptance of information technology in recent years. TAM is based on principles adopted from Fishbein and Ajzen's [Fishbein & Ajzen, 1975]. Theory of Reasoned Action (TRA) from psychology [Davis & Venkatesh 1996]. This theory explains the action of humans on a general level via attitudes and personal norms. According to TRA, one’s attitude (A) towards a specific action and subjective norms (SN, Subjective Norm) form the intention (BI, Behavioural Intention) to behave: BI = A + SN. Attitude is composed of beliefs about consequences of performing the behaviour and evaluation of the consequences. This forms the intention which explains the behaviour directly [Integroitu julkaiseminen 1999].

Psychological research and TAM suggest that intention to use (BI) is the single best predictor of actual system usage. One's attitude toward using determines the intention to use. Two specific beliefs determine the attitude. Perceived usefulness (U) is the user’s perception of the degree to which using a particular system will improve one's performance. Perceived ease of use (EOU) is the user's perception of the extent to which using a particular system will be free of physical or mental effort [Davis & Venkatesh 1996)].

External variables are supposed to influence the behavioural intention to use, and thereby usage, by their influence on beliefs: perceived usefulness and perceived ease of use. These external variables are features of the user himself/herself and features of a user interface [Davis & Venkatesh 1996].

According to TRA the impact of beliefs on intention should be completely mediated by attitude towards the behaviour. The original conceptualisation of TAM and subsequent research have shown that the effect of perceived usefulness on intention is only partially mediated by the attitude towards using. Davis et al. [1989] explain that people may use technology even if they do not have a positive attitude towards using it, since it may improve productivity. The original theoretical conceptualisation of TAM included the attitude construct. In the final TAM model (Fig. 4) [see Davis et al. 1989, pp. 995–996], it was excluded since attitude did not fully mediate the effect of perceived usefulness on intention [Davis & Venkatesh 1996]. According to Davis, usefulness has notably more influence on actual use of technology than ease of use. The importance of ease of use lessens with use [Davis 1993]. Nevertheless, ease of use has a strong affect on perceived usefulness and is thereby worth consideration [Davis et al. 1989].

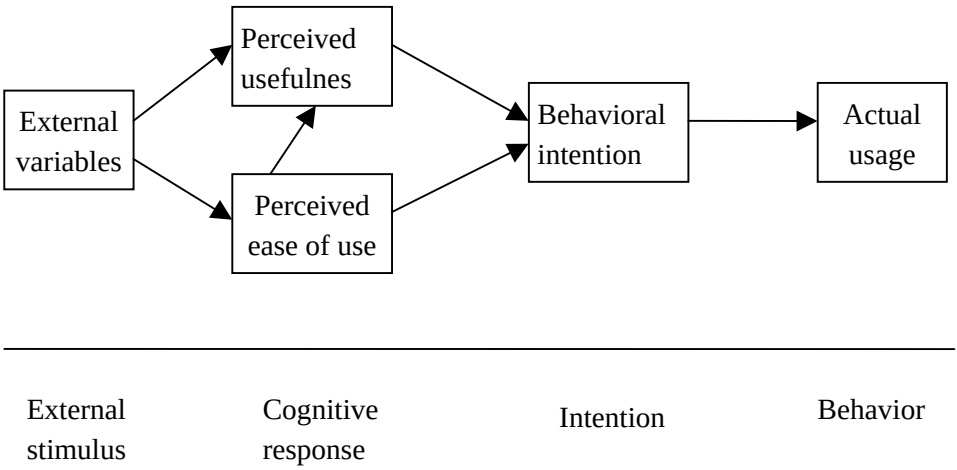

Figure 4. Technology Acceptance Model.

2.4 Journalism in the digital age

The IMU project is an effort to respond to the challenges that the rapidly changing information and communication environment is posing to all agents in the communication field. From the audience's perspective, the characteristics of the change include, among other aspects, the growth of available information, the increasing variety of information sources and the emergence of new platforms for receiving information. From the journalistic point of view, the development of new communications technology is at the same time challenging the old conventions of journalism and enriching the forms of journalistic story telling.

When analysing the characteristics of online publishing, it is possible to distinguish at least the following aspects of journalism in the Digital Age. First, the relationship between journalism and its public seems to be changing. Instead of a vertical, one-way flow of information dissemination, journalistic publications online can be spheres of interactive communication between journalists and their audience and even horizontal communication among the audience. Both the journalistic institutions and the professional journalists must hence adopt a new attitude towards the audience that, in a way, allows it to become a co-producer in journalism rather than being a passive receiver. Secondly, online journalism includes a variety of new features compared to journalism in the traditional media. Publishing on the Internet means that journalism can make use of the web's global nature, its immediacy and its vast information resources. The expansion of time and space frames in online journalism means that it is possible to create large productions on the web, and also that the audience can easily access the stories long after their original publishing date [Heinonen 1999].

Another issue of journalism these days, is the possibility to utilise various media in presenting news stories. This is often referred to as multiple media journalism or integrated journalism, indicating that in the process of journalistic production there is a variety of publishing platforms – *both old and new* – available, and that journalists are required to consider this whole assortment in their working process. The obvious challenge here is to understand the characteristics of each medium so that its potentialities and limitations are considered from the point of

view of journalism. The danger is to see multiple media journalism in an unrefined business-oriented way: as something that merely offers another cost-cutting means by allowing the recycling of the same bulk material over and over again. This approach hardly contributes to improving the performance of journalism and hence, in the long run, is harmful also for the sustainable business. Instead, multiple media journalism should be seen as a chance to enrich journalism by exploiting the differing nature of the various media. Though the basic material can be shared over several media, each publishing platform provides unique possibilities for augmenting the message with media-specific features.

Digital media and the web are also changing the traditional role conventions in the communication process. News has typically been offered as a ready-made package that the journalists produce according to the production rhythm of their media. This is changing in three important ways: (1) news content can be tailored dynamically to individuals and communities, (2) communities are producing the content themselves, which is equally accessible as the content of media companies, thus challenging the professional journalists to find new ways to make relationships between media producers and active communities, and (3) without carefully designed news services, the customer will likely suffer from the effects of information overload and information decontextualisation. [Turpeinen 2000].

The customisation of news is typically depicted as a fully automated process, where the original news source is *delivered as is* to the automated software agents for packaging and dissemination of personalised information to end-customers. This approach is somewhat misguided, since these two resources do not rule each other out. There are many ways in which the journalistic work, information professionals (librarians), and software agents can *together* provide customised news services. The key to successful services is in combining the skills of professional journalists and the computational media [Turpeinen 2000].

2.5 Developing community communication

During the last few years, there have been several projects in Finland, the purpose of which has been to give different kinds of communities tools for *going*

online. The communities have been offered access to the Internet, often by founding telecottages or Internet cafés where the members of the community can browse the Internet, create homepages, check their e-mail, etc. In addition to giving the hardware and access to the Internet, the communities have been given training in the use of the equipment and, naturally, services they can use as a community or as individuals via the net. The projects have been carried out both in the countryside and in the neighbourhoods of major cities.

The aims of the projects have been varied; because of the long distances, in the countryside the key point has often been to give people easy access to different services via the net[6]. The objective has been to find new sources of income for people in the countryside, preventing marginalisation and thus keeping the countryside alive and populated (e.g. Cronberg 1999).

In the cities, the starting point has usually been somewhat different. The focus has not been in giving people different services via the net – although this is not excluded either – but rather in creating or strengthening their neighbourhood identity or generating public debate on issues of general interest [Heinonen 2000a]. An example of this kind of project was the *Locality in the Global Net project*[7], which was carried out in Tampere and in Oulu 1998–2000. The project was also used as a model for part of the IMU2 project.

What has been common in many community projects is that they have been planned and *brought* to the community from outside. That is, the initiative has not come from the community members themselves but from an outside organisation. In the Locality project mentioned above, the starting point was, however, the interests and the aims of the community, and the purpose of the project was just to create and offer skills and technical premises for the action [Heinonen 2000b].

The Locality project has shown that the Internet can provide the communities with excellent opportunities for participation, but only if the members of the community are both able and willing to utilise it. The technology, or the access

[6] See e.g. North Carelian project ”Oppiva Vaara-Karjala” http://unk.pkky.fi/
[7] http://mansetori.uta.fi

to the Internet, do not as such make people more active or interested in participating in community issues, but they do give the communities a way to enrich their activities [Mäkinen 2000].

Another thing that the Locality project pointed out and that should be kept in mind when planning and carrying out future projects, was that it often is easier to find encouragement for a project rather than actual commitment to work for it. People do show interest in and curiosity about the new technology, but it is hard to get them to take charge, especially if the project has not come about through the community's own initiative. [Mäkinen 1999].

2.6 IMU as a tool for scanning the business environment

One of the research areas in the project is how to exploit the IMU publication in scanning the business environment. Environmental scanning is defined as the acquisition of information external to an organisation, the knowledge of which would assist management in planning future courses of action [Aguilar 1967]. An organisation can respond more easily to the demands of the environment by scanning. Strategic planning is closely connected to environmental scanning (e.g. see Beal 2000, Boyd and Reuning-Elliot 1998, Hambrick 1982), since adaptation to environmental demands and the ability to stay ahead in environmental challenges are vital to an organisation's success. An organisation does not operate in a void.

Figure 5 presents management's way of forming the strategic framework of an organisation's business together with the other functions of the organisation. Communication, marketing or information departments scan the business environment according to the strategic framework. The scanned information is delivered to management, which reacts to changes in the environment, or to hints of changes, by either altering the courses of action or external communication. One important goal of organisational communication is to gain trust and acceptance from those groups that are important to the organisation. External messages should reflect an organisation's true identity. Corporate management, the communications department and the external environment are constantly interacting. Information from the external environment can thus be used to either react to or predict changes.

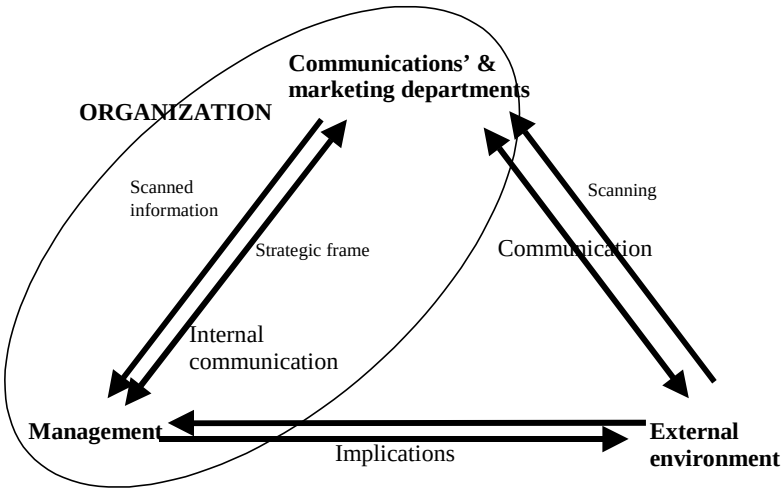

Figure 5. Business environment scanning, strategic frame and communication.

Information sources can be classified in different ways. Aguilar [1967] separates information sources into internal and external sources. These sources can then be divided further into personal and non-personal sources. For example, customers are an external personal source of information. Internal reports are internal non-personal sources. The IMU publication discussed in this report is a non-personal external source.

2.7 Market research

2.7.1 Internet advertising

The goals of advertising are to increase sales, create awareness, give information related to a brand's attributes, and associate images or attitudes with the brand. Advertising strengthens a brand's value and aims to link consumers' personalities with brand characteristics [Batra et al. 1996]. Internet advertising is increasing in Finland year by year. When comparing the years 1999 and 2000, the investments in Internet advertising have grown 69% [Gallup-mainostieto

2000]. When comparing January 2000 and January 2001, the Internet advertising budget has grown 36% [Gallup-mainostieto 2001].

Finnish attitudes towards advertising in general were researched in 1999 by a survey of 1000 respondents [Gallup-mainostieto 1999]. Seventy-four per cent of the respondents had positive attitudes towards advertising. Over 70% consider advertising to be acceptable and a natural part of everyday life. Advertising is necessary and beneficial to the consumer. Twenty-seven per cent thought that there is too much advertising. The characteristics of a good advertisement are that it is no-nonsense, informative, humorous, clear and exact. The quality and standard of advertising have improved according to 68% of the respondents. Some people criticised presentation methods that they deemed to be too tricky and far-fetched. It can be concluded, based on the research, that advertising presented in the IMU publication should be clear, exact and avoid unnecessary tricks.

Click-through-rates as measures of success in advertising campaigns have been criticised by many researchers. Briggs and Hollins [1997] investigated the effects of banner advertising on consumer attitudes and behaviour. The result of the research was that banner advertising is effective regardless of whether one can or cannot click on them. Advertising on the WWW is more similar to advertising in print media than to advertising on television. WWW and television advertising are not functionally similar.

Krugman [1975] has stated that advertising should be presented 3–4 times, since the last time is already most probably not necessary. According to Ostrow [1984], more presentations are needed when the target audience is not committed or motivated to process the information in the advertisement. Well-targeted advertisements can raise commitment. If the target audience is committed, increasing the number of presentations is not useful. Content is more important in this case. Therefore, advertising in the IMU publication should be well targeted and each advertisement should not be repeated more than four times.

2.7.2 IMU concept testing

A new product often fails due to insufficient market orientation and evaluation. Market-oriented functions are often the weakest link in new product development, despite the fact that they are usually connected with success [Cooper 1990]. Being a prototype, IMU will not be launched to the public market as a product. However, the results of concept testing will be used to create guidelines for making this prototype into a product.

Kotler [2000, p. 329] has named factors which can hinder the success of a new product:

"- A high-level executive pushes a favourite idea through in spite of negative market research findings.
- The idea is good, but the market size is overestimated.
- The product is not well designed.
- The product is incorrectly positioned in the market, not advertised effectively, or overpriced.
- Development costs are higher than expected.
- Competitors fight back harder than expected."

Competence in market knowledge, as well as strong research and development functions, affect new product superiority, which promotes the product's success [Li & Calantone 1998]. The key to market knowledge is concept testing. When developing a new product, the concept should be tested carefully before launching the product. The product concept or the product itself is introduced to target consumers, who give valuable information on their reactions. In the IMU project, a customer-driven approach is mainly used. Some of the development is made within the research group, but the opinions of potential customers are incorporated in the design. Kotler [2000, p. 339] suggests that consumers should be asked the following: what are the benefits of using the product, does the product solve a problem or fill a need, do other products meet this need and satisfy the customer, is the price reasonable in relation to the value, would the customer buy the product, who would use the product, and when, and how often? Some of these questions are important when developing the IMU concept and are, therefore, used in market research.

3. The design process

3.1 Human-centred design

Human-centred design (ISO) is a design approach in which the product development process focuses on users from the very beginning and throughout the development process. Adopting a human-centred design leads to more useful and more easy-to-use products. The key issue is to accept the fact that we cannot determine exact user requirements at the beginning of the design process. That is why we have to refine the initial user requirements throughout the design process by illustrating the planned design decisions to users and getting their feedback. The earlier a new or a refined user requirement is identified in the design process, the easier it is to take it into account in the design.

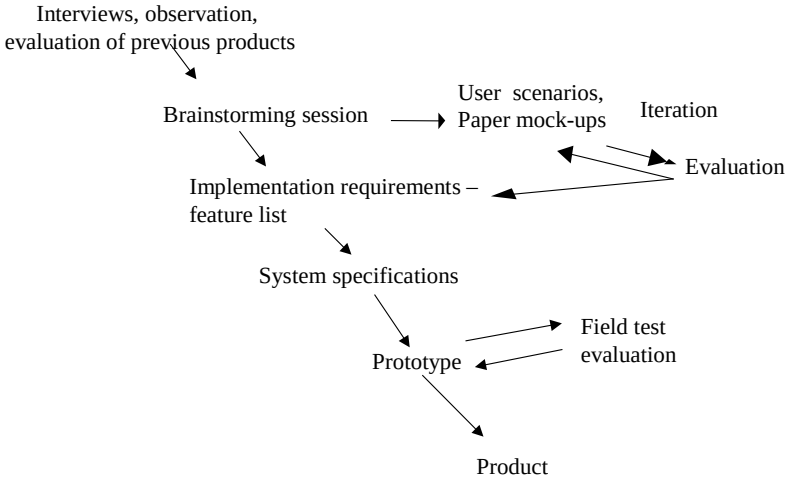

Figure 6. The human-centred design applied in this project.

In the beginning of 1999, a brainstorming session on the subject “Mass communication in 2001” was organised (Figure 6). Every one anonymously wrote his or her own ideas about this subject. All the ideas were gathered and voted on. This was the first step in designing the content of the future project IMU2. Some ideas from the workshop, e.g. multiple user terminals, integration, and IMU-editor, were implemented during the project. On the other hand, some ideas were not implemented. For example, the content providers were not willing to tag their content with metadata. Instead of that, the project had to develop automatic solutions for metadata. After the workshop, the first user scenarios and visualisation pictures were made in order to make the ideas a bit more concrete and for demonstration to the project management group (see Figures 7–9).

Figure 7. Visualisations were tested according to the scenario, that a family uses personalised news and other communication features.

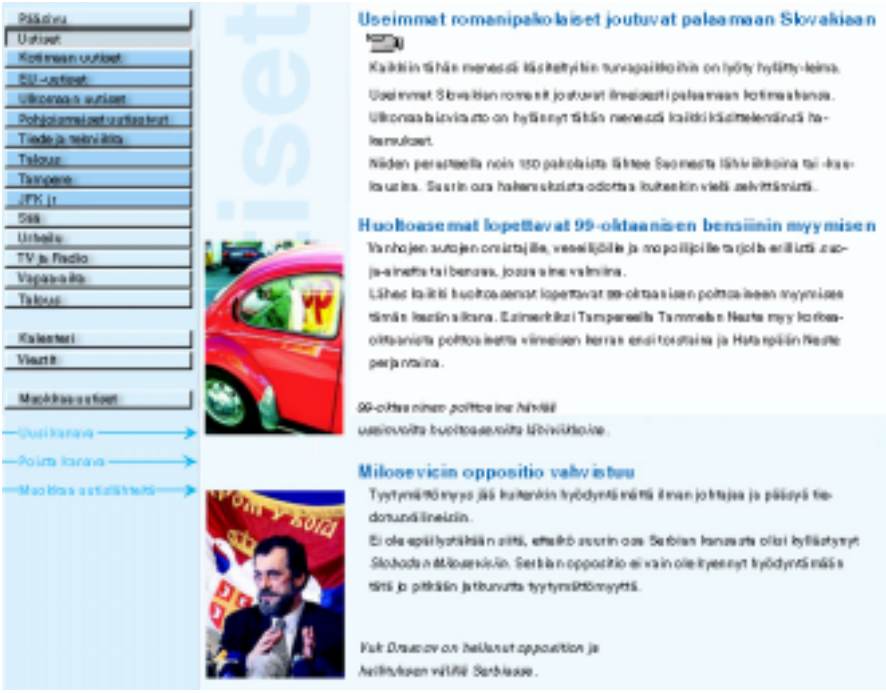

Figure 8. Visualisation, which was demonstrated to the project's management group and, later, also tested by end-users.

Figure 9. WAP Visualisation.

The visualisation pictures were made and tested as paper mock-ups. Test users were asked to take on a particular role in a four-member family. They completed a few scenarios and gave comments about the logic and the overall idea: Would this kind of feature be useful in this kind of service? The function of this test was to find out whether the designed functions and features were considered as

useful and necessary especially when mobile phones or PCs already offered some of the features.

Calendar is a feature that can be found in some mobile phone models; however, because the original "almanac" is so strongly favoured the Calendar functions, apart from the reminder function, were not implemented. However, the more specific Media Calendar feature was selected for inclusion in the system. SMS messages in cellular phones are very popular especially among youngsters; here messaging was broadened with the possibility of posting group messages. Also, the fact that you can write SMS using a PC keyboard led to a growth in messaging popularity. The community idea was seen as the best feature by far in the project as it promoted and assisted the sense of community. The news service was considered to be an adult feature; youngsters were not very interested in it. The possibility to create one's own channels was seen as so important that test users proposed that it should be highlighted. For instance in a WAP phone, one's own channels should be one of the first items in the news list. On the other hand, the search-function was considered to be sufficient when the interest is short term, such as some current happening (e.g. the Olympic Games or a concert). Test users thought that it would be good to be able to use the service from multiple terminals, in this case a PC, a home TV and a personal WAP phone. The service use was considered to be somewhat time-consuming, but the general attitude was positive and mobile use was seen as an idle time service, for instance while waiting for a bus or sitting on a train.

After the paper mock-up tests, a list of system features was agreed on. On the basis of this list, the system requirement specification was drawn up in consultation with the management group. The implementation began after specifications and field tests started in September 2000.

The final specification was constructed for three terminals: PC, TV and WAP phone. Based on this document, the system implementation started. The PC terminal consists of a *channel menu* (including news channels, own channels, community channels and a tool for business scanning), a *news area* (including a scrolling channel on the top of the screen, a main article area and an article menu below it) and a *news banner* (including some main articles and pictures). Functions are *format news channels*, *format own channels*, *format business environmental scanning*, *help*, *search* and give *feedback* (See Chapter 4.2).

The same information can be retrieved via the TV and the PC, so the features and functions are quite similar. TV also includes *DVD* and television *recording* and timing possibilities, and an *Event and Media Calendar* (including TV programs, movie schedules, movie comments and other local happenings). On WAP phones, the user can read articles from news channels or own channels, search articles, save search results and format the channel menu.

3.2 The process of designing technology

The three-tier software architecture is a natural, almost self-evident, choice for a modern web application. Java is a very natural choice for the programming language to implement this kind of a web application. However, how to implement each tier is a more interesting question.

3.2.1 Client

The Model View Controller and Presentation Abstraction Control architectures were considered as client architectures. In our case, where Java was chosen as the implementation language, Java applets and Java applications represent the fat client approach, and Java servlets represent the thin client solution. The benefits and shortcomings of applet and servlet implementations are compared in Table 1.

Table 1. Pros and cons of thin and fat clients.

	Thin client (Java servlets)	**Fat client (Java applets / applications)**
Network connections	+ No special requirements, i.e. HTTP protocol with port 80 is usually used.	- If server-side services, such as databases, are used, firewalls may prevent communication.
User interface (UI)	+ A servlet can create any markup dynamically, e.g. HTML, DHTML, XML and CSS.	+ Java offers a rich set of features.
Client device	+ No special requirements, i.e. a web browser is usually enough.	- Processing power and a correct Java version required; by using Java plugin, the newest Java version can be used.
UI development	- Generating e.g. HTML pages in a Java program may be a tedious task; technologies such as JSP may ease the task.	+ Since a user interface is generated directly, developing and maintaining code may be simpler.

PC

Regarding the PC, we mainly developed a thin client. One servlet takes care of most user interaction tasks. All data needed for the user interface are kept in Java objects that remain active throughout the session. The model of the visible user interface is kept internally in a DOM (Domain Object Model) tree structure. Normally each interaction from the user causes some parts of the DOM object to change, but as much as possible of the object is kept constant to reduce the computing load. After each interaction the whole DOM tree is written out as an XML document.

The XML content is converted into HTML by the browser according to rules given in an XSLT style sheet attached to the XML file. The layout has been constructed using HTML tables in the style sheet. Visually very different user interfaces can be generated just by using different style sheets. This division of content (XML) and representation (HTML) makes it possible to develop the

servlet software and the external graphical look of the publication independently of each other. Separating the model handling from the graphical representation makes it much easier to generate HTML dynamically with servlets. Because of the need for XML and XSLT support we have used Microsoft Internet Explorer. Most of the user interface consists of HTML documents without frames. Only the so-called scrolling channel has been implemented as an applet. All selectable items cause a call to the interface servlet.

There is also a third alternative, which is the thin and fat client solution. Here, the user interface is implemented as a simple applet and as much as possible of the application logic is handled by a servlet that communicates with the user interface applet. This architecture has been used for the personalisation wizard of the PC client. The communication between the personalisation applets and the corresponding servlet is done using HTTP tunnelling [Moss 1998]. HTTP tunnelling is a technique where serialised Java objects are passed between the client and server using the HTTP protocol. The greatest benefit of HTTP tunnelling is that firewalls are not a problem, as they might be if other protocols were used.

Other clients

The TV client uses a fat client architecture, where the browser is written as a Java application. The WAP client is a scaled down version of the PC client. The biggest difference is that XSLT style sheets and applets cannot be used on the client side. WML documents must be generated by the server servlet directly.

The applet–servlet combination was used to implement the Editor tool depicted in Figure 10. In principle, the Editor tool could probably have been implemented with a servlet or servlets, but applets were considered to be better suited to handling the complex user interactions.

The Editor tool consists of several applets that communicate with each other using a static class. One of the applets is active through the whole editing session. The other applets are invoked as needed. For each applet, only a minimum set of information is fetched from the server. Complicated Java 1.2.2 objects of the database system are converted into smaller and simpler Java 1.1

objects for the client applets. Converted Java objects are serialised and sent from server to client and back using the HTTP protocol.

3.3 Server

3.3.1 Server platform

The server platform was designed to support dozens of concurrent users. There are two NT server computers in the system: a media server and an application server. The media server stores Microsoft ASF content in the file system and serves it by using Microsoft's streaming media server software. The server side of the IMU2 application runs completely in the application server. In addition to middle tier software, i.e. Microsoft's web server (Internet Information Server, version 4.0) and JRun servlet engine (version 2.3.3), the database runs in the application server (Informix Dynamic Server, Workgroup Edition, version 7.3).

3.3.2 Middle tier

Despite the fact that the J2EE (Java 2 Enterprise Edition) technology (*http://java.sun.com/j2ee/*) is quickly emerging as a platform for multitier enterprise applications, Java servlets were chosen as the middle tier technology. Although J2EE would be a platform of choice for mission-critical applications with long business component life-cycles, Java servlets have strong benefits in a research project:

- Servlet engine products are relatively easy to use
- Developing and deploying servlets is relatively simple and quick to learn
- The J2EE technology and products that support it are not yet established
- Reliability and performance of servlet engine products is acceptable

3.3.3 Database

Since IMU2 is a complex application with user profiles, editor tools, etc., a flexible DBMS (Database Management System) was needed. An RDBMS

(Relational Database Management System) was chosen, because RDBMS products are mature and the JDBC (Java Database Connectivity) technology provides a reliable and efficient way to use them from Java. However, the RDBMS is not the only persistent storage means available. The NT file system, acting as storage for images and the textual content of articles, simplifies application development and debugging. Furthermore, it eases RDBMS administration to some extent.

Although XML (Extensible Markup Language) and its Java representation, DOM (Document Object Model), are used heavily by the IMU2 clients, the database uses XML only as the storage format of the textual content of articles. Each article is stored in the file system as an XML file that conforms to the XMLNews-Story DTD (Document Type Definition) (*http://www.xmlnews.org/*). Article metadata, i.e. data needed for article selection and displaying article lists, are stored in the RDBMS, as are metadata about images and video clips. The database API (Application Program Interface), written in Java, retrieves data from the RDBMS and returns them to the client modules as Java objects. Those objects are instantiated from classes that represent IMU2 objects such as users, channels and articles. Java objects contain URIs (Uniform Resource Identifiers) to images and videos. The textual content of articles is passed as DOM objects. DOM object handling is minimised in the database API, because it is easier to develop software using custom Java classes than XML

3.4 IMU newsroom

The basic IMU concept – in IMU1 – relied on fully automated news-feed where the proxy server gathered, indexed and published the news. Though the output was even then largely usable, sometimes the automatic selection resulted in an inadequate news offering. News items were placed in wrong departments, the main news articles were not always necessarily the most important ones, and links were incorrect. In the IMU2 experiment we, therefore, wanted to create a special mechanism to observe, manage and augment the news flow. Thus we implemented a *newsroom with editors*. We also wanted the editors to be able to produce material of their own, and thus make the IMU content more original. We developed an applet-based editing and information managing application for

these tasks. During the trial period, the newsroom staff consisted of two editors, who were also researchers in the project.

We wanted the editing application to be versatile enough for different journalistic functions. With it, the newsroom staff can control and override the automatic operations performed by the IMU publishing system, in a way work as the *proxy supervisors*. However, no modifications can be made to the actual content of the news articles as the edited articles could then be considered to be IMU's own news. It is important that the users can trust that the news from Helsingin Sanomat or Aamulehti appear *unaltered* in IMU. The IMU editors do not compete with the news sources, but *supplement* them. With the help of the editing application the journalistic team can also compile the news packages and moderate the discussion forums. In addition, with the same system, the community moderators can administer their community channels.

The editing application was designed and created in co-operation with researchers from the University of Tampere and VTT. One researcher had a background as a multimedia web journalist. Firstly, the needs of the editors and the community moderators were charted. Then, a specification paper was written, including sketches of the editing application interface. During the final programming phase, a lot of communication was still required between the technical members and the journalistic designers as many functions of the system had to be redesigned.

3.5 Defining the journalistic aspects of the IMU system

Admitting that in a technically advanced experiment in the field of journalism there is still a need for editors is not taking a step backwards. On the contrary, it can be seen as a sign of a new, healthy approach towards developing tomorrow's news and communication solutions. In IMU2, we tried to create a device that *combines* the benefits of automatic news distribution and the professional expertise of journalists. So there should not be, at least in the IMU context, any threat to journalists losing their jobs to automatic proxy servers. The proxy might be quite good at distributing *bulk information* to different terminals, but it still makes a lot of mistakes. There have to be humans guarding the distribution process. On the other hand, systems such as IMU can reduce the amount of

copy–paste journalism. Often multiple distribution means that the journalists have to manually copy and paste the news content from one source to the different media and platforms. Perhaps with the aid of automated systems such as IMU, there is more time for more profound journalistic work.

In IMU2, we wanted to augment the original IMU system with more journalism. We added the news packages and the thematic news channels, which are both well suited to an integrated publishing environment. The editors can gather news articles from the vast IMU archives to augment the news packages. The staff can also serve the users by personalising thematic news channels for them to subscribe to. Additionally the IMU editors take an active part in the discussion forums; hence we were experimenting with a relatively new dimension in the professional role of journalists.

3.5.1 Prior assessment by journalists

The new journalistic ideas were tested among the IMU project group, and also by interviewing ten Finnish journalists in the autumn of 1999. Questions of online journalism, in general, and aspirations of community communication were discussed with the journalists. Six of the interviewees worked in online media. A working report *Maksimaalista informaatiota* (Maximal Information) [Seppälä 1999] was published based on the interviews.

The interviewees considered IMU to be a worthwhile experiment, as it involves the development of services that are not yet widely (or at all) available. The journalists considered integrated publishing to play an important part in the future of journalism. However, many of them were quite sceptical towards the co-operation of the different media corporations, asking for example *"how the media dare to have their material published together in one publication"*. The journalists also saw potential problems (both for the media brands and the audience) in separating the news articles from their original contexts. The role of the IMU editors was conceived to be indispensable in controlling the news flow. A *news machine* cannot prioritise the news, so at least a human editor in chief (or a *journalistic big brother*) is needed.

The interviewees thought the adding of community communication to the IMU environment to be a good thing. The possibility of publishing their own content in a journalistic framework might be significant for ordinary people. Yet, surprisingly, many of the journalists turned out to be a bit *citizen phobic*. They feared that the common people would begin to publish all kinds of profane material in their community channels. In addition, if the members of the public act as content producers, the boundaries of the journalistic profession would easily blur. The least that could be done (and actually was implemented in the IMU interface) then would be to strictly separate the "*objective and value free*" material produced by professionals from the "*mere opinions and bulletins*" of the ordinary citizens.

3.5.2 Analysis of discussion forums

In the pursuit of more interaction in and about news journalism, we wanted to experiment with what we call *dialogue journalism*. Our intention was to make use of the interactive features of the web in the context of IMU so that the audience can have their say regarding the daily news topics. Therefore, we attached news discussion forums to the news packages. In order to better understand the concept and observe the utilisation of dialogue journalism, a survey *Puheenvuorojournalismia verkossa* (Dialogue Journalism on the Net) [Seppälä 2000] was undertaken in summer 2000 on the news discussion forums of twenty different online media. These included big names such as the BBC, CNN and USA Today, but also smaller media in 12 countries.

All of the media had discussion forums on their sites, but it was apparent that most of the forums were allowed to function very much on their own. There was monitoring of the forums, mainly for obscene or offending messages, but only a few of the media entities had really invested journalistic resources in the forums. The editorial staff only rarely took part in the discussions, or added links or journalistic material to the discussion forums. So, in a way, the forums could have functioned anywhere on the web, and not specifically on the sites of online media. However, in many of the forums, the discussion was very active, despite the fact that they did not get any help from the editorial staff. In IMU, we wanted to try to develop dialogue journalism by means of active participation of the editors in the discussion forums.

3.6 Defining community aspects of the IMU system

We wanted to create a link between the large-scale news production in major media and the small-sized content production in different communities by implementing a community communication dimension in the formerly journalistic IMU environment. The IMU2 system was intended to offer communities the possibility of integrating their own communication in an environment where there is high-quality information available from journalistic providers. We set up communication spheres (channels) that consisted of a bulletin area, a discussion forum and a personalised news channel for the communities taking part in the trial. In their IMU channel, the community members could communicate in the discussion forum and read community information, as well as news concerning the community. A couple of members from each community acted as moderators. It was decided that the majority of the television set-top boxes would be given to community users. The IMU staff would work in close co-operation with the communities, especially their moderators.

During the planning process, five active community members were also interviewed, but at quite a late stage, so their opinions could not be fully taken into consideration or implemented in the design of the system. This was a mistake, because the communities were offered a ready-made technical and contentual infrastructure, which was not planned and constructed especially for them and keeping their needs in mind. Thus, in any subsequent projects, the participating communities should be engaged at an earlier phase, so that their requirements can be better taken into account in the technology and content provided.

We wanted to invite three communities to participate in the trial, two local communities and one community formed around a mutual interest (interest community). The communities were quite hard to find as the community leaders that were first contacted were quite suspicious of such a technical system. However, after several rejections, three voluntary communities were found: the Merihaka residents' association (comprising people living in a Helsinki neighbourhood), the Iidesranta resident community (mostly university students living in two apartment buildings in Tampere), and Montaasi (a hobby club of students at the Helsinki University of Technology interested in movies). The

Iidesranta population was connected both by a shared local living area and their collective student status.

3.7 Companies as potential users

3.7.1 Interviews 1999

Eight corporate representatives were interviewed in October–November 1999. The interviewees' functional tasks in their corporations differed from development to management. The interviewees were shown pictures (visualisations) of the planned IMU publication and the concept was explained to them. With the help of this research, the development team received information of potential business-to-business markets and also of the needs and wishes of corporate user. Also, the IMU publication's potential competitors and the product's value in actual use were evaluated. Interviewees also discussed the publication's visual presentation, but it was not considered to be one of the more important issues during this project.

Content is most important in the IMU publication, and is created by the different media. The integration of different media into the same publication was considered important. The possibility of selecting the media to be followed was an especially positive feature. The IMU publication collects information that the user really wants. Personalisation was discussed as a highly important feature. The publication can be used in organisations as an information source, as a helpful tool in organising information flow and as a tool for business environment scanning.

In corporate terms, the most beneficial channels of distribution were computers (Internet) and WAP phones. The IMU should be designed for SMEs, since large companies already have solutions for IMU-type functions. Direct benefits from using the IMU publication in corporations are hard to distinguish. Time saved in information searching and improved reaction time to environmental changes can be direct benefits for businesses using the IMU publication. Companies can also benefit from advertising in the publication.

Interviewees listed different competitors to IMU. Most important of these were portals and newspapers on the Internet. The price of IMU cannot be too high, but the content defines it in the end. The IMU could be visually more attractive. Visual presentation was thought to be clear (simple). Clarity was the most important issue in visual design.

The IMU publication is suitable for corporate use. However, some of the interviewees considered the IMU only as a tool for future development and did not like to think about its commercialisation.

3.7.2 Environmental scanning in Finnish SMEs – telephone survey 2000

A telephone interview concerning the strategies of business environment scanning was administered to 150 randomly selected Finnish SMEs employing more than 10 and less than 250 people in February 2000. The goal of the interview was to form topics of interest to the scanning wizard discussed below in Chapter 4.2. Interviewees were asked how important it is to receive information from different areas of the environment and how often they scanned the areas. Frequency of scanning is connected to the perceived importance of the issues scanned [Boyd 1989, Choo 1993, Daft et al. 1988]. The question format of frequency of scanning is derived from Hambrick's [1982] study validated by Farh et al. [1984].

Researchers often combine different topics to form sectors of the environment. The environmental areas were named according to Daft et al. [1988] as competition, customer, technological, regulatory, economic and socio-cultural sectors. The natural environment was added as one sector (see e.g. Kotler 2000). In this research, some new topics were added to the definitions of sectors of Daft et al. [1988]. Therefore, the sectors were divided into separate questions, for example, the scanning frequency of the 'competition sector' was divided into the frequency of scanning competitors, companies that make substitutes, potential competitors and competition tactics in the business area.

All questions concerning the importance and frequency of scanning were subjected to factor analysis to ensure that questions measuring each construct

(sector) were loaded more highly on their intended construct than on other constructs. The reliability of each construct was obtained based on Cronbach's alpha. When measuring the frequency of scanning, Cronbach's alpha differed in environmental sectors from 0.69 to 0.83. When measuring the importance of scanning, Cronbach's alpha differed from 0.59 to 0.84. New topics fitted the model and, therefore, were homogenous enough to form coherent constructs sectors. New topics included potential competitors [Porter 1996], changes in customer's business area, suppliers [Porter 1996], new developments, changes or circumstances in the business area, environmental activists [Freeman 1984] and the natural environment [Kotler 2000]. Different environmental sectors were used as channels in the IMU publication, and separate topics as search keywords in the scanning wizard.

The results of the interviews are presented in Figure 10. A 5-digit scale measured the importance of scanning: (1) very unimportant to (5) very important. Frequency of scanning was measured by a scale: (1) at most once a year, (2) a few times a year, (3) at least once a month, (4) at least once a week, (5) at least once a day. Scanning was considered to be most important in competition, customer and technology sectors. Scanning was also most frequent in these sectors.

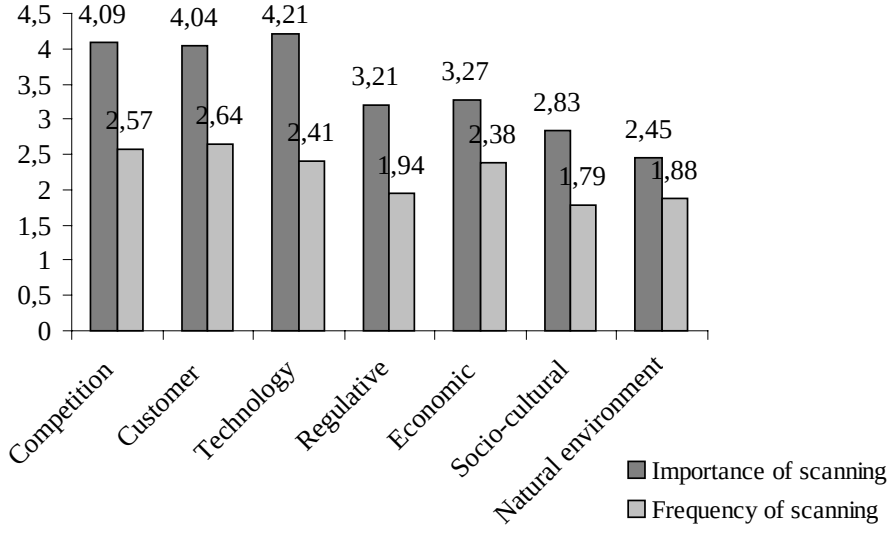

Figure 10. The importance and frequency of scanning different sectors.

3.8 Internet advertising – interviews 1999

The goal of interviews related to Internet advertising was to find out which forms of advertising are suitable for the IMU publication. Interviewees were given details on how the IMU publication functions. The interviewer showed pictures with commercials and played an audio advertisement. Advertisements, when using the publication by computer, were banners, pop-up windows, audio advertisements, videos, company information bulletins and an advertisement channel in the publication. Advertisements in the TV-IMU were banners, videos, information bulletins and an advertisement channel. WAP-advertising included text, icons and scrolling text. Interviews took place in September 1999. The target group consisted of people who best resembled IMU users in the future trial; four university students of information technology, four 35- to 45-year-old adults and two 12- to 18-year-old teenagers. There was an equal amount of men and women.

Advertising on a computer. The attitude towards banners was neutral or positive. However, some points became apparent: if an advertisement were to actively change, it could be distracting; if an advertisement changes, changing should not occur too rapidly; and there should be only one changing advertisement on the screen at any one time. Two of the interviewees were strongly opposed to advertisements that change.

Interviewees were shown a picture of a banner that could be clicked on. After clicking, a video appears as a pop-up window. The possibility of choosing whether to see an advertisement or not, was found to be a positive feature. Respondents would click the advertisement, if it were tempting and entertaining.

A pop-up video with an advertisement was shown to the interviewees. This type of advertising was the most criticised, since a pop-up window interferes with using the Internet. The user must react in order to close it. A window can be acceptable if it appears in an empty space on the screen. A pop-up window is usually closed immediately after it appears.

An information bulletin from a company was suggested to be one form of advertising. It was considered to be a good form of advertising, since it contains

more information and the user can choose whether to read it or not. There should not be too many bulletins and they should be distinguished clearly from the other material (e.g. news) by using a different colour and by stating “bulletin” after the headline.

The interviewer presented a picture of a banner and simultaneously played an audio advertisement. Some of the respondents had a positive attitude towards audio advertisements, but some considered them to be irritating. Some advertisements are naturally pleasant and some annoying. Audio advertisements in general must be short.

A channel that collects advertisements, was introduced to respondents. An advertisement channel was considered to be a positive feature. Respondents appreciated that one can get more information about the products by using the channel. However, many doubted their interest in visiting the advertisement channel.

Advertising on IMU television. Banner advertising on television created positive reactions. An advertisement must be small. Advertisements for movies should not be situated next to programme information in order to avoid confusion.

A video commercial can be clicked open on a television. A video is acceptable if one can click it open by him/herself. Some interviewees doubted that a clickable advertisement would work on television, because television is a medium, which is only watched passively and not used actively by clicking links. Information bulletins from companies could work as well on television as in computers, but there should not be too many bulletins.

The interviewer showed a picture of an advertisement channel and asked whether the respondent would visit the channel when using a television. The channel could be visited if there was some more information on products that were advertised elsewhere in the IMU publication. It was suggested that the channel would be used more on a computer than on television since one is used to interactivity when using a computer. Television is a more passive medium.

Advertising on a WAP phone. Interviewees were shown pictures of text advertisements on a WAP phone. Advertising on a mobile phone created

negative responses since an advertisement took up too much space on the screen and loading the advertisement would demand expensive time when connecting to the service. A mobile phone was considered as a more personal medium than a television. This was mainly the reason for negative responses to advertising on it.

The interviewer showed a picture of a mobile phone, which had an advertisement icon on the screen. An icon was a better solution than text. A picture was considered to be more neutral, vivid and impressive than text.

Scrolling text on the bottom of the screen was considered to be the worst option of advertising on mobile phones by many interviewees. However, some thought that a scrolling text would be least distracting since it was situated on the bottom of the screen.

Ways of targeting advertisements. Most of the respondents had a positive attitude towards targeted advertising based on the user's background information. When targeting advertisements based on background knowledge, a user's consent is imperative.

It was suggested to interviewees that commercials could be shown based on news topics or programmes. Most suggested that this way of presenting advertisements could be combined with targeting advertisements based on background knowledge, since one is not always interested in buying products related to news topics.

Respondents were asked what they think should happen after clicking a banner. Should a video, advertisement channel or a company's (product's) Internet pages appear on the screen? Most of the interviewees would wish to see a company's Internet pages, but some thought that an advertisement channel would be a good option as well. If there were more information on a product on the Internet than on the advertisement channel, then Internet pages would be a better option. It is important to be able to find more information concerning the advertised product. It is also important to be able to return to the IMU publication.

The price of IMU. If there were advertisements in the publication, the interviewees would like to get a 100–500 FIM discount on the price of IMU. (The interviewer suggested that 1000 FIM/year was the price of IMU.) 500 FIM

was mentioned most often. The interviewees would not tolerate irritating commercials even if they would get more discount on IMU.

Different platforms, television, WAP and the Internet, are suitable for advertising. Advertising in general should not disturb the user and if possible, it should give more information on products. Advertising on television was of a different nature than on a WAP phone or a PC, because a television is commonly known as a passive medium. In future, perhaps, television advertising could be more interactive.

4. The trial system

4.1 Architecture

News articles are fetched daily from four online newspaper web sites: Aamulehti, Helsingin Sanomat, Karjalainen and Turun Sanomat (Figure 11). Television news is digitised from Finnish Broadcasting Company (YLE) broadcasts. Up-to-the-minute news articles, as well as teletext news, are acquired from the YLE web site. Event information covers culture offerings – movies, theatres, music and art events, etc. – in the cities of Helsinki and Tampere during the week to come. The movie theatre and theatre programmes include links to reviews in newspapers. The radio- and TV-programme guides cover a 2-week period. Event information is fetched from supplements of the web newspapers Helsingin Sanomat and Aamulehti. Radio and television programme information is fetched from the web sites of television companies.

The content is viewed over fast networks on PC and TV platforms. In addition, WAP phones and MP3 players are available terminals.

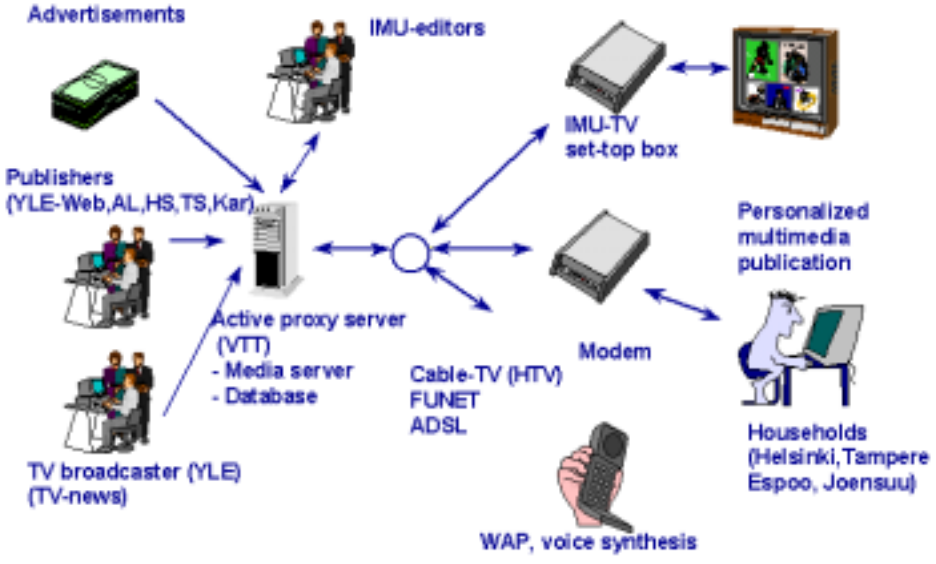

Figure 11. The trial set-up, where the active proxy server processes the content from the media houses. The IMU editors control the machine-made choices and produce their own news packages. The publication is used on different terminals.

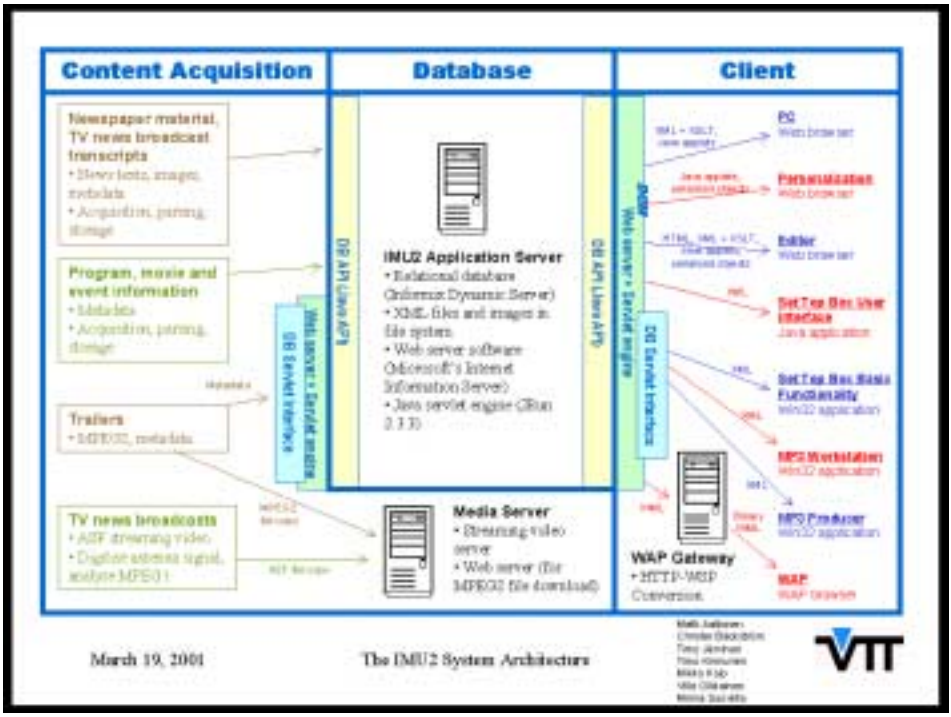

Figure 12.

4.2 PC, TV and WAP user interfaces

4.2.1 Functionality

The system functionality and user interface were designed in a multistage process – starting from a brainstorm with the project companies, proceeding through a requirement description, ending up in a user interface description that was implemented and put into the trial.

As described in Figure 12, the IMU system combines related articles, video clips and media events into channels. Video articles, mostly TV news, and text-based articles are treated and presented in a similar way. There are three main areas on the front page (Figure 13) (from the left):

1) The channel selection area where the user can select and modify the available channels. The main groups are News, Personal Channels (personalised channels and community channels) and Event and Media Calendar.

2) In the centre of the window is the news area where the most topical news item is opened in the upper part, and in the lower part there are the headlines of other news items (max 50, in order received). Many news articles also have a picture attached to them.

3) Six other main news headlines are placed in the news banner on the right.

4) In addition to these news areas, there is what we call a rolling channel – a sort of news ticker – in the uppermost part of the front page.

5) Under the rolling channel is a space for bulletins from the editorial staff, where they can, for instance, inform about new news packages or encourage the users to personalise their own channels. From the front page, which opens up at login, the users are able to proceed to the various news departments and other services of IMU such as community channels or personalised channels.

Figure 13. The IMU publication, where the channels are presented on the left. The channel "Kotimaa" is selected. The channel contains the domestic news headlines and TV news drawn from several newspapers and TV stations. A News banner with the top headlines is displayed on the right.

The news material is automatically assigned to the different channels (domestic news, sports news, etc.). The different news providers also have their own channels which include only news stories fetched from their web site. The television news has its own channel, where the latest news can be watched (either the whole newscast or individual stories). The 100 most recent news articles can be read directly from the front page. A maximum of four links to other IMU news is automatically added by the system to each news article. The users can choose to eliminate all channels except the front page from their personal IMU interface.

The PC and TV interfaces are very similar. The same information can be retrieved via the TV and the PC. Of course, the smaller resolution of the television screen affects the way in which the elements are shown. For example, the news stories cannot be scrolled as on the PC, and have, therefore, to be paginated. The remote control device had to be taken into account, when designing the TV interface (Figure 14). Most of the commands can be given using the remote control buttons.

Figure 14. The TV-IMU is used with a TV remote control. The menu "Uutiset" is selected with the remote control red button. The channel "Kotimaa" is selected with the arrow keys. The browser is written in Java.

The WAP-IMU service provides news for the users (Figure 15). The metaphor behind the user interface is the channel. It is also possible to search the IMU news database with a WAP-IMU.

Figure 15. The WAP-IMU publication, where the user at first logs in, selects a channel (kotimaa), a heading (Filatov: En ole...) and finally gets a short article.

Event and Media Calendar

In the TV-IMU Event and Media Calendar, the user can switch between television and radio programme schedules, movie theatre schedules, and events information. The News banner at the right is used as a navigation tool. From the banner, the user can also pick movie or theatre reviews for viewing (Figure 16). The Event and Media Calendar was implemented only in the TV-IMU.

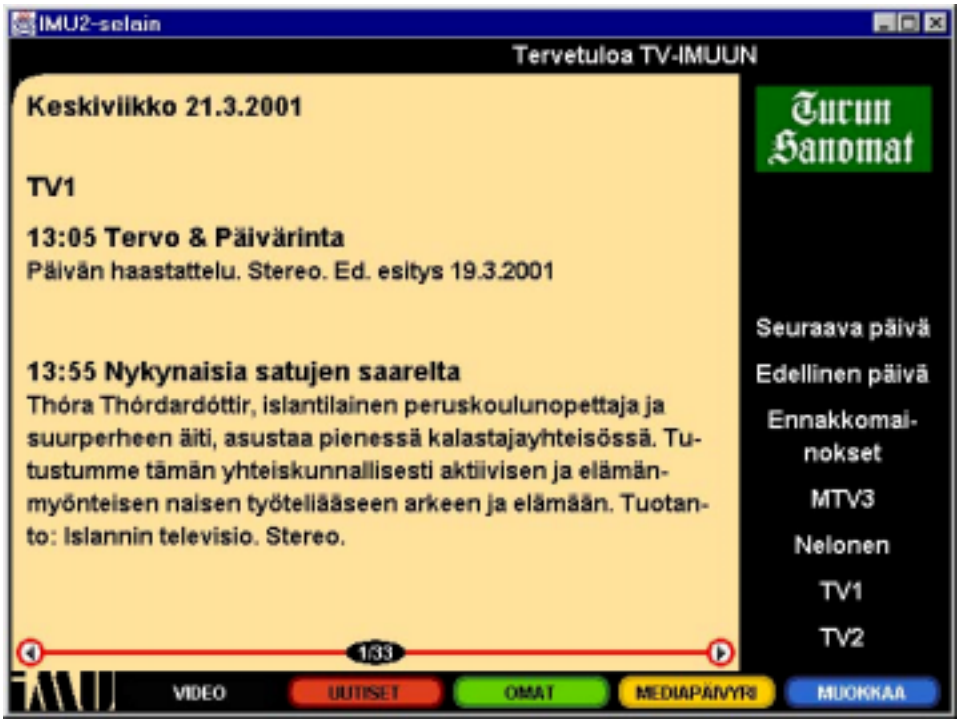

Figure 16. The event and media channel from the TV-IMU. It shows the user TV and radio programmes, movie theatre offerings, and some other event information.

4.2.2 Implementation of the PC-IMU and WAP-IMU user interfaces

When implementing the PC-IMU user interface, one of our main goals was to make it as light as possible computationally on the one hand and, on the other hand, to keep the amount of transmitted data to a minimum. We had learned a lesson from the previous IMU project, where almost a megabyte of applet classes had to be downloaded when starting a session. For the Wireless Application Protocol (WAP) environment, this goal was very natural as mobile WAP devices set very tight computational and memory usage constraints. We selected the so-called thin client approach and decided to build the PC-IMU user interface using dynamically created HyperText Markup Language (HTML) and Wireless Markup Language (WML) documents.

The architecture of the PC-IMU and the WAP-IMU is loosely based on the View/Model/Controller (VMC) model. The Model is the part that implements the application logic, View is the screen representation of the Model, and the Controller defines how the user interface reacts to the user input. In the PC-IMU and the WAP-IMU the model is the database system. The controller is the middle tier that generates the documents that make up the view part together with a normal HTML or WML browser. The VMC model helps ensure that the finished application is both robust and maintainable. Decoupling of the user interface from the application logic increases flexibility and reuse [Gamma et al. 1995].

4.2.3 PC-IMU

The implementation of the controller part of the PC-IMU user interface is based on Java servlet technology and the Extensible Markup Language (XML). We have been able to separate the application logic of the servlet from the visual representation of the user interface by means of XML and Extensible Stylesheet Language Transformations (XSLT). XML is used to define the data content of the IMU publication and XSLT is used to describe rules for transforming the content into HTML form that can be visualised by Web browsers.

We have selected Xerces Java Parser 1.3.0 by the Apache Software Foundation as the tool for processing XML documents. Java 1.2.2 was used on the server side for servlet programming, mainly because new container classes were introduced in this version and these classes were heavily used in the database system. The PC-IMU servlet communicates with the IMU database through an Application Programming Interface (API) that hides the details of the underlying JDBC connection and various database queries. The program development environment we have used is Symantec VisualCafé 4.0 Expert Edition. Because we decided to use client-side XML to HTML transformation we selected Microsoft Internet Explorer 5.x as the project's Web browser.

The PC-IMU servlet generates the user interface as an XML document, which is then converted into HTML in the client. Internally, the servlet keeps the data for the user interface as a Document Object Model (DOM) object. A DOM object is a Java object representation of an XML document. A DOM object has methods

for manipulating the document it represents. Elements and element attributes can be added, removed and modified.

At run time, there is, at least in principle, only one running instance of the PC-IMU servlet on the server. This servlet creates a server object for each user. The PC-IMU keeps track of server objects by inserting them into a session object that is automatically associated with each user's HyperText Transfer Protocol (HTTP) session.

At the beginning of a PC-IMU session, the servlet creates a server object for the new user and fetches data about the user from the database. Most of the data that are needed to build the user interface are placed in channel objects, which are one of the central data types defined by the database API. Channels contain information that is needed when fetching article metadata from the database, i.e. information about publishers, article categories, query clauses and so on. Channels are kept internally in Java lists. At the same time, the PC-IMU servlet creates a DOM object that is an internal representation of the user interface. As a result of each user action, the servlet writes out the DOM object as an XML document and sends it to the client device. On the client device, an HTML browser converts the XML content into HTML according to rules defined in the XSLT style sheet. Most user actions result in database queries such as fetching an article or channel data and thus at least in small changes to the user interface DOM object.

There is no Document Type Definition (DTD) for the XML created by the PC-IMU, because no validation is necessary. We have selected XML element names to reflect the structure of the PC-IMU publication as closely and naturally as possible. There are elements such as: `articlelist`, `channel` and `searchlink`. We took element names for article data from the News Industry Text Format (NITF), because NITF is used for storing IMU articles. After PC-IMU fetches an article, it appends the resulting article DOM object into the user interface DOM object using the method `insertNode` in the DOM API. An example of XML output is shown below.

```
<doc title="PC-IMU">
...
  <body>
```

```
    <body.head>
      <headline>
        <hl1>Ericssonin     suuromistajat     antoivat
tukensa</hl1>
        <hl2>Konsernijohtaja Hellström vakuutti</hl2>
      </headline>
      <byline>
        <bytag>Aamulehti</bytag>
      </byline>
      <dateline>
        <story.date>2001-03-29 13:00:39.0</story.date>
      </dateline>
    </body.head>
    <body.content>
      <p>Ericssonissa     määräysvaltaa     käyttävät
suuromistajat                                        ...
      </p>
     ...
    </body.content>
  </body>
...
</doc>
```

The `body-head` part of the above code is converted to HTML according to the rules shown below.

```
<xsl:template match="body.head">
    <div>
      <xsl:attribute name="style">font-size:14pt;font-
family:Verdana;
        font-weight:bold</xsl:attribute>
      <xsl:apply-templates select="hedline/hl1" />
    </div>
    <div>
      <xsl:attribute                name="style">font-
size:8pt</xsl:attribute>
      <xsl:apply-templates select="byline/bytag" />
      <xsl:apply-templates
select="dateline/story.date" />
```

```
    </div>
    <div>
      <xsl:attribute    name="style">color:black;font-
size:12pt;
        font-family:TimesRoman;font-
weight:bold;</xsl:attribute>
      <xsl:value-of select="hedline/hl2" />
    </div>
  </xsl:template>
```

Here is the HTML code that results from the transformation.

```
<div   style="font-size:14pt;font-family:Verdana;font-
weight:bold;">
  Ericssonin suuromistajat antoivat tukensa
</div>
<div style="text-align:left;font-size:8pt">
  Aamulehti
  2001-03-29 13:00:39.0
</div>
<p>Ericssonissa määräysvaltaa käyttävät suuromistajat
...
</p>
```

The fact that we separated the visual representation of the user interface from the application logic made it possible to divide the system development into programming and graphical design. A graphical designer could have written the style sheet independently from the programming work. In this project, this possibility was not utilised fully as the application programmer wrote the style sheet following guidelines given by the graphical designer. Still, we feel that the separation of the view from the controller made the development work much simpler compared to the previously normal way of programming HTML generation directly into the application.

In the final HTML form of the user interface, we have used HTML tables to get the desired graphical structure. We chose not to use HTML frames like we did in the previous IMU project [Södergård 1999]. One of the reasons for not using frames is that it was required that the user should be able to scroll the whole page using just one scroll bar. This time the application did not have to adapt to

the window size and because the application had no way of knowing the size of the browser window we did not use hyphenation.

The so-called scrolling channel at the top of the page is an applet. It does not communicate with the database directly, it only shows scrolling links and redirects requests to the PC-IMU servlet. Only HTTP is used for communication between the client and the server and so IMU can be used through firewalls.

Using tables to define the visual structure of HTML pages is not usually considered good practice because tables make it hard to extract information from the page for other purposes, e.g. for non-visual user agents. As an exercise, another style sheet was written to create a different look for the PC-IMU application. In this version, the nested tables were replaced by simple list structures that closely mirror the logical structure of the content. A picture of Accessible-IMU is shown below (Figure 17).

Figure 17. Accessible-IMU shows the same information as the PC-IMU but in a different way.

4.2.4 Personalisation

Personalisation is done by means of four applets, which are loaded to the browser only when needed. These applets were programmed in Java 1.1 using AWT components exclusively to minimise download sizes and times. When implementing the applets, the main focus was on flexibility.

The personalisation system is a good example of the MVC design and also of the medium weight client approach. Applets are used to display and modify channel data. In the server database, objects are converted into simpler ones before sending them to the client. On the other hand, applets are powerful enough to minimise the amount of data exchanged between the client and the server. Every user action does not result in a servlet request as in the thin client solution of the PC-IMU.

The personalisation servlet does not have to deal with user interface aspects such as highlighting selected text or deciding how to display a variable number of channels; applets have quite good facilities for this kind of action. The applets do not communicate with the database directly. The controller servlet handles all database operations. The communication between the applets and the controller servlet is done using HTTP tunnelling [Moss 1998]. In this case, serialised Java objects are passed from the client to the server and back using the HTTP protocol. The personalisation servlet is programmed in Java 1.2.2 like all other server-side Java programs in this project.

Personalisation used with the environmental scanner does not differ from the personalisation of normal channels. In the case of the environmental scanner, there is some extra support for complicated and scanner-specific searches in the database classes.

4.2.5 WAP-IMU

The WAP-IMU servlet is a simplified version of the PC-IMU servlet. Because WAP browsers do not support XSLT style sheets, the WAP-IMU servlet was programmed to produce WML directly. This change from XML to WML was quite easy because WML is an XML language. In a more ideal case, the same servlet could have served both HTML and WAP clients, but this would have required server-side style sheet handling, which was not available this time.

Because the WAP browsers do not normally create sessions in the same way as Web browsers do, a HttpSession object taken from the HttpServletRequest could not be relied upon in this case. Instead, the servlet was programmed to give each new server object a unique identifier after a successful login. The servlet stores

server objects into a static hash table. The identifier is included in every request so that the WAP-IMU servlet is always able to use the correct server object.

The WAP-IMU servlet uses hyphenation to make better use of the small displays of mobile client devices. The line length is selected by looking at user agent information that is part of the servlet request data. If the user agent is unknown to the WAP-IMU then hyphenation is not carried out.

The programming style used is procedural rather than fully object oriented. There is a clear object structure, but objects cannot always handle their data in an object-oriented way and there are many dependencies between objects.

It would have been better if the XSLT transformation had been done on the server side. For example, Cocoon software by Apache Software Foundation promises that "The new Cocoon paradigm is based on the fact that document content, style and logic are often created by different individuals or working groups." An additional benefit from this kind of solution would have been that the PC-IMU could have been used with any browser.

Symantec VisualCafé 4.0 Expert Edition is not a particularity good choice for servlet development. The Enterprise Edition would probably have been better but switching to another development tool might have taken too much time. The parts of the system, especially those which relied on HTTP tunnelling, were sometimes very hard to debug because the development tool did not support developing distributed Web applications. Those parts of the IMU system could be run only in the real environment where the error messages and other output was scattered among several log files.

4.2.6 A tool for environmental scanning

The scanning function of the publication is based on personalisation of news. A user creates personal channels using a scanning wizard. The wizard suggests different topics of interest to the user: corporate issues, customers, competitors, technology, economics, co-operation, regulative, social issues or nature. The user can, for example, select a ‘technology environment’ channel and personalise it by different keywords (Figure 18). The scanning function helps the user to find important news from the different media.

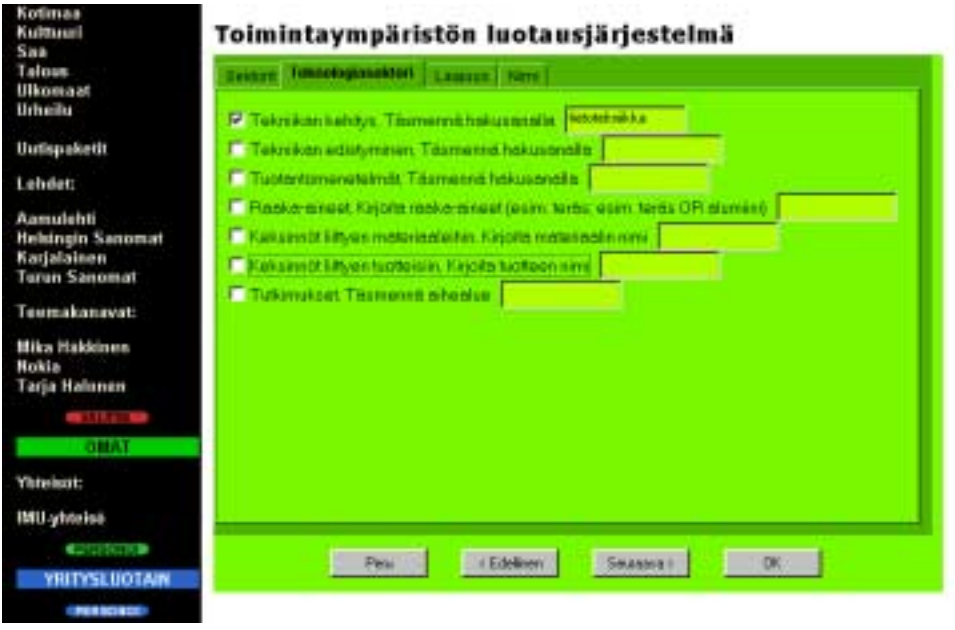

Figure 18. Business environment scanning wizard – technology sector.

4.3 TV Platform

4.3.1 Set-top box

The TV Set-Top Box (STB) was built to study how an integrated media terminal – mixing computer and television – could be used as an integral part of everyday life in a living room. The PC-based STB has some additional features, namely DVD playback and facilities to record and replay television programmes. The STB also has an infrared remote control, which complies with NorDig digital television remote control specifications [NorDig I, 2001].

As described above, the Event and Media Calendar contains schedules of four television channels. These schedules are used for interactive programming resembling the services available for digital recorders TiVo and ReplayTV. In addition to television schedules, television trailers are available for STB users. These trailers are in the MPEG2 format compressed at up to 8 Mb/s. It is also possible to use STB as a television tuner with an instant recording capability. The STB has a Nicam [Television Systems, 1994] tuner to receive and record digitally transmitted stereo audio.

The STB users may compare it to a PC when browsing and to a television when it comes to video quality. As a result, we decided that the user can only browse IMU pages and that the video quality should be comparable to VHS quality, which is widely accepted for home recordings.

Hardware and software

A normal television CRT has 0.7–0.8 mm pitch, which means that display resolutions higher than 640 × 480 are unobtainable in the most common 28-inch receivers. The user interface was thus made for a 640 × 480 display, although video clips and DVDs are played back at their original resolution. For quality reasons, an RGB signal is used between the STB and television set. An RGB input is available on most European television sets, in the Scart connector.

The chosen hardware is as follows: microATX motherboard (Asus P3B-1394), Matrox Millennium G400 Dualhead together with Rainbow Runner, 30 GB HDD, DVD-ROM drive, cordless mouse and cordless keyboard. The Matrox Rainbow Runner includes a tuner with Nicam audio and hardware compression and decompression utilities to record and play back video clips. The RGB signal at television refresh rates can be obtained at the secondary output of the Matrox Dualhead display adapter.

In addition to these hardware components, an infrared remote control reader was constructed. This infrared reader is installed into the STB case and it gets its power from a +5 V standby supply, so it runs even when the PC circuitry is turned off. The infrared reader has the necessary circuitry to switch on the Set-Top Box whenever the power button of the remote control is pressed. It is also used as a settable power-on timer, and it generates the necessary control voltages to switch the television input over to the STB and to make the television set select between the RGB and composite video modes of the Scart input.

Windows 98 SE was selected as the operating system, mainly because of its software support. On top of web Windows, there is a Java application for browsing the IMU pages. This application hides the Windows user interface completely and runs without any web browser, which makes it easier to integrate the remote control with the user interface. When compared to Java applets, a Java application was considered to cover some reliability requirements.

Behind the browser window there is another application written with Microsoft Visual C++, which takes care of:

1) communicating with the infrared reader hardware, controlling the power-on timer and Scart signals
2) converting remote control commands to functions, arrow and enter key keystrokes,
3) controlling Matrox hardware, including the TV tuner, video recording and playback, and Dualhead functions,
4) controlling the DVD playback software,
5) controlling the ASF playback,
6) downloading, playing back and deleting television programme trailers from the local hard disk.

The software block diagram is presented in Figure 19.

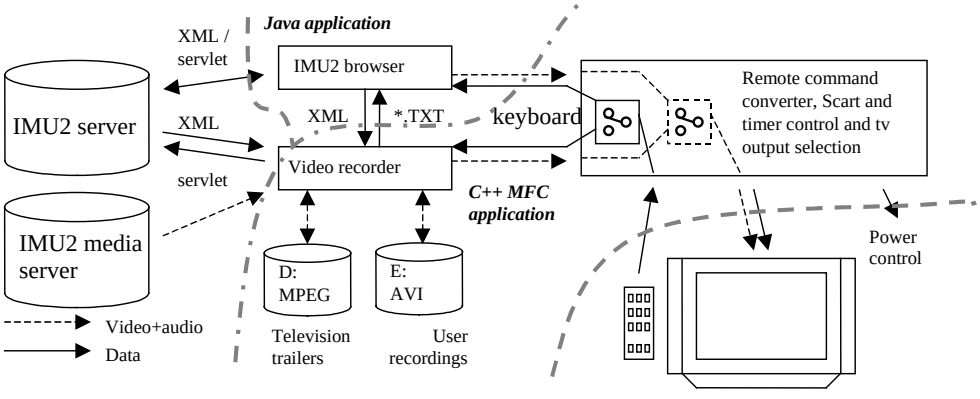

Figure 19. Block diagram of the IMU Set-Top Box application software.

The C++ application receives commands from the IMU2 server and the browser in an XML tagged file. The XML tagging basically represents a subset Louth VDCP commands. Louth VDCP (Video Disk Communication Protocol) is a commonly used serial line protocol in the broadcasting industry to control disk-based video recorders. It features a tightly coupled master-slave methodology [Louth… 1999].

Early each morning, at about 04:30 h (adjustable), the STB boots up automatically and reads the XML command files, which contain commands to delete expired television trailers and to download new ones from the IMU media server. The media server is also used to store log files and to contain the latest versions of IMU browser and C++ applications. Log files are uploaded and the latest versions downloaded automatically. The reason for downloading the television trailers onto the local disk instead of using streaming video is the 8 Mb/s bit rate requirement, which exceeds the speed of the Internet connection.

Using the IMU Set-Top Box

The STB has four different operating modes: TV-IMU, IMU, video and television mode. In TV-IMU and IMU modes, the browser is visible and at the user's command. In TV-IMU, there is also a small TV window on top of the browser showing the real-time television programme. In the video mode, the user can view his own recordings, television trailers, IMU news clips or DVDs. In television mode, the STB serves as a television tuner with digital Nicam audio.

Changing from one mode to another takes place either with remote control buttons or from menus. It is also possible to make an instant recording in TV-IMU mode. The IMU browser can be used normally when STB is recording due to hardware-based video compression. Various commands, menus and links are addressed in a sequence by pushing the arrow buttons on the remote control. The activation path starts at the advertisement in the upper right corner and goes through the news banner titles to the right to the opened article and the article list.

4.3.2 TV User interface

The TV user interface is responsible for the following: displaying the data to the user, displaying (most of) the available functions to the user and responding to the user activity (carrying out the tasks connected with those functions).

A three-tier software architecture was used to implement IMU2 for TV with the set-top box. In this case, the middle tier and client are in the scope of the user interface. Java was used as the programming language as it is used throughout the IMU2 project.

Due to the architecture, the user interface can be divided into two parts: the middle-tier, implemented with Java-servlets, and the client application, implemented with a Java-application. Unlike in normal web-applications, thin client was not a goal. Because the application is not downloaded, the size of the application is not an issue. Neither is the performance, because the set-top box is basically a powerful PC. Much of the computation can be done in the client without increasing the load on the server. With the specific browser application for IMU2 data, there was no need to use a normal WWW browser at all, although this excluded the normal WWW-pages from the TV environment. Debugging the Java-application is easier and Java offers powerful tools for creating the user interface and for client-side data manipulation. The middle-tier was needed to avoid direct communication between the client application and the database. That could have caused some problems due to security issues, e.g. firewalls. To ensure that the user has the newest version of the client application, the set-top box looks for a newer version on the server regularly.

Middle-tier

Data are stored in the database. Only servlets can access the database. Most of the database transactions are data retrievals. When data are retrieved from the database to be displayed in the client, log information is added to the database. This occurs automatically when the database interface is activated and it is invisible to the TV user interface. The only time that the TV user interface updates the database is when the user presets a recording of a TV program.

The client application calls the servlets with normal HTTP document requests. Servlets fetch the necessary data from the database and build an XML document of that data. The XML document is then returned to the client. The client parses the document and shows the data to the user. XML was chosen to communicate between the client and the servlets for the following reasons: it is textual data, semantics can be embedded into the document and powerful tools (parsers) are available for handling XML documents. Below is an example of an XML file used in communication between a client application and servlets. In the example, all news package headers, images and their possible priority order are delivered to the client application.

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<channel>
 <db_parent_id>23489</db_parent_id>
 <news_package>
  <id>392</id>
  <title>Hervanta</title>
 </news_package>
 <news_package>
  <id>36</id>
  <title>Itä-Timor</title>
  <image>

http://ttes30.tte.vtt.fi/IMU2/application/images/00010
293..jpg
  </image>
 </news_package>
 <news_package>
  <id>444</id>
  <title>Mitä uskallat syödä?</title>
  <image>

http://ttes30.tte.vtt.fi/IMU2/application/images/00013
718..jpg
  </image>
 </news_package>
 <pri_articles>
  <id>444</id>
 </pri_articles>
</channel>
```

Client

A client application responds only to keyboard events. The set-top box software maps the remote control events to the keyboard events. The client application also needs the set-top box software for other purposes. The set-top box software automatically starts the application and keeps it visible on the screen. All the video playback and recording capabilities are out of the TV user interface's

scope. Communication between the client application and the set-top box is done using XML documents. The client application generates an XML command document and writes the document into a directory. The directory is polled by the set-top box software. When a new file is found the set-top box software reads it and carries out its commands. Below is an example of an XML command file that makes the set-top box play a videoclip.

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<stb>
 <head>
  <user_id>5</user_id>
  <modified>20010328093830</modified>
 </head>
 <body>
  <command type="PlayCue">
   <parameter name="filename">
http://IMU.vtt.fi/servlet/netshow.MakeAsx?file=2703203
0.asf&sta=0:0:36&dur=0:0:18
   </parameter>
  </command>
  <command type="Play" />
 </body>
</stb>
```

Responding to a user's activities is normal application logic. The customised look of the TV user interface is more interesting. Java's existing user interface classes were used as a basis. Swing classes were used instead of older AWT classes. Only in forms were Java's components used as such. All other visual components of the user interface are derived from empty windows and panels. Functionality and custom painting of the component is built to the new TV user interface classes. Painting is done using Java's graphic methods.

The most notable part of the user interface is the pagination. Because the user cannot scroll the screen with the remote control, articles and channels are paginated. It means that visual elements (images, strings) are divided among several pages. The user can then browse the data page by page. This is something that would have been harder to achieve if the client was implemented,

for instance, as HTML pages. Now Java offers good tools to calculate the space requirements of the visual elements in the current environment. Pagination logic is quite simple. With articles, there is the article's title, ingress and source on the first page. Below them, there is the first image of the article. Other images are laid out on the next pages, only one image per page. The article's bodytext is then laid out to use the available space left over from the other elements. Links are applied to the end of the text on the last page. This pagination is done before the first page is shown to the user to enable browsing from the first page directly to the last page and to determine the total number of pages needed.

4.4 Audio platform

The IMU2 audio platform makes it possible to listen to the news with an MP3 player. The news articles are converted from XML presentation into audio format with a speech engine. The user’s workstation downloads the audio clips according to the user profile. The application was developed in co-operation with the Finnish Federation of the Visually Impaired (FFVI).

In addition to the MP3 player, IMU2 articles are transferred to the current FFVI audio service, which has 1200+ users. Also, a simplified version of the IMU2 user interface was developed to make it possible to browse IMU2 content with existing non-visual browsers, such as pwWebSpeak.

4.4.1 Data flow

The data flow for an audio platform is presented in Figure 20. As an addition to the existing IMU2 system, the audio platform consists of a dedicated MP3 coding station, end-user MP3 workstations, MP3 players, non-visual browsers and the FFVI news service. The software for the MP3 coding station and MP3 workstations is run by Visual C++ MFC applications.

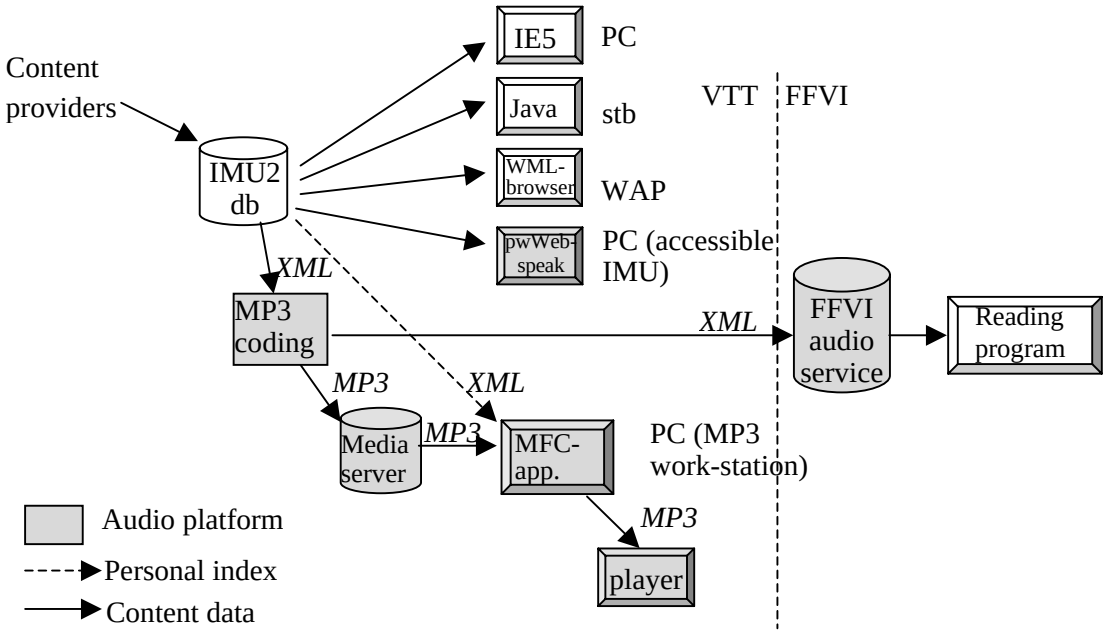

Figure 20. IMU2 audio platform data flow.

4.4.2 MP3 player

All new articles in the IMU2 database are converted into MP3 format in the MP3 coding station. This workstation checks every hour to see if there are new articles available in the IMU2 database. All new articles are converted into wav speech files using the Mikropuhe speech engine developed by Timehouse Oy. The wav files produced by Mikropuhe are then converted into 24 kb/s MP3 format using Telos Audioactive MP3 software. The MP3 files are uploaded to the IMU2 media server and the original XML files to the FFVI news service.

A displayless Digisette Duo-Aria was chosen as the MP3 player. It seems that every MP3 player with a display has at least one setup menu or one-button selection in the display, which is not appropriate for visually impaired users. Duo-Aria has a C-cassette shape and can also be used in normal cassette players.

To download the articles into an MP3 player, the MP3 workstation retrieves a list of news articles according to the user's personal profile. The appropriate MP3 audio clips are then downloaded from the media server and stored in the hard disk of the MP3 workstation. When an MP3 player is connected to the workstation, its content is automatically updated.

There is no index for the audio clips, but every audio clip gets an extra header saying "track one", "track two", etc when downloaded to the player. The audio clip itself always begins with the headline of the article.

4.4.3 Other audio devices

The Finnish Federation of the Visually Impaired has an audio service, which contains the latest newspaper articles. For the end-user, there are reading programs, which can be used to browse the content of different newspapers and play the selected articles. IMU2 is included as a separate newspaper containing only the latest news, on an hour-by-hour basis. The service is available for those 1200 visually impaired users who use a DOS-based reading program.

Also, a special style sheet (Figure 21) for IMU2 browsing was developed to provide such an accessible user interface that non-visual web browsers can also read it.

Figure 21. Accessible IMU2 user interface.

4.5 Content acquisition

The content acquisition not only fetches content "as it is" from the project partners online publications, but it also extracts keywords and metadata from the source content, generates news items from digitised TV news broadcasts and finally stores content and metadata in the database to allow a deep level of integration of different content items. Also, when event information and television and radio programme information is parsed and stored with extracted keywords, they are brought to a new level of usability. Figure 22 illustrates the main components used in the content acquisition process.

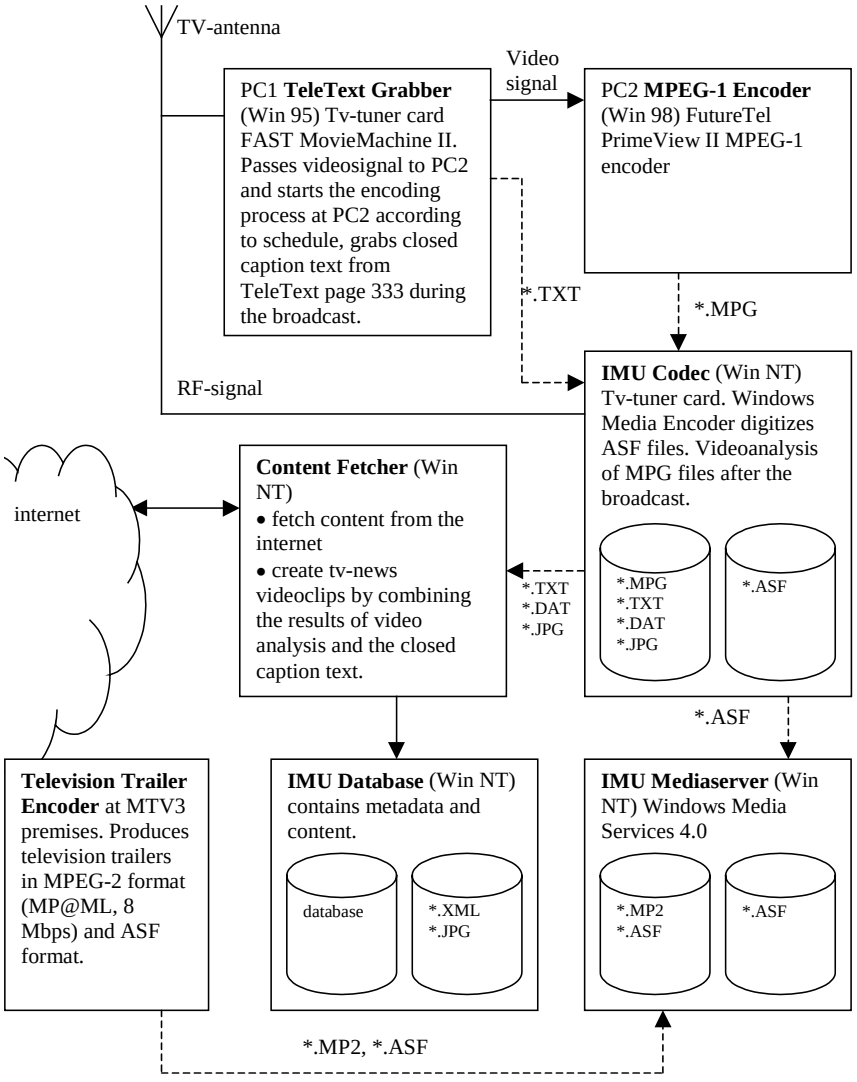

Figure 22. The IMU2 Content Acquisition, main components.

4.5.1 Content sources

Content is fetched from four online newspaper web sites: Aamulehti, Helsingin Sanomat, Karjalainen and Turun Sanomat. The same public HTML-tagged content that is available to all readers using web browsers is used here. There was no extra work required on the content provider's side. Video material is digitised from the Finnish Broadcasting Company

(YLE) news broadcasts during the day and, also, the YLE web site is visited once every 30 minutes to fetch updates for up-to-the-minute news articles and updates for short teletext news. Teletext news provides shorter text-only versions of YLE news articles, which are better suited to a WAP platform.

4.5.2 Content parsers

Fetched HTML pages are parsed according to predefined rules. These rules are coded into each individual fetcher. Metadata are extracted and stored in the database, whereas content is stored in the filesystem. Content data can be a XMLNews-Story[8] tagged XML file, where articles ingress, bodytext and subtitles are stored as a JPEG or GIF file, which contains picture data, and an ASF file, which contains one TV-news broadcast in Microsoft Advanced Streaming Format[9].

Fetcher applications are written using Java programming language (JDK version 1.2.2)[10] and HTML parsing is done using Java Swing-classes. All material is fetched using the HTTP protocol, with one exception, where the HTTPS protocol is used. In that case, the Java application must use class extensions, which support the HTTPS protocol. The Java Secure Socket Extension (JSSE 1.0.1)[11] and HTTPClient Java package written by Ronald Tschalär (HTTPClient Version 0.3-2)[12] are used. These extensions are both available on the Internet for free download. Other parts of the content acquisition system (TeleText Grabber, MPEG-1 Encoder and IMU Codec) have several "glue" applications written using C programming language. These applications use appropriate SDKs and they enable fully automatic acquisition and analysis of TV news broadcasts.

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[8] http://www.xmlnews.org
[9] http://www.microsoft.com/asf/
[10] http://www.javasoft.com/products/jdk/1.2/
[11] http://java.sun.com/products/jsse/
[12] http://www.innovation.ch/java/HTTPClient/

4.5.3 Content types

IMU2 content can be divided into the following three types:

- **News articles** – content is text, pictures and metadata.
- **Events and programme information** – content is text and metadata (specific event information, for example: location, start and end times etc.).
- **TV news broadcasts** – content is video and metadata. A video news article containing text, picture and metadata is generated for each news item within a news broadcast.

News articles

News articles are fetched from six different sources. Four of them are online newspapers, which update their content every morning. IMU2 fetchers are scheduled to fetch these articles for the IMU2 database between 07:00 and 08:00 h. The last two news article sources are YLE Internet news and YLE Internet TeleText news, which update their content many times during the day. Content is fetched from these two sources once every 30 minutes, starting at 08:00 h and stopping at 09:00 h. HTML-tagged pages are fetched and parsed. Metadata, keywords and pictures (if available) are extracted; bodytext, ingress and subtitles are wrapped into an XMLNews-Story tagged XML file and a DOM document object is created. Finally, all these elements are placed into a new Article class object, which is defined in DB API, and stored in the IMU2 database.

Events and programme info

Event information includes a one-week programme schedule for movie theatres in Helsinki and Tampere (including critics from Helsingin Sanomat and Aamulehti), plays in theatres, rock, pop and jazz events, other music and other events and exhibitions in Helsinki and Tampere. Programme information contains radio- and TV-programme guides, covering four channels for both media type. A 2-week programme schedule is obtained once per week for each radio and TV channel. Event

information is fetched from Helsingin Sanomat NYT-liite and the Aamulehti web site. Radio and TV programme information is fetched from the MTV3 and YLE web sites. Content is stored on the IMU2 database using the DB API classes, EventInfo and ProgramInfo.

TV news broadcasts

TV news broadcasts are digitised from the Finnish Broadcasting Company (YLE) news broadcasts during the day, usually at 13:00 h, 17:00 h and 20:30 h. Each TV news broadcast is digitised in one streaming format ASF file. The broadcast is first digitised onto IMU Codec's own hard disk and then copied to the IMU Mediaserver. Closed caption text lines with timestamps are also grabbed from TeleText page 333 in real-time during the broadcast. Closed caption text (transcript) and video analysis results (text file with a DAT extension) are combined to produce a video news article for each news item within the news broadcast. Video analysis also produces a representative JPEG picture for each video news article. Since analysis uses MPEG files but the video is streamed to users from ASF files, the file creation time for both files must be used to synchronise analysis results to be relative to the ASF files' timescale. Content is stored in the IMU2 database using the DB API class Broadcast.

ASF encoding is done using a multiple bit-rate setting. The parameters used and their bit rates are as follows:

Dual ISDN		100 Kb/s
Intranet		150 Kb/s
High Speed Internet		300 Kb/s
LAN		500 Kb/s
High Speed LAN		700 Kb/s
Audio	Codec:	Windows Media Audio V2
	Format:	16 kb/s, 16 kHz, mono (for audio/video)
Video	Codec:	Microsoft MPEG-4 Video Codec V3
	Image Size:	CIF (352 × 288) approx. 12 frames/s

4.5.4 Scheduling

The scheduling application in the TeleText Grabber schedules MPEG-1 encoding according to teletext information, which is read every morning for one day's schedule using the TV tuner card SDK API functions.

Scheduling at IMU Codec is done with Macro Scheduler[13], a scheduling and macro scripting tool for Windows 9x, NT and 2000. Macro Scheduler scripts read correct encoding start times and durations from the TIMETABLE.INI file and simulate key-press messages to launch Windows Media Encoder with the correct parameters. Also, copying digitised ASF files from the IMU Codec to the IMU Mediaserver and launching the video analysis software is scheduled with Macro Scheduler.

Scheduling at the Content Fetcher is handled in a Java application, which runs different fetcher threads according to a predefined schedule.

[13] http://www.mjtnet.com

4.6 Database

The database consists of persistent data storage and a database API (see Figure 23).

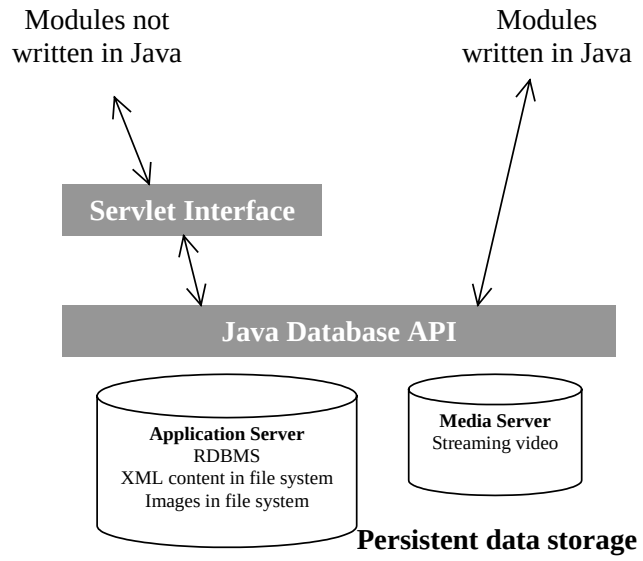


Figure 23. Database architecture.

4.6.1 Database API

As with the other IMU2 modules, the Database API (DB API) is implemented in Java. The DB API provides a transparent interface to a persistent data storage system. That is, other modules do not have to know about the details of the data storage implementation. The same API Java classes can be used by the Content Acquisition module and by various clients, if they are implemented in Java. For software modules that are not implemented in Java, such as some parts of the STB (Set-Top Box), the database provides a Java servlet interface. Since DB API is independent of data presentation on the client, all clients can use the same services. It is recommended that the DB API runs on the IMU2 server in a strictly controlled environment for security reasons. Some DB API services also use specific server resources such as network drives to store images and the textual content of articles.

Package fi.vtt.tte.IMU2.db.java

Package fi.vtt.tte.IMU2.db.java contains an abstract class DatabaseSession that is the actual interface with the database. Classes that extend DatabaseSession may use various database solutions. Two extended classes were developed, one for hard-coded data, used in early development, and one for the final RDBMS. In addition to standard Java classes and primitive types, classes from fi.vtt.tte.IMU2.basic package are used as types for the input parameter's end return values of the interface methods. For example, the method createUser takes an object of type fi.vtt.tte.IMU2.basic.User as an input parameter.

The most time-consuming operation in JDBC code is usually establishing new connections to the database. Since no third-party connection pools are used, creating connections is handled in the DatabaseSession class. A single connection object is used for each database retrieval operation and for modification operations that require no transactions. A new connection object is created for each modification operation that requires a complete transaction. Connection pools could not have been used, because DB API may run outside the servlet engine.

Package fi.vtt.tte.IMU2.basic

Package fi.vtt.tte.IMU2.basic contains basic classes that represent the objects of the IMU2 application, e.g. classes for users, channels and articles. In addition to setter and getter methods to their variables, they contain create and retrieve methods that enable polymorphism. For example, we may have the method createChannel in the class DatabaseSession:

```
public void createChannel( Channel cha )

{
      cha.create();
}
```

We may also have classes that extend the Channel class and implement the methods create and retrieve, such as ArticleChannel and MediaCalendarChannel. An object instantiated from any of these classes may be passed to the method

createChannel as the input parameter. When the create method is called, it behaves in a channel-type specific way. This significantly reduces the amount of code, because branching statements, such as if-else and switch, are not needed. It also lightens the class DatabaseSession, since most of the JDBC code can be distributed in the basic objects.

4.6.2 Persistent storage

RDBMS is the major persistent storage type in the IMU2 system. Images, textual content of articles and video files are stored in the file system. Article metadata stored in the RDBMS contains references to those objects. Since each video file contains a complete TV news broadcast, reference to video must contain the start and end information of the video sequence. Streaming video is stored and served by a separate media server computer. The textual content of articles is stored in XML format conforming with the XMLNews-Story DTD. RDBMS contains article metadata, which is needed for selecting articles and displaying article lists.

There are about 60 tables in the RDBMS. There is a table for each IMU2 object, such as user, channel and article, and usually some tables with one-to-many relationships to these parent tables. For example, each article channel may select content from one or more content providers. IMU2 objects have also respective classes in the fi.vtt.tte.IMU2.basic package of the DB API. Because DB API classes are implemented in an object-oriented manner, plenty of object-to-relational mapping is needed in the JDBC code. The RDBMS stores log information about usage of the IMU2 application in two ways. First, there is a generic table that stores information about each user action and a reference to its parent action. Second, when users remove objects such as channels, they are never really removed from the database. Rather, channels are just marked as deleted. In this way, the modification history of the channels can be found later.

4.7 Video segmentation

The aim of this approach to video segmentation is to provide a tool for showing recorded story-based news programs. Usually the starting time of the news broadcast does not adhere precisely to the schedule. Correcting measures have to

be made for faulty scheduling in order to record the full contents of a news broadcast. Automatic segmentation of broadcast news requires image analysis; the end result can be complemented with other sources of information such as synchronised news transcripts.

The segmentation is divided into two main categories. The correct starting and stopping time of the news broadcast is determined and, furthermore, the video is segmented into stories. Typically, the extracted parameters of the video include colour, shape and texture.

The segmentation is based on some regular occurrences or patterns in the news program – scene clustering. The appearance of the news anchor and various kinds of digital image manipulation govern the boundaries for a story. A story is further segmented in separate scenes and shots.

The news show is digitised in MPEG-1 format. The recorded MPEG-1 file is run through the software and a file containing transition information is formed. The exact starting and ending time of the news program, the starting and ending time of the stories and scenes are among the data that are extracted. A scene is part of a story and is distinguished by an abrupt change (cut) or a slow and gradual change (dissolve or fade). These types of changes can of course apply equally to stories, but the points of change are determined by template matching or some visual prompt that signifies the start of the story.

4.7.1 Methods

A simple feature algorithm is used when calculating the **colour** content. The feature vector is coded with information about the shades and relative amounts of colours. The position of the colours within the image is, however, irrelevant.

The **texture** content of the image is extracted by calculating the spatial frequencies of the pixel brightness of the image. The spatial frequencies are used independently of any positional information within the image.

For **shape** content, a generic method is used. The image is not analysed in order to get an understanding of the content but rather to get a numerical classification

of it. The shape content between different images is distinguished by the direction, curvature and consistency of the edges. Again, the spatial location of the edges is of no importance.

Cut is signified by an abrupt change in image content. The feature vector is calculated by using the absolute position and the contrast in brightness and colour of the pixels in the image.

Fading within an image is characterised by transitions in video content. An overall brightening is called fade-in and an overall darkening fade-out. Fade is calculated by using at least three consecutive frames. The pixels of the intermediate image are compared to the other images. The more pixels that are between that of the previous and next frames, the more likely is the image part of a fade sequence. Furthermore, is the STD calculated, if the STD is at first small and increasing a fade-in is in question and vice versa?

Dissolve is a gradual blending transition in an image sequence where one scene is fading out and the next scene is fading in. The detection of dissolve is calculated like fading except for the STD.

Key frames are defined as change of context. This feature gauges the variation of image content over longer periods (>2 s). The acceptance criterion used depends on the STD and the change of the pixels in the current frame compared to the previous key frame.

Shift is useful in detecting camera movement in perpendicular directions. Here, the similarity between successive images is calculated as a function of displacement. If the location of maximum similarity is changing in a consistent way during several frames, the sequence contains camera movement (pan or tilt or both).

Detection of **blank frames** (black) in conjunction with fade-in or fade-out is very useful for determining the exact start and end of the news show. The blank is, of course, detected by demanding that the mean value of the image is below a given threshold. A further restriction is that the length of the fade-in and fade-out period should exceed 0.6 s.

4.7.2 Story segmentation

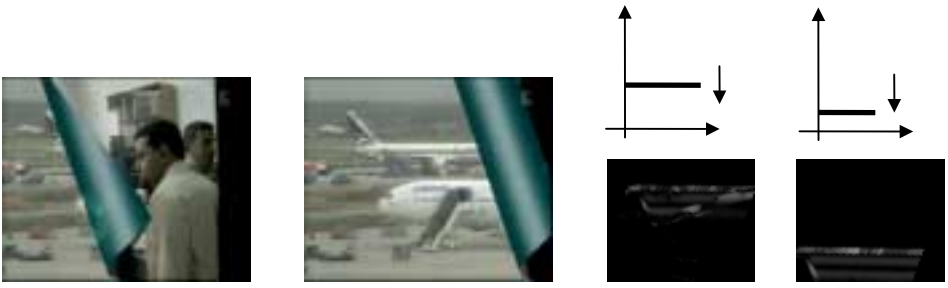
The segmentation of the video into stories is dependent on the analysis of consecutive difference images in order to detect an event in the movie. Two events in the news broadcast signify the start of a story – the news anchor and the digital image manipulation of the broadcast.

Feature matching

There are several thousand scene changes and cuts in a typical news broadcast. The image outlook, however, of individual news anchor shots bears strong resemblance to each other. It is possible to group the news anchor shots in a few clusters using a feature set that is calculated at each scene change. Restrictions are imposed on the clusters in order to weed out undesirable groups. In order to qualify, the members of each cluster have to be distributed across at least half of the news broadcast time scale and to consist of at least three members. The scheme functions correctly even if the news anchor image is changed.

Difference images

Analysis of difference images is used to detect digital image manipulation like the one in Figure 24. Ideally, consecutive difference images show two impulses moving from left to right. In practice, however, the impulses are deformed and covered by noise, especially if the camera is panning in the two scenes. In order to minimise the disturbances, the centre of gravity is calculated for each of the rotated difference images. If the location of the centre of gravity is moving from left to right in a consistent way, the image sequence is classed as the changing point of two stories.



a b c d

Figure 24. Example of image manipulation associated with a change of story. The pictures are paired as a-c and b-d where c and d are the rotated difference images. In pictures c and d, four "impulses" are seen that correspond to the edges of the "turning page". When, in a sequence of consecutive difference images, the impulses are observed to move from top to bottom consistently, a change of story can be assumed.

Scene segmentation

The whole video is analysed frame by frame for the detection of several low-level occurrences. The transitions include cut, dissolve, fade-in, fade-out and blank frames. Any of these occurrences, falling within the boundaries of a story, form the basis of a natural segmentation of scenes. In Figure 25 g, h and i represent a cut or dissolve, which signifies the start or the ending of a scene.

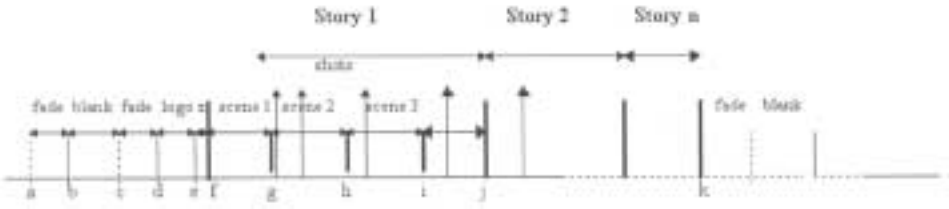


Figure 25. Time representation of a typical video segmentation. The above timeline represents events within the video. Fade-out is represented by a–b, blanks by b–c, fade-in by c–d. During d–e, the news show logo is displayed. During e-f, the news anchor is zoomed in upon. The news program and the first story begin at transition f. The periods f–g, g–h, h–i and i–j signify scenes in the first story. At j, a new story starts, which is usually found by association with the news anchor (template matching). Event k represents the beginning of a fade-out; this also represents the end of the news program. In fact, the sequence beginning with k can be substituted by the sequence a–d.

4.7.3 Software implementation

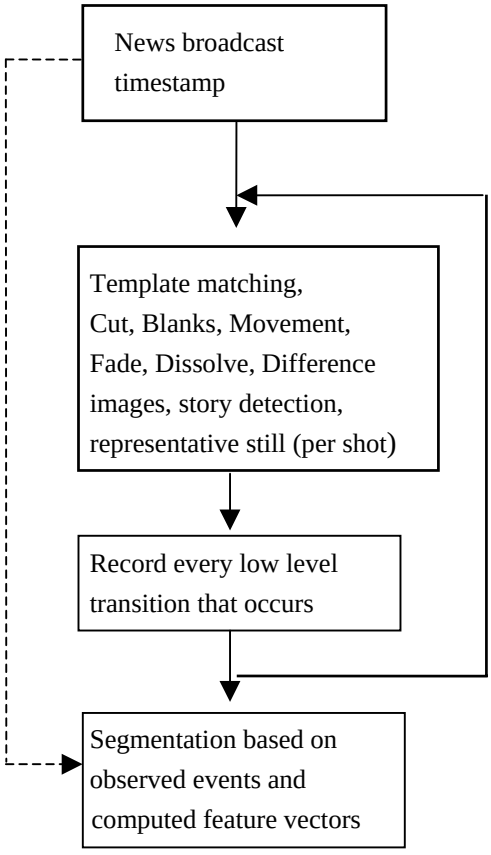


Figure 26. Simplified flowchart of the analysis software.

The video analysis software detection system is built with the help of an SDK from Excalibur Technologies. The software implements MPEG-1 decoding and image analysis functions. The video software implements the functions discussed above. Part of the image content that is segmented from a news video is shown in the example below (Figure 26).

Applicability

The analysis algorithms work in a fully automated manner for use in the segmentation of news programs with clusterable scene beginnings. Other forms of scene transition usually consist of some sort of digital image manipulation that can be handled by methods like the difference images algorithm above.

Example

Stories are segmented from a 13:00 h news broadcast. Here, two pictures are shown from each story (Figure 27): – the first shot of the story and a shot from the second scene. The numbers shown under the pictures correspond to the frame number of the digitised video.





Story 1: 725, 958, .. *Story 2: 1599, 1681, ..* *Story 3: 2171, 2329,*

continues...

Story 4: 3627, 3814, .. *Story 5: 4795, 5060, ..* *Story 6: 5797, 5984,*

Story 7: 6533, 6625, .. *Story 8: 6742, 7118, ..* *Story 9: 7861, 8036, .*

Figure 27. Pictures from a video segmentation.

4.8 New journalistic features

At the heart of the IMU concept, is a proxy server that automatically fetches the contents and re-directs them to various terminals. The text-based news material we use comes from four online newspapers (Helsingin Sanomat, Aamulehti, Karjalainen, Turun Sanomat) and one online news-site (Yleisradio). All of them are big players in the Finnish media arena. The web material is fetched, indexed and saved to the IMU proxy server. Another source of material is television newscasts; we similarly fetch and save TV news onto our proxy server.

All this means that the news-feed available is rich in content. It is, therefore, possible to offer the users a variety of angles on different topics because – at least in theory – the various media have their individual perspectives from which they cover daily life. Another enriching aspect is that there are different types of news formats available. The largely static journalistic presentations of online newspapers can be augmented with video-clips from TV news. In addition to the general news service, we have added to the IMU system such features as news packages, thematic news channels and discussion forums.

4.8.1 News packages

Apart from just administering the news-flow, the IMU editors construct special news packages. The news packages are created from the material that is fetched from the different media (text-based news with pictures, television news stories). For example, if one day a hectic political debate erupts, naturally most of the online newspapers cover it, hopefully from at least slightly different angles and using different sources. The IMU newsroom can then gather the most interesting output into a coherent news package which offers the audience a broader view of the topic than separate pieces of news that are scattered all over the IMU departments. The newsroom furnishes the news package with an appropriate lead and contextual material such as links to outside information resources on the Internet.

The editors place the lead article providing background information as the main news article, and put other important articles in the news banner of the package.

All the articles, as well as links to other Internet sites, are in the article menu. The link to the discussion forum is at the top of the news banner. The editors can also quickly construct news packages without including any material of their own just by gathering the relevant articles from the IMU archives. The editors can, for example, select a television news story to be the lead and then amplify its scope with newspaper articles (Figure 28).

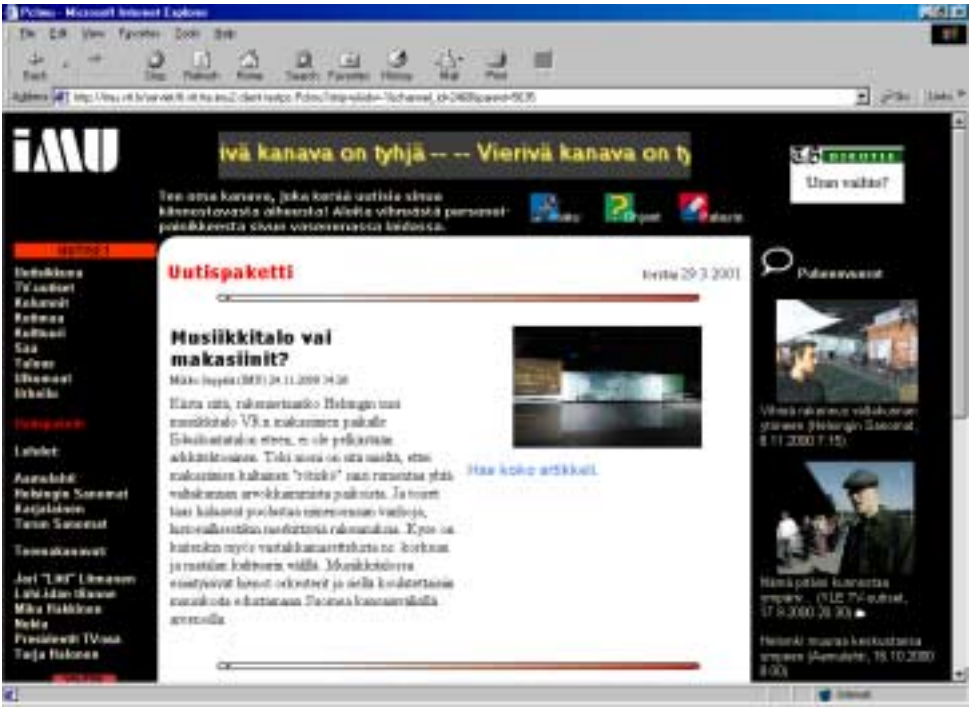


Figure 28. The news package covering the controversial Helsinki music house.

An important aspect in our integrated publishing concept is that the news packages may contain material not only from different sources but also from different types of media. The IMU newsroom can compile the news package using largely text-based news from newspaper sites alongside lively news material produced by television journalists. All of the material is already in the IMU system, so it can easily be retrieved by the editor compiling the news package. The news packages offer users a *multiple media coverage of topics with the editing input from the IMU newsroom as an added value.*

4.8.2 News discussion forums

To every news package, we added a news discussion forum. In the forum, the users can enter discussions centred on the topic of the news package in question. What is important is that the IMU editors actively take part in the discussion forums. Their role is to launch a discussion with their own contribution, or, for instance, with a specially commissioned contribution from an expert on the topic. The editors also moderate the discussions, and wrap up and close the forums at some stage.

In the discussion forums, the message rated most important by the moderator is placed in the main area in the centre (in the same way as the most topical news article). The moderator can also lift up some other messages by placing them in the news banner (or in this case the *message banner*). All of the messages are listed in the article menu (Figure 29).

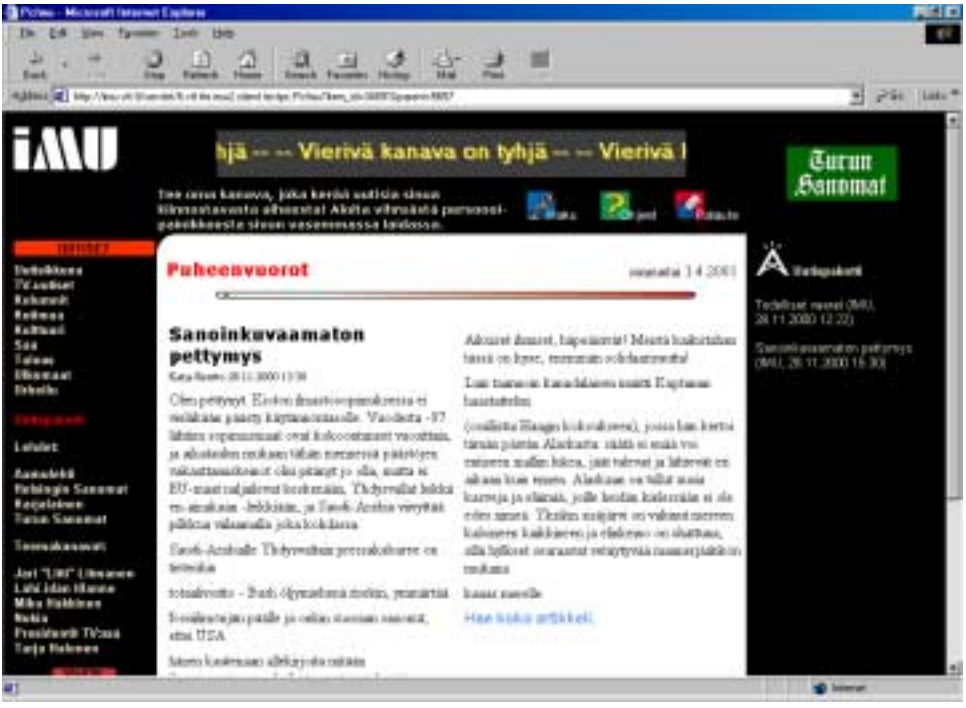


Figure 29. The discussion forum of a news package.

The users can write their own messages by either choosing to compose a totally new message or to comment on somebody else's message (Figure 30). In both cases, a text editor opens up in place of the message, where the user can write her words and then post the message.

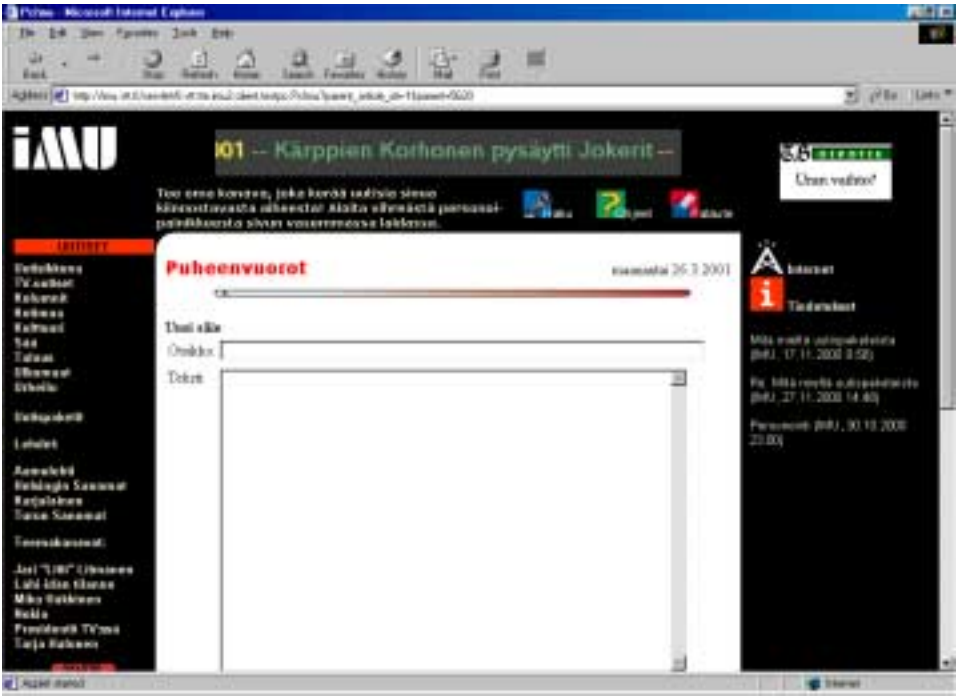


Figure 30. The text editor for posting messages for the discussion forums.

4.8.3 Thematic news channels

One aspect of IMU2 that was inherited from the previous IMU project is the personalisation of news. From the user's point of view, the IMU setting means that the sheer amount of available journalistic material is overwhelming (this can be expected when news from five important media is available in IMU). To fight the information overload, IMU offers the possibility of filtering the news feed. Using a Personalising Wizard application, users can, for instance, diminish the number of news channels appearing in their interface and, thus, reduce the amount of incoming information. It is also possible to create one's own personalised news channels. In this case, users can create a news channel

providing all the news about, for example, the suburb they live in, their hobby or the football star *Jari Litmanen*.

The editorial staff use the Personalising Wizard to create thematic news channels, which the users are able to subscribe to. In a way, the thematic channels are channels that are *personalised by the editors for the users*. Where the news packages are rather short-lived by nature, the thematic news channels contribute towards offering constantly updated, longer-term information about evolving topics. During the trial, we created, among others, a thematic news channel concentrating on the US presidential election, where the users could find all the current news, as well as older information from the course of the campaign. The channel was filled with interesting news, especially during the post-electoral confusion and various vote counts.

4.9 Editing application

4.9.1 Principles

The creation of an IMU newsroom combines the benefits of automatic news generation and the professional expertise of journalists. The essence of the newsroom is that the editors can always override the selections made by the proxy server. They use judgement based on journalistic values and professional skills and, in this way, improve the performance of the automatic system. During the trial period, the IMU newsroom staff consisted of two editors whose main task was to manage the news flow. In addition, they personalised thematic news channels, created news packages from the material fetched from the different news sources and moderated the discussion forums.

With the editing application, the editors can select the news for the main news slots (separately for the front page and the different news departments), delete repetitive news (such as material based on the same wire-service piece), move articles from one channel to another and delete incorrect links. These tasks are simple to accomplish: for example the articles for the news banners of the individual channels are chosen by giving them numbers 2 through 7 in the editing window. Number 1 places the article as the main news article, and 0 deletes the article from the system (Figure 31).

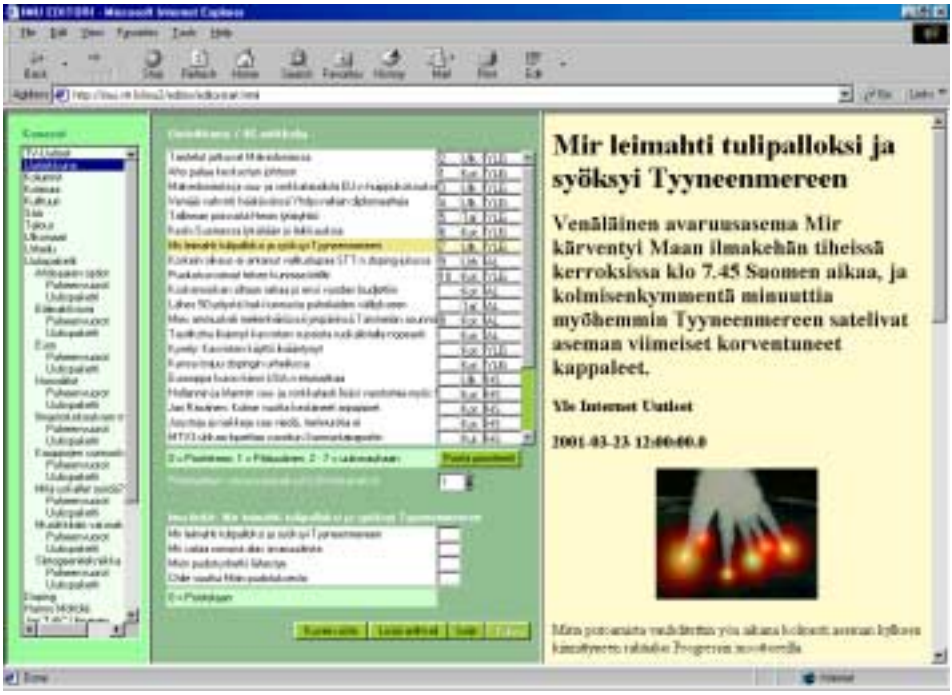


Figure 31. The editing application for controlling the content of different news channels.

We created a *rotation system*, for those times (evenings, nights and weekends) when the two IMU editors are not at work, which uses an algorithm to count the importance of different news articles. Thus, the main news in IMU is not selected randomly, but with the aid of an equation using the status and newness of the article. So, if the original article is placed on the front page of the online newspaper from which it is fetched, then it also gets a high value in the IMU system, which is even higher if the article is very recently created. The rotation of the news, for instance in the news banner, functions according to these values. The rotation is dynamic, so every time the user chooses a channel, the IMU system checks to see if there are any new articles with high rotation values, and then changes the order of the news accordingly. The editors can manually set a time for each channel after which the rotation system kicks in, so they can force their selections to be active for the period they want (normally 1–3 hours).

The editors can easily compile the news packages in a separate section of the editing application. With the search function, they can quickly get a list of the

potential news articles in the IMU system that could be added to the news package in question. The editors can read the news items in the list to see if they are valid enough to be included in the package, and then add the selected ones to the package. In addition, the editors can attach external links to relevant web sites. The order of the articles in the package can be arranged with the same numbering system as in the ordinary news channels. The news and link collection in the package can be altered at a later stage. The editors use a text editor to write the lead article for the news package and also to add a picture to the article. The pictures can be moved from the hard disk of the editors' workstations to the image archive in IMU. In the news package section, the editors can also write a small notice for the users, that appears in the upper part of the IMU interface (Figure 32).

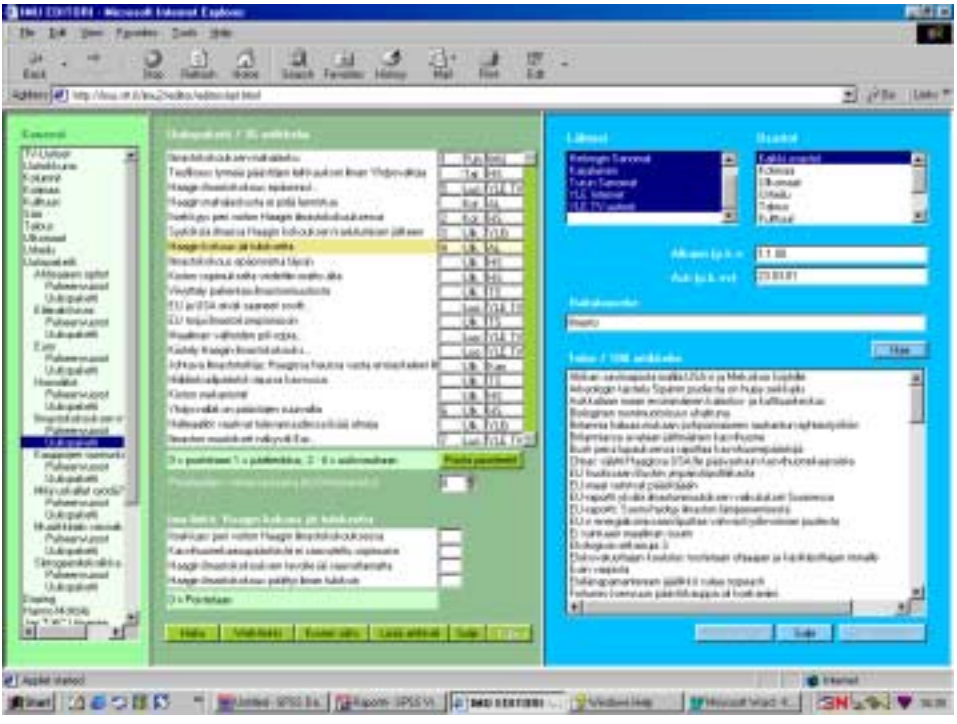


Figure 32. The editing application for creating news packages.

The discussion forums can be moderated with the same simple system (the community moderators can act only in their own forums). The IMU editors or the community moderators are able to select the messages on the news banner in

the discussion forums, thereby placing them in a better position. They can also remove unsuitable messages. The editors and moderators can easily write their own messages with the same type of text editor as is used for writing the lead articles for the news packages, and also add pictures to the messages (Figure 33).

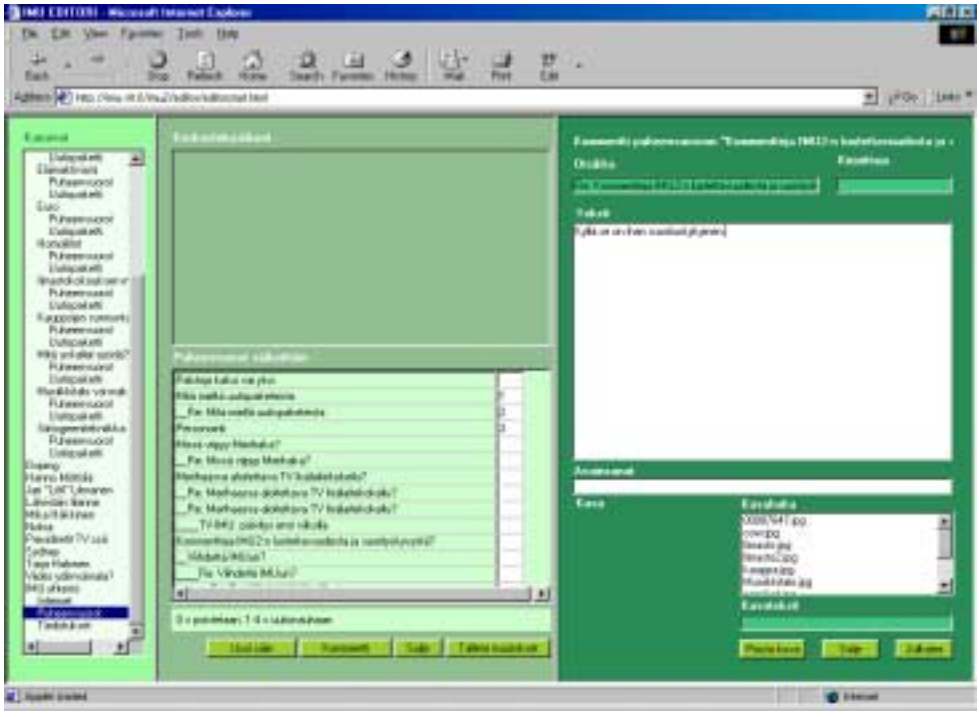


Figure 33. On the right, the text editor that is included in the editing application.

The bulletins for the community channels can be written with the same text editor. The moderators can also add links to other web sites. The order of the bulletins can be arranged in the same way as is done with the news articles.

The thematic news channels are first personalised by the editors and then manually added to the list in the Personalisation Wizard for the users to subscribe to. An editing application for the advertisement channel was planned but never implemented.

4.9.2 Implementation of the editing application

The IMU editor is a typical three-tier View Model Controller (VMC) application. The visualisation (V) part was implemented with applets, the controller part (C) with a servlet and the model part (M) is the IMU database system as with all the other IMU clients.

The editor tool consists of applets that communicate with each other using a static Java class [Mecler 1997] and a controller servlet that communicates with the applets by means of HTTP tunnelling, which means that the applets send requests as serialised Java objects to the controller servlet. The controller servlet sends the requested data back to the applets in the same way. The controller servlet uses Java 1.2.2 objects defined by the database API to hold information about the channel, articles and other items needed by the editor. The applets use lighter Java 1.1 objects. The controller servlet converts objects from Java 1.2.2 form to Java 1.1 form and back. Java 1.1 is used on the client side because this version of Java is supported directly by the browser, which means that many of the classes needed by the editor applets do not need to be downloaded from the server.

One of our goals was to make the editor so flexible that it can work with arbitrary hierarchical channel structures. As little as possible of the structure of the current channel systems is hard-coded into the editor. The channel hierarchy is visualised simply by using indentation on the channel list applet.

The editor window is divided into three frames. After login, the frame on the left contains the channel list applet. This applet is active throughout the entire editing session. When the user selects channels from the channel list, other applets are loaded into the middle frame using the `showDocument` method in the `AppletContext` class. The applet in the middle frame shows a typical list of articles.

Most of the editor operations consist of fetching or storing channels, articles and article metadata; these are all done on the server side by the controller servlet. There are, however, two additional servlets: one for showing articles and the other for storing uploaded images. The servlet that is used for showing articles generates XML pages with normal XML to HTML conversion on the client side.

Internet Explorer supports file uploading so that the client part of the uploading system is fairly straightforward. We only needed to write an HTML form where the input `type` is `file` and `enctype` is "`multipart/form-data`" [Hun98]. For file handling on the server side, there is a servlet that stores the uploaded file in the server's file system. This servlet extracts files from the input stream and stores them using slightly modified code from the IMU data acquisition module.

```
<form action="/servlet/IMUUpload"
      enctype="multipart/form-data"
      method="post">
  File name: <input type="file" name="file">
  <input type="submit" value="Submit">
</form>
```

4.10 Community communication

During the trial period, there were three real-life communities taking part in IMU. Two of them were local communities (Merihaka and Iidesranta) consisting of people living in the same area, and one was a hobby group (Montaasi). However, the Montaasi community never really became involved, as only a few members registered and nothing was published on their channel. Also, the content produced by the Iidesranta community was quite limited. One additional, virtual community was the IMU community. The IMU community channel was meant for all IMU users to gather in cyberspace and discuss matters related to IMU, or read information concerning IMU.

Each community has its own sphere (channel) within IMU where the community members (and members only) can post and read community information. The communities have a couple of moderators who are supposed to edit and publish material in the community bulletin area. In addition, there is also a discussion forum for each community for internal debate. The communities are also able to create their own personalised news channels. These community news channels can present a filtered selection of all the IMU content that is based on the interests of the communities.

The community members can access their own dedicated channels through the IMU front page, thus also seeing the daily news feed. The interface in the community channels works the same way as in the news channels. The community bulletins posted by the moderators (shown by default) open up in the main news area. The rest of the bulletins are listed in the article menu below. Important bulletins chosen by the moderators are shown in the banner on the right-hand side. The community discussion forums work exactly like the discussion forums attached to the news packages. The personalised community news channels work like any other personalised channels. The moderators can use the same editing application as the IMU newsroom.

As was said earlier, it was planned that the IMU newsroom staff would work in close co-operation with the moderators. Before the trial began, they trained the moderators to use the editing application, and were also supposed to help them if they needed assistance in creating content for their channels or inviting guests to their discussion forums. However, the actual amount of co-operation was quite small, as the communities' actual interest in the trial appeared to be lower than expected (more of this in Chapter 7.3), and they therefore did not see the need to request help in producing the content for their IMU channel.

5. Methods used in the study and the collection of the data

5.1 Usability methods

5.1.1 User interviews

TV and PC-users were interviewed on three separate occasions: The first interview *(See Appendix C and F)* was at the beginning of the experiment after which the questionnaires *(See Appendix H)* were transmitted to the PC screen and others were sent by mail to TV *(See Appendix I)* users. Based on the results of the questionnaires, a phone interview *(See Appendix J)* was carried out. More details about the questionnaires appear in Section 5.1.2. The last interview *(See Appendix D and Appendix G)* was executed at the end of the experiment during winter 2000 and spring 2001. WAP users were interviewed *(See Appendix E)* once during spring 2001.

Six test users were interviewed for the first PC interview, and in the last interview, five test users were interviewed. One test user refused to participate in the last interview. Nine of the PC test users were interviewed by telephone. In the first TV interview, four test users were interviewed and in the last TV interview, six test users were interviewed. One of the test users interviewed in the first interview refused to participate in the last interview. Three new test users were interviewed in the last interview. Two WAP users were interviewed.

The interview questions were based on the theories presented in Section 2.3. Before the actual interviews, the questions were tested; in this way it was possible to change some ambiguous questions and ensure that the interviewee understood the questions properly. Different terminals had specially adapted questions based on the fact that user context, functions and features are not the same in every terminal. Basically, the questions concerned learnability, memorability, readability, navigation and ease of use.

The interview stations were VTT's usability laboratory and the test users' homes both in Tampere and Helsinki. An interview lasted from 50 minutes to 1 h 30

minutes. The interviews were video recorded and executed as user-centred interviews.

5.1.2 Questionnaires

After the first round of interviews, the usability of the PC was researched by an electronic questionnaire *(See Appendix H)* that appeared on the PC screen. There were 10 statements concerning different easy-to-use features of IMU. Respondents answered by choosing the most convenient alternative out of six possibilities. Besides the statements, respondents had a chance to make comments about IMU. Statements stayed on screen for a 1.5-month period at the end of the year 2000. Seventy-seven users provided answers to the statements.

After the first round of TV interviews, the STB users were sent a questionnaire about their experience of IMU. Several questionnaires were sent to each household. There were 11 statements about usability, especially ease of use. Respondents answered by choosing the most convenient alternative out of 6 possibilities. There was also the opportunity to make comments about the system. Ten questionnaires were returned.

5.1.3 User comments

Users had the opportunity to give direct feedback about PC-IMU via e-mail. Comments concerning usability were kept in mind when evaluating usability.

5.1.4 Expert evaluations

In expert evaluations, the systems used in the different terminals were checked systematically using some basic functions and by following the usability guides presented in Section 2.3. For example, in a PC system, creating one's own channel was a function that could not be carried out on other systems, so it was tested repeatedly. The same kind of testing and repetition was also carried out with the other features and functions presented in Section 3.1, and in Chapter 4.

In the TV system, the walk-through mainly concentrated on navigation. The distance between the user and the set-top box, and a new kind of navigation with a remote control are things that were considered to be so difficult that repeated testing was considered to be wise. Also, the search function was considered to be such an important feature that it was tested more carefully than other features.

The WAP system was tested differently. The walk-through was also based on Section 2.3. guidelines, but in addition, the system was compared to other existing WAP services.

5.2 Evaluation of the journalistic features

There were 410 registered users, of whom 335 were more or less active participants in the trial. Thirty-six of them were registered as community users. The majority of the participants used the IMU system with their PCs, but 10 television set-top boxes were also given to families (seven in Merihaka, two in Iidesranta and three in Joensuu). The users also included eight journalists as a special focus group. We also tried to select women and older people for the interviews, although the majority of the participants in the trial were young males. All the journalists were male, the rest of the users interviewed by the researchers of the University of Tampere comprised 13 men and 7 women.

The participants that were interviewed used IMU on average a couple times per week, according to their own estimates. Only three were heavy users, who logged into the system every day, sometimes several times a day. One of them also considered IMU to be her most important news source, partly because she had not subscribed to a newspaper.

The journalistic aspects of IMU were researched qualitatively by interviewing the eight journalists alongside 12 ordinary users (10 PC users and two STB users). All of the journalists worked in the participating media corporations and were the same reporters who were interviewed for the IMU report carried out in autumn 1999 (see Chapter 3.5.1). The other interviewees were residents of Espoo, Helsinki and Tampere. The interviews lasted between 30 and 75 minutes, and they were recorded on tape and then transcribed. In the thematic interviews, we used three different question sets: one for the journalists, one for the

community users, and one for the ordinary users. All the interviews were carried out in Finnish, so the responses might have lost some of their authenticity when translated into English. The interviewees were told that their opinions would be handled anonymously. In addition to the interviews, the research material also included the content created by the users and their online feedback.

The quantitative methods of obtaining material comprised log file analyses and an online questionnaire carried out at the later stage of the trial. Most of the log data information dates between September 18th and December 3rd 2000. The log files provided a lot of information compared to the IMU1 trial, as the amount of users was six-fold. The online questionnaire was completed by 64 PC users and nine STB users, which is quite a small share of the total amount of users. Therefore, it can be assumed that only those who were more enthusiastic about IMU were still active users at the time of the questionnaire, and in this sense responded more positively than the average user would have done (however, the users were also encouraged to answer the questionnaire through a raffle of movie tickets for the respondents). The questionnaire had 13 multiple-choice (totally agree, almost agree, slightly disagree, totally disagree, no opinion) questions and also a space for comments. Both qualitative and quantitative results are reported in Chapter 7.2.

5.3 Evaluation of the community features

The opinions of the community users and their usage statistics were analysed using the same methods as were used for the ordinary users, although a larger share of the community users (eight out of 36) were able to be analysed more profoundly by interviews (five PC and three STB users). The community moderators were interviewed in September before the start of the trial. Later on, in January, their opinions on the system were assessed again with a short e-mail interview. The evaluation results of community usage are reported in Chapter 7.3.

5.4 Corporate users and commercialisation

Corporate users of the environmental scanning function were interviewed and their use of the publication was analysed by interviews after the trial. This

information was compared to the results of the telephone interviews concerning environmental scanning as well as to the results of the interviews of companies as potential users, discussed above, and the results gathered from log files. Eight corporate users were interviewed before the trial and six afterwards. The interviewees after the trial were selected by studying log files.

Advertising and commercialisation of the IMU publication were studied by comparing interviews both before and after the trial. Advertising and the IMU concept were tested before the trial with 10 interviews and after the trial with six interviews.

6. Description of users

6.1 Background of trial users

Ten different user groups tried IMU. Of these 410 potential users, 325 have actually used the system. All users apart from TV-IMU users and WAP users used PC-IMU. There were also users who tried more than one terminal. The table below (Table 2) shows the main terminal that each group used.

Table 2a. User group.

User group	Size
Cable modem users	233
Helsinki University students	44
Tampere University students	33
ADSL users	27
Iidesranta community	19
Merihaka community	9
WAP users	16
Environment watching users	10
Journalist trial	9
TV-IMU users	10
Total (IMU community)	410

Table 2b. Age group.

Age group	Size
Under 12 years old	3
17–24	139
25–34	182
35–44	51
45–54	26
55–64	8
over 65 years old	1
Total	410

Most of the potential users were males, 360. There were only 50 females who took part in the trial. Potential users were mostly quite young (Table 2b), with 324 of them under 35 years. There were also quite a few students, 160 (Table 3a). Most potential users were also very experienced or quite experienced computer users (Table 3b). Time spent browsing web pages in the week also bears this out *(See appendix B, Figure 1).* Of the users, 217 users surfed the Internet more than 10 hours/week. It can be said that a typical potential user was a young male student, very experienced in using computers. A distorted distribution may have some effect on the results. Pentium 2 was the most frequently used processor *(See appendix B, Figure 2).*

Table 3a. Occupational group.

Occupational group	Size
Higher officer	93
Lower officer	46
Entrepreneur	24
Labourer	67
Student	160
Pensioner	5
Housewife/househusband	2
Unemployed	3
Other	10
Total	410

Table 3b. Experience in using a computer.

Experience in using computer	Size
Very experienced and versatile	326
Experienced and versatile	61
Somewhat experienced and versatile	13
Somewhat inexperienced and limited	1
Inexperienced and limited	1
Very inexperienced and limited	0
Missing values	8
Total	410

Most respondents represented single- (n = 147) or two- (n = 148) person households, while 278 of all respondents reported not to have children. If the family had children, they were most often 1–4 years old (n = 46).

The most interesting of all topics introduced to respondents was information technology. More than half of the respondents were interested in economics, mobile phones, computers, science, sports, travelling, movies and music. Least interesting topics were pets, handicrafts, antiques, gardening and plants. The respondents had a relatively neutral attitude (mean) towards Internet advertising. Advertisements should include information about products and the subject of the advertisements should fit with the other contents of the page. (This result is in keeping with the advertising interviews in 1999, discussed in Chapter 3.9). The respondents most often disagreed with the statement that "advertisements are entertaining" and stated that they did not usually click on advertisements.

6.2 Description of the participants' media usage

Those who registered on the IMU trial represent a very *computerised* portion of the Finnish population: over 98% have a computer in their household (one user reported owning no less than 12 computers). Over 97% of the IMU users also own one or more mobile phones. The WAP phones are less common as only 23% own one (Figure 34).

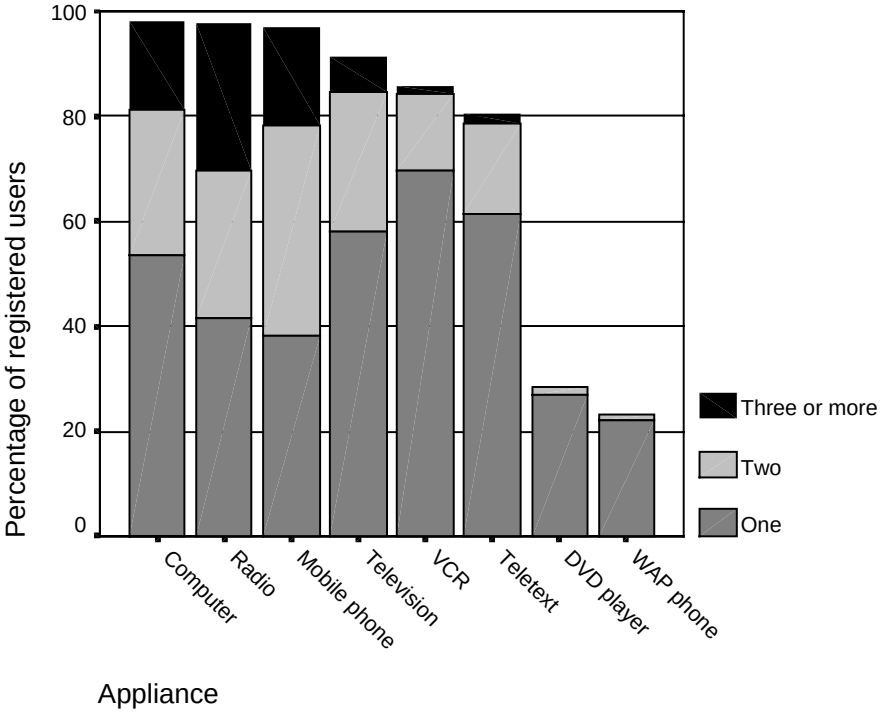


Figure 34. The media appliances owned by the registered users.

The use of the Internet is extremely common among the IMU participants, as 99% use it daily. The nationwide statistics show that in the year 1999, only one-fifth of the whole Finnish population used the Internet daily. Television is viewed every day by 85% of IMU users, but only 62% read the daily newspapers. The radio and teletext were used daily by over half of the respondents (Figure 35).

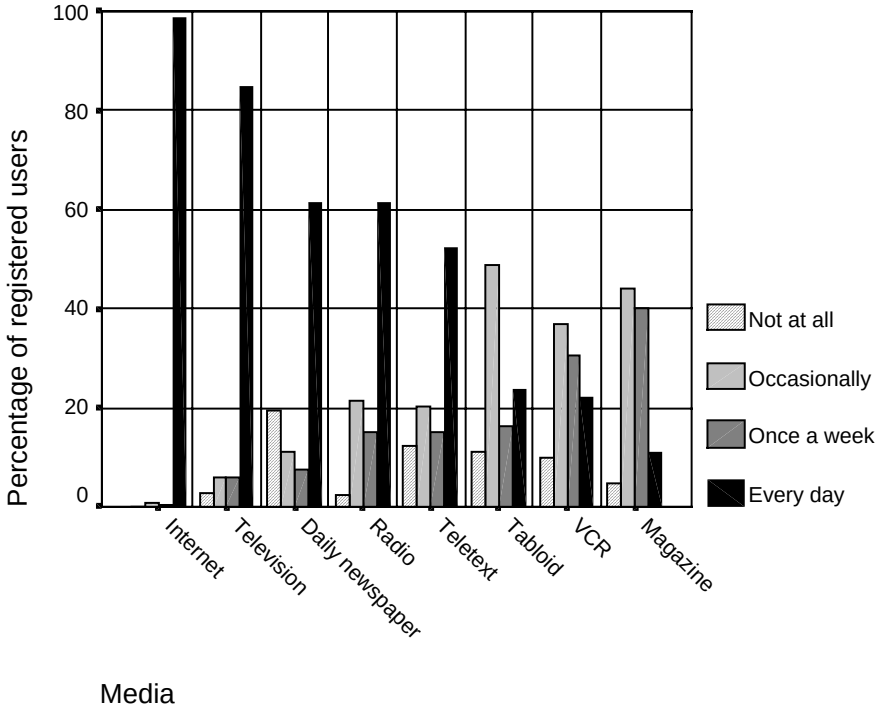


Figure 35. The media usage of the registered users.

As a source of news, television is clearly the most popular. However, the Internet is already second, and has overtaken newspapers and the radio as a news medium. These results are quite interesting in the IMU context, as IMU is a web medium also offering television news (Figure 36).

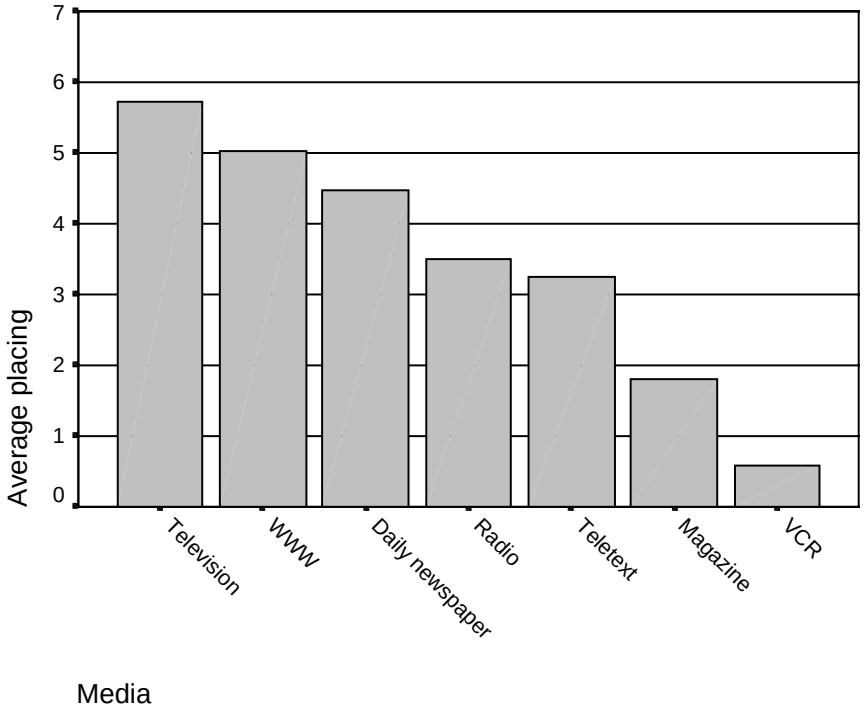


Figure 36. The use of different media as sources of news information (the respondents prioritised the media from 1 to 7, 7 being the most important).

The difference between the WWW and television is smaller as means of entertainment and pastime, although television is still more popular (Figure 37).

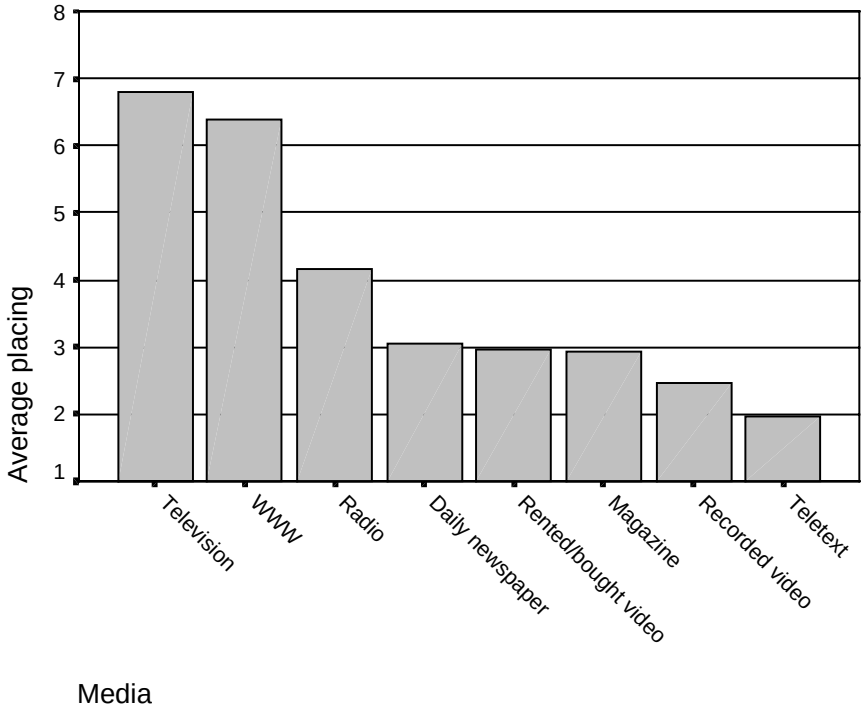


Figure 37. The use of different media as sources of entertainment (the respondents prioritised the media from 1 to 8, 8 being the most important).

The respondents spend quite a lot of time on the web, as half of them spend over 10 hours a week at various web sites. Only a few per cent spend less than one hour per week on the web (Figure 38).

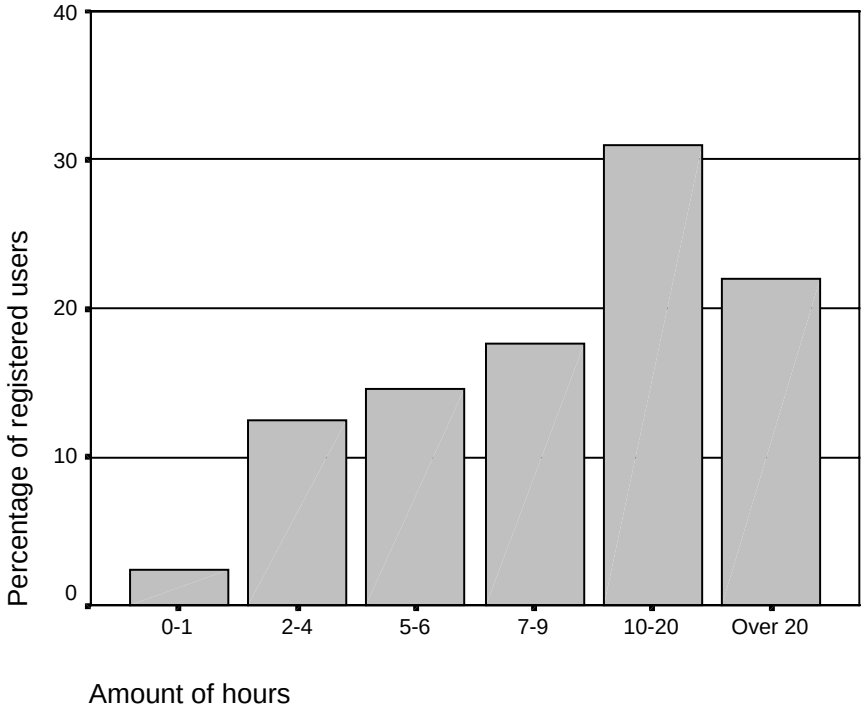


Figure 38. Time spent on the web per week.

On the web, the registered IMU users spend most of their time acquiring information: they read news, use search engines and bookmarks to find certain information, etc. Activities such as non-specific surfing, listening to music and playing games are a lot less common, according to the respondents' own estimates (Figure 39).

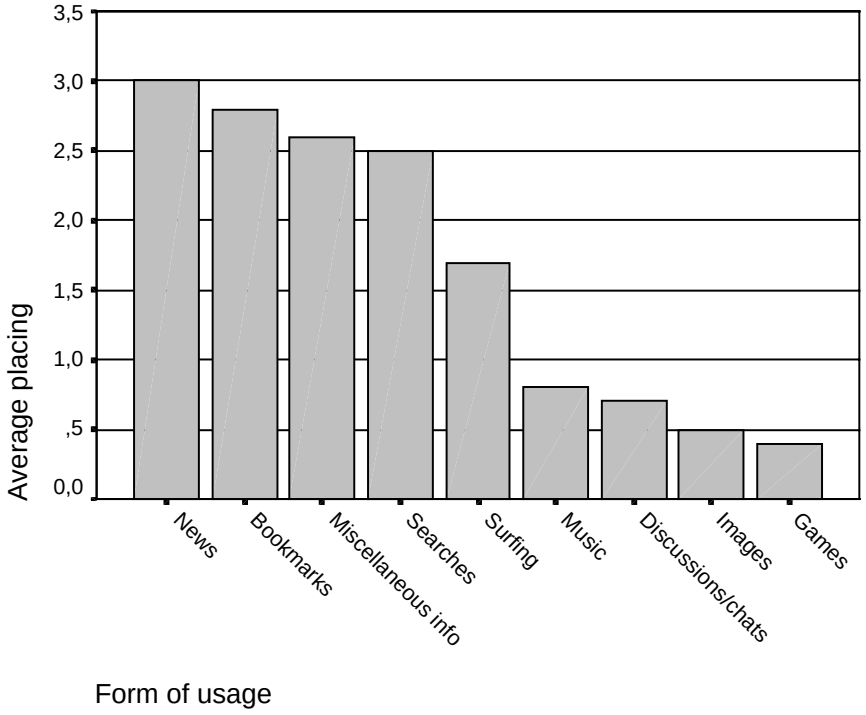


Figure 39. The forms of web usage (the respondents prioritised the forms from 1 to 5, 5 being the most important).

The most popular of the participating media are the television newscasts of Yleisradio. The majority of the registered users watch them every day. Of the newspapers, Helsingin Sanomat is read commonly. Aamulehti, Turun Sanomat and Karjalainen are read far less often. This correlates well with the fact that most of the registered users are from the Helsinki area, and only a small minority come from Tampere or other cities. About 90% of the users say that they never read Turun Sanomat or Karjalainen.

The Yleisradio site and the Helsingin Sanomat site are the most popular web sites of the participating media. However, the users do not log on to the online publications as often as they the watch the Yleisradio television news or read Helsingin Sanomat on paper. With the rest of the media, there is not much difference between the popularity of the newspaper and the online publication (Figure 40).

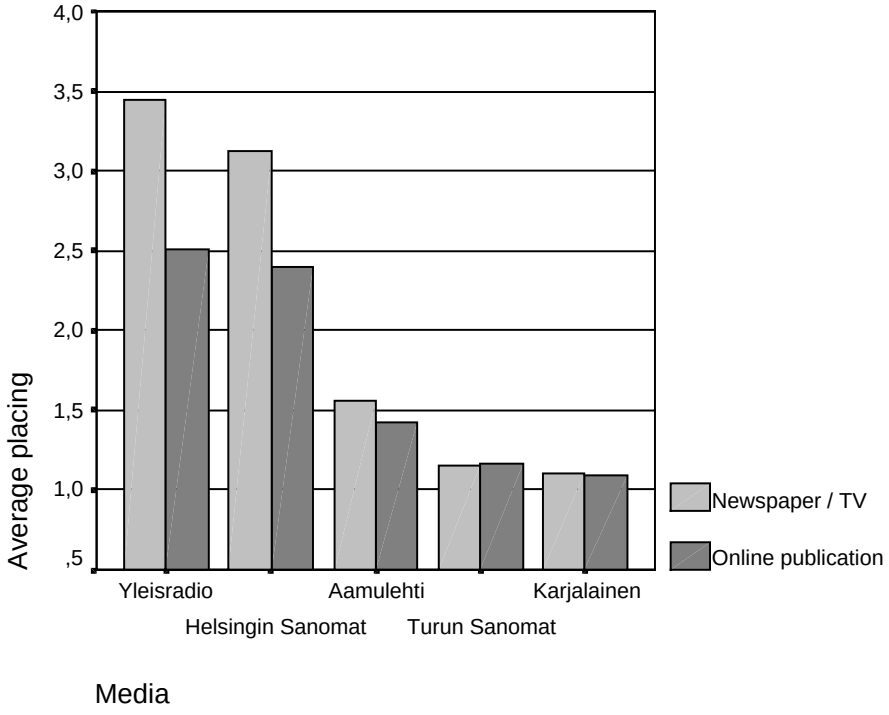


Figure 40. The popularity of the participating media (4=every day, 3=once a week, 2=occasionally, 1=never).

7. Results

7.1 Usability

7.1.1 Ease of use

The PC and WAP systems were considered to be easy to use; the TV system, on the other hand, was considered to be difficult to use. The problem with TV was mainly navigating and commanding using the remote control, which was felt to be difficult and unfamiliar. Navigation is dealt with more fully in section 7.1.5. Usability is handled in section 2.3.1.

One purpose of the IMU2 project was to examine how the features and functions of the PC service works on a TV service, so all the functionality that was offered in the PC-IMU system was also included in the TV-IMU system. This experiment brought perhaps too many features to the TV system, which, on the other hand, was controlled by remote control. Using a remote control as a tool to select an item and move on the screen is, in a way, clumsier than using a mouse. Also, the way of moving on the screen (navigation) is different with a mouse and a remote control: controlling and navigation with a mouse is direct manipulation. This means that the user has to click the mouse button only when he or she is pointing at the required item. However, with a remote control, the user has to click the remote control's navigation buttons several times before she or he even reaches the required item, after which the item has to be selected with a further button click. In the test, it could be noticed that the difference is so remarkable that in some cases it affected the user's will to use the service.

Based on the test results, the TV service as such was too difficult for novice users. The number of features must be reduced, or, alternatively, the service must be structured for different user levels, e.g. a level for novice users and a level for expert users. But then again, such a result was to be expected – one aim of the research was to find out how the same functionality works on a TV and on a PC.

Between the first and last interviews, the systems were expanded and modified based on the results of the first interview. The major change in the TV system was better feedback (it was felt to be inaccurate during the first interview); voice feedback and navigation were made easier by changing colours when the cursor

had activated a particular link. In the PC system, one new feature, *the environmental scanning wizard*, was added after the first interview. Moreover, some clarifying changes were made with colours in the article menu, and also the *help*, *search* and *feedback* buttons were formatted.

PC

The PC IMU-service was considered to be easy to use. Ease of use was measured with questionnaires and with theme-centred interviews. Quantitative results of the questionnaires can be seen in Chapter 7.1.2. In the beginning there were some problems; when test users tried to use the service, the system crashed and needed to be reloaded. At the first test, users reported some difficulties with creating their own channels, also the search statement, basic words with Boolean operators AND, OR or NOT was felt to be difficult. The search results were not what the users had expected. This means that when the search was focused on each segment of a newspaper (i.e. sports, economics, weather, TV-programs, culture, etc.) the search-result was quite diverse. Only the article menu on the bottom of the screen was considered to be difficult to use; it was suggested that there should be, for instance, fewer articles to choose from or a larger row width.

"*...I still wouldn't find anything from here* (referring to the article menu) *not very easily anyway. It's difficult to find a single news article from here...*"

But overall, the basic functionality (i.e. reading an article and selecting an article) was felt to be easy. Once the technical problems were solved, users did not report any difficulties concerning usage. Also, the test users who were interviewed gave really positive feedback.

“...This is easy...” “...this is quite easy, even if you had never used this before. It doesn't take long to learn how to use this (meaning the PC-IMU)...”

Before the last interview, the PC's user interface was formulated and the test users found these new changes to be useful and that they made the system easier to operate. The difficulties were similar to earlier problems. The basic use, reading and selecting articles, and also the formatting of one’s own channels or creating new ones were notably improved. Test users were familiar with the system and found things easier and faster.

TV

At first, the navigation and commanding with a remote control that had technical problems were the main difficulties with the system. The remote control was felt to be an odd tool and difficult for moving on the screen and opening links.

"... She opens Helsinki movies from the Event and Media Calendar, and tries to open one particular movie called "American Beauty", but does not succeed, though she tried several times. *Navigation is really difficult*, she says and suddenly she is able to open another movie, but not the one she was wanted..."

The feedback was seen to be inadequate, and it improved appreciably after the first interview at the beginning of test use. The interviewed test users also wished that they had a back-button – the system's information structure did not have enough navigation support. This was considered to be as serious absence and resulted in needless effort by users.

By the time the test users were interviewed for the second time, there were still some difficulties, but the basic navigation was felt to have advanced. Test users were able to do what they wanted more easily and without errors. The main structure was clarified and the improvements were noticed and felt to be very good. The search function was easier to use, as was recording, because of better feedback. Still the system's reliability and speed was not fulfilling expectations.

WAP

Test users were quite pleased with the WAP IMU service. It functions as other WAP services do, and the structure is quite similar. So, if you have used some other WAP services, you can also use the IMU service. The problems that were mentioned were about hyphenation; it felt unnatural and slowed down reading. In other WAP services the text is not hyphenated, and test users felt it to be a better and faster way of reading. Also, there was no possibility of reversing one or more steps in the middle of an article. The links to the previous level of the hierarchy can be accessed from the bottom of the page, but not by interrupting the reading.

7.1.2 User acceptance statistics

Different aspects of the PC-IMU were estimated on the electronic questionnaire that appeared on the PC screen. One was the worst score that an aspect could receive and six was the best. 77 of the test users filled in the questionnaire. Results were relatively similar on all features and well in accordance with results from interviews. Self-learning and memorability gained the highest points and the consistency of the system had the lowest score. Other aspects are dealt with as follows: Speed and reliability in sections 7.1.1 and 7.1.6, navigation in section 7.1.6, personalisation and search in 7.1.1 and 7.1.4, and utility in 7.1.9.

The results about self-learning and memorability support the results from the first and last interviews. It was found that test users learn to use IMU quite quickly and easily. IMU was considered to be useful but competing information sources were mentioned, for example newspapers and other Internet based services.

There was no single outstanding and clear cause of inconsistency in the system. There are some single points that, taken together, can be assumed to affect opinions and create a conception of inconsistency. The use of the back button in the browser did not always lead to the previous page. Some of the test users found the appearance of the same title in both the article menu and the news banner confusing. Also, it can be assumed that using the name *muokkaa* for two separate personalisation features is confusing and inconsistent. This term was later replaced with *Personoi (Personalise) and Valitse (Choose)*. The following points were also found to be inconsistent: search results do not always match the query, the whole article should open with one click and old news should not appear in the article menu (Figure 41).

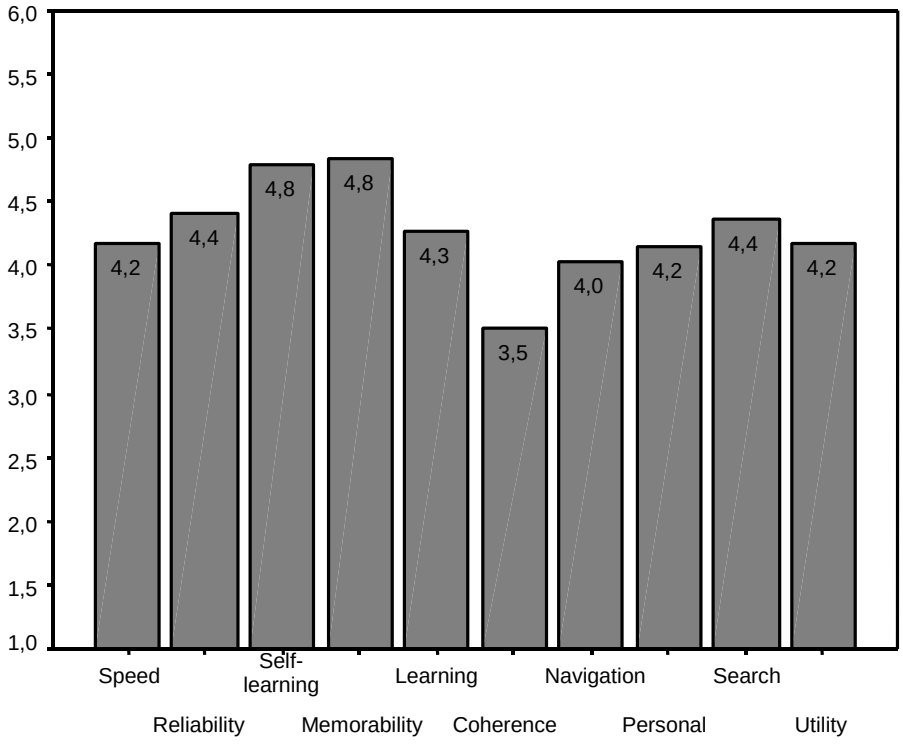


Figure 41. User acceptance statistics.

7.1.3 Appearance and clarity

The appearance and visual clarity of the IMU system were examined by asking interviewees to name different parts of the system and to give opinions about different features. Generally, test users found that all terminals were rather clear. However, the TV and PC were found to be a bit awkward.

PC

The IMU's outward appearance was found to be quite clear and unfussy but a bit awkward and old fashioned. It was quite easy for test users to perceive which part of the IMU they were currently using. They could identify different parts of the IMU – a news item, an article menu and channel menu – rather well.

"..it is a little old-fashioned.."

"There is no blinking thing which can be distracting. "

Even though different parts of the IMU were recognised rather well, test users did not note the personalisation feature or search-, feedback- and instruction buttons. Log files show that these features were not used as much as was expected. Initially, the Finnish word *muokkaa* for ‘personalisation’ was not easily understood.

"It doesn't tell you what to personalise"

It was also mentioned in the beginning as well as at the end of use that the *article menu* was hard to read. Articles should be sorted in some way, as there were too many headlines in one long list. For example, alphabetical order or sorting by topic were mentioned as possible alternatives.

"Alphabetical order would help me."

"I don't know if I could easily find anything here."

Colours were considered to be calm and neutral, though dark colours were said to be bleak and aggressive by a couple of test users. Perhaps there should be the possibility of changing colours.

"Colours are good and clear."

"..neutral is usually best – black pops up too much."

TV

It was easy to understand from what parts of the IMU were involved. Even though a couple of users had problems in naming different parts of the IMU in the beginning, all test users could do it quite well at the end.

"This is pretty clear."

Even though texts and pictures were well differentiated still some of test users still had problems with news items when there was a lot of text. A large amount of text was hard to read.

"There is too much text, spread too widely." " There should be some breaks like pictures or something like that."

The impression of the appearance varied depending on the test user. The colours were considered neutral but the pink background colour was a bit annoying. The IMU was also said to look clear, old-fashioned, heavy and disorganised in some cases.

"It's clear, even a bit primitive."

"There is a different type of text on the top part than on the bottom part. The overall impression is of disorganisation.

WAP

Test users easily recognised the functions of the WAP-IMU. One of the biggest problems was with returning to an earlier level. There is no option to go back up to an upper level while, for example, reading an article or going through different channels. One always has to go to the end of an article or through channels to find a command to get to an upper level. Writing on a WAP was said to be much more difficult than writing on a PC. It was mentioned too that it is nice to have personalised channels on the WAP system that were created on a PC.

7.1.4 Readability

It is difficult to read the news from a computer screen. The text is always a little bit too small and inaccurate. Scrolling pages up and down was not found to be disturbing, but many of the test users mentioned spontaneously that it would be better to see the whole article at a glance. It is also difficult to turn pages with a remote control when using TV-IMU. Paragraphs should be reasonably narrow. It happened that same title could be in both the article menu and news banner of the TV and of the PC. It was seen to be space consuming, unnecessary and even confusing.

PC

Newspapers were found to be easier to glance through: "cosier", clearer and faster were the words used. With features especially, easier to glance through and cosier were emphasised. It appeared in some comments that IMU cannot be used to replace a newspaper. Still, the attitude to IMU as a reading experience was rather neutral.

"Newspaper and IMU are equally about reading but I wouldn't eat all kinds of food next to my PC."

When asked at the end, test users didn't find scrolling bothersome. However, at the beginning of use as well as at the end, became apparent that test users preferred articles that fit in one page and could be seen at a glance.

"An article spread over two columns would be better. If the article was long, it wouldn't be necessary to scroll down and I could see the length of the article at a glance."

Generally, test users had no particular preference for articles spread over one or two columns. The important thing was to see as much as possible at a glance.

There were many different links in sight when reading the IMU. Test users still did not think that their reading was disturbed.

"In my opinion, there is nothing dispensable."

TV

There should be a function to change the size of the font. This would give an option to weak-eyed person to enlarge the text. On the other hand, users who prefer seeing more text at once could make the text smaller.

"I can't read from far. I have to be closer to the screen. So, it would be OK to change."

Many of the users spontaneously compared the readability of the IMU with that of a newspaper, especially at the beginning of the test. They preferred newspapers to IMU. Not everyone gave a reason, but seeing everything at a glance and the familiarity of newspapers familiarity were mentioned. Still, IMU as a reading experience was considered to be rather good, even surprisingly good.

"I was surprised at how easy it is to read long articles from it.... The same article in IMU appeared to be shorter than in Helsingin Sanomat (a newspaper). It seemed shorter somehow because it was in short pieces."

Test users thought that there was enough room for open articles. Some of them thought that when reading an article, it would be nice if it filled the whole screen like web pages.

"The entire article would open like on the Internet and other things could stay in the background. Then I could go back using the back button."

WAP

Test users found hyphenation to be the most irritating thing as regards legibility. Because of hyphenation, there were empty spaces that could have been used for text. Reading in short pieces makes it slower and disturbs thinking. It was also said that services of this kind do not usually have hyphenation.

"When I read fast I read the image of the word. It is slower to read from a small screen when words are hyphenated."

As a reading experience, IMU was considered to be relatively pleasant.

7.1.5 Learning

By measuring learning, it is also possible to measure the system's usability at some level. According to Jakob Nielsen, any system must be both efficient and learnable in order to be usable and useful *(see Figure 3 in Section 2.3.1).*

Learning was observed mainly by comparing the interviews done at the beginning of the test with the ones at the end. No oversimplified conclusions could be made, because IMU was not in use for a time during the test. Overall it was noticed that PC and WAP IMU services were considered to be easy to learn, and the TV system's navigation and search function were seen to be difficult to learn. Once again, it must kept in mind that the TV system was under construction during the test, and this can be seen as one reason why learning was not felt to be very smooth.

PC

The PC system was seen as very easy to learn. The usage was considered to be easy from the very beginning.

"I haven't had any problems...has been easy to use starting from the beginning. I even thought that the Help-document was to guide the feedback-feature..."

In the interview, test users were asked to mention some aspect of the system that could be described as difficult to learn. The question was tough and interviewees could not answer at first. Someone said that the search function was difficult, because the singular form of a word had to be used as the search term. Another person mentioned that personalisation was difficult, because the directions given (help-documentation) were not sufficient, or that they could not be found easily enough. But mainly, the PC IMU system was considered to be easy to learn, even so easy that it was peculiar to talk about learning, because test users could use the system immediately, with some exceptions. Even the personalisation was done much more fluently during the last interview at the end of the test.

TV

Interactive television is quite a new system; few people have already used or even tried it. The remote control has mainly been used to select a numbered channel and to modify volume, so the use has been quite simple and precise. In IMU on the other hand, the remote control's use was much more diverse; the remote control can be clumsy and time-consuming to use to move through different levels of the information structure – moving towards a link and then select the link, etc.

Still, every interviewee thought that it was possible to learn the TV system well, so that the usage could be said to be fluent. Also, they drew on the guidance they had in the beginning of the trial, without that the use would have been much more difficult.

"If you have enough time and you are careful, then you can learn to use the system. My rating from 1 to 5 is 4."

"Not so easy, but also not too difficult. My rating from 1 to 5 is 3."

The users also thought that the only way to really learn how to use the system is to try everything and take your time. During the final interview, the users thought that navigation was easier than in the beginning. In conclusion, it can be said that navigation was difficult to learn, but menu buttons were learned and used (*See Figure 16 in Section 3.1 for TV menu buttons on the bottom of the screen*). Such advancement could not be made with the search function. Test users did not use the feature very much, and some found the use of the keyboard and remote control at the same time to be annoying (there was also a mouse available, but it was rarely used, the same functionality could be done with the tabulator and Enter keys). Also, the date field in the search function caused some problems: users saw it as unnecessary information.

WAP

The WAP IMU service was tested for such a short period that it is impossible to draw conclusions about learning. Test users had some problems with the WAP phones themselves.

7.1.6 Navigation

When defining navigation, one usually refers to moving on the screen with some control device. In the case of a PC, this device is the keyboard but mainly the mouse. In TV, on the other hand, the control device is a remote control and is somewhat like a keyboard, whereas in a WAP service the phone's own buttons and soft keys are the controls. Referring to Nielsen's view of usability,

navigation can be seen as one sub-area of efficiency and because of that it was noticed in interviews and questionnaires (*See Sections 5.1.1 and 5.1.2*).

Navigation on the screen

In the TV-IMU service, recording a TV program was seen as one of the easiest functions. Women especially liked to use it, because it made it possible to see some programs later in the evening. When an interesting TV program starts in the middle of cooking, it is difficult to follow it; it is nice to watch it afterwards in your own time. Also, recording was simple to use. However, reading an article was not so simple and the reason was found in the user interface structure. In TV-IMU, the screen is divided into three main areas with 5 menu buttons on the bottom of the screen. When interpreting *Figure 55* in chapter 7.2.8 and reading the test user's comments, it can be said that such features and functions that could be carried out under menu buttons were more popular than those demanding straight moving on the screen. Also, when test users were asked to name something that was difficult when using the TV-IMU service, most of interviewees named navigation. Indeed when observing the usage, advancement in navigation between the first and last interviews was surprisingly low; the same things were felt to be awkward in both interviews: selecting a link and moving between news banners and article menus. This means that even the most basic functions were considered to be strange and difficult to access.

"Instinctively tries to click right-button to go to page's right side.... *This isn't logical at all. I try to go the right side of the screen and I have to click the button down in order to get there.*"

"In the beginning I was really amazed, because the left /right buttons don't function in the same way as the up /down -buttons. My wife still has difficulties with this." "Navigation is the most difficult feature in TV-IMU."

It seemed that the information structure did not properly support navigation on the screen. Also, the screen area itself was divided into so many parts that users favoured such features and functions that could be carried out only by moving in one sub-area of the screen. All of the features named in the figure in chapter 7.2.8.1 can be accessed under menu buttons, and they do not require moving in the bigger screen area. For example, recording a TV program can be done by

selecting TV program from one area (with the up/down navigation buttons), clicking Video menu (with the OK button) and selecting "Record" from there (moving towards the item with the up/down buttons and selecting with the OK button). Reading an article, on the other hand, is done after selecting an item from the article menu (several clicks with the up/down and left/right-buttons) and then moving to the article itself (with the up/down and left/right-buttons, and then the OK button) and changing pages there (with the left/right navigation buttons).

Moving with the remote control is done in a step-by-step manner (scanning) while moving with a mouse is faster and more flexible (called direct manipulation). In TV-IMU, the obvious problem was the logical fail between the remote control and the screen's information structure. TV-IMU is structured so that there are three main areas *(See Figure 4 in chapter 4.2.1)*: The biggest area is reserved for news articles and the article menu, and the area on the right side is called the *news banner* and is intended to be used as a navigation tool. When trying to access the right hand side, users tried to move with the right arrow, when the actual button would be the down button. Furthermore there was a difference between the right/left- and up/down-buttons. Left/right-buttons were meant to select pages in the news area and the up/down-keys were meant to move between areas and inside menus below the screen. This appeared to be illogical and navigation was not felt to be natural.

"In my opinion, this blurring between the news banner on the right side of the screen and article menu is always difficult..." "I use a PC at work every day, and THIS navigation is still difficult." "The navigation makes it much more difficult to remember how to do it .... If you haven't used IMU for a while, you don't remember how to move in the system..."

"[She] does not manage to select the article she was told to select, instead she starts to scroll with left/right-buttons through the article menu's headlines."

Also, every now and then, the lack of a back button was noticed. There were a few situations when users could not find a logical way to go back to the previous state or step because there was no back-button either on the remote control or in the user interface.

During the second interview, navigation had improved; test users had noticed the changes that were made to the UI and they felt that they made navigation easier. It was easier to follow your own movements and actions on the screen. The changes are explained in chapter 7.1.2.

In the PC-IMU service, navigation did not cause any problems. Users could open news articles fluently and move from one article to another without problems. Only the article menu on the bottom of the screen was felt to be difficult to use. This caused problems when trying to find single news articles. Also, the article is divided into too many pieces, headlines were felt to be useless and the whole news article should start directly after selecting the headline.

The WAP-IMU service was also considered easy to navigate. The different information hierarchical levels were found easily, and moving between two levels was smooth. The only thing that was commented on was the need for a back-button when reading a long news article. The back-button was only at the bottom of the article, but when the story is long it is desirable that one can interrupt reading by clicking a back button.

Simultaneous control devices

The TV-IMU test users were asked about simultaneous control devices. One half of the interviewed test users thought that the simultaneous use of a remote control, keyboard and mouse do not cause difficulties. Some interviewees assume that the simultaneous control device situation is such that they do not have any choice; in order to use the system, you must accept all three of the control devices. This assumption was of course wrong. Furthermore, the situation of simultaneous control devices was realistic only every now and then, especially when using the search function. Navigation as such was performed with remote control only, and the use of the mouse could be totally compensated by using the keyboard's tabulator and Enter keys.

"If every control device has a meaning, then why not. Besides I'm used to working with a PC, so I don't consider these to be strange, I mainly have some storage problems."

The other half of the interviewees on the other hand, saw simultaneous control devices as something that must be further developed. Three such apparatuses in the living room together with the TV's remote control is too much. Also, concurrent usage is hard when lying on the sofa or sitting comfortably in an easy chair.

"Well I don't know, a remote control alone would be enough. This remote control could be a bit like Nokia's communicator [meaning Nokia 9110 Communicator] *with a keyboard that can be opened. The mouse could be implemented as a ball in the remote control."*

So, test users had nothing against simultaneous control devices as long as they are all physically the same device. A remote control with a keyboard in it and also possibly a mouse is acceptable as long as only one physical device has to be used.

OK button

The OK button was randomly compared to a keyboard's Enter button. The usage idea was indeed the same. OK as a name was seen as descriptive, but the button's location was a bit inconvenient; a better place could be in the middle of the navigation buttons, so it would be more easily noticed and remembered. The button was so far away from the most frequently used buttons, that it was easily forgotten and the users tried to accept items with the right arrow button.

"It should be more visible or in a better place. Now it lies to the side so that you forget to click it. Besides it is difficult to accept that you have to click OK in order to open something."

This comment is explained by the fact that, in a PC environment, the user does not need to accept their selection; instead a simple mouse button click is enough to open another level or view for the user. But in a TV environment, the navigation is done with a remote control, and the moving is done on a step-by-step basis, where every new action must be started with some button. And when the up/down and left/right buttons perform the navigation itself, the opening-function must be done with another button, for example with OK.

7.1.7 Implementation

PC

The PC-IMU service was considered to be reliable and fast. The only problems were with the Video Player and Internet Explorer's compatibility. This problem was solved when users updated their version of Explorer. Some users complained that the TV news did not appear quickly enough; the delay between the actual TV broadcast and the time that the program was available on the IMU service was considered to be too long. PC users considered the service to be useful, but still they were not ready to pay for an IMU kind of Internet service.

TV

During the whole IMU project, the TV-IMU technology was still under development. Nevertheless, technical problems hampered the usage, but the major problems were not in the IMU software. Most of the technical problems were caused by defective motherboards. These problems were reported to the hardware manufacturer. The start-up failure was persistent by nature: when it appeared, even restart did not help. Unfortunately, these problems were so severe that they decreased the user's enthusiasm for using the service.

Test users felt that the set-top box started to slow down. Other users often thought that the system would not start at all, and in the middle of the starting process they already tried to close it down. Also, TV-clips were considered to start slowly and the *Event and Media Calendar* pages were empty, there was no information about happenings or movies in Helsinki and Tampere cities.

It can be said that the TV system was not considered to be very fast or reliable. When asked if the TV-IMU system had functioned quickly, the comments were usually:

"Well, I have probably said it already during this interview: No it hasn't." "Nowadays it is a bit faster, but TV-clips start really slowly."

And when asked to comment about functionality (meaning reliability, no errors and fastness):

"In my opinion it would be a great risk not to read a newspaper... and you never know what the system will do, will it turn off or not." "I really can't say that this is reliable."

The comments were a bit more positive during the second interview, and indeed there was not as many critical errors anymore.

WAP

The WAP-IMU service was considered to be as fast as other WAP services. There had been some problems with reliability.

"It's not so reliable...just this week there was a certain thing for which I needed this service, but it didn't work. The connection didn't succeed."

Also, the automatic spelling-system did not please the interviewed users. It was said to slow down reading, and indeed the spelling did not always function correctly. At some point, every single word was automatically written onto a new line – one word per line.

7.1.8 User acceptance and usefulness

PC-IMU

Overall, test users perceived PC-IMU as a relatively useful system. Opinion did not change between the first and the last interviews. When asked about PC-IMU´s utility in the electronic questionnaire, the average score was 4.2. Test users were relatively interested in using IMU if such a system existed, despite the fact there were other sources of information that were recognised as competitors of IMU, such as newspapers and other Internet-based services. This could partly explain the fact that test users were not very disposed towards paying for such a service. Test users also wished that IMU would be updated more quickly and that there would be other kind of content, for example foreign sources. These features would make IMU more interesting.

These form very interesting conclusions. According to Davis, intention to use is the single best predictor of actual use (Davis *et al.*,1989). As was said before, test users were rather keen on using a system like IMU if such a system existed. This supports the idea that people would take system like IMU into use. On the other hand, Davis says that perceived usefulness is an important element that affects actual use of technology (Davis 1993). It appears that the usefulness of IMU is affected by plenty of other competing information sources that offer the same type of information. Thus it is very difficult to speculate which information sources would be chosen in real life. Price, content and usefulness are factors that have an affect on use decisions.

"I'm not prepared to pay for this. There is so much information on the Internet that you can read news for free."

PC-IMU was considered as easy to use; according to Davis that is another important element affecting the intention to use technology.

TV-IMU

As with PC-IMU, more content and features were also sought on TV-IMU. Readiness to pay for the service was questioned in the first interview. As expected, it was dependent on content. Test users wished for more various sources of information from local to international news. Access to the Internet and the possibility of using e-mail were also requested.

"This should be an alternative to a computer for those who don't have one at home. The TV has a bigger screen and it is better to watch. It could be nice for the elderly."

As noticed in preceding chapters, TV-IMU was more difficult to use than other terminals and thereby affected comfort of use. Especially at the beginning of the test, this is an important element that has an affect on perceived usefulness (Davis, et al. 1989) and therefore should be taken under consideration as a possible upcoming research project.

WAP-IMU

WAP-IMU was compared to other WAP-based services. As a service it was considered pleasant to use.

7.2 IMU as a news medium[3]

Most of the interviewees understood that the IMU project was intended for testing a system of integrated news publishing. They used descriptive terms such as "*advanced news portal*", "*aggregate news service*", "*comprehensive package of domestic and foreign news*", and "*topical information channel*". However, one interviewee regarded integrated publishing with irony and called IMU "*a portal where you can read the same piece of news many times, just originating from different sources*". This is, of course, the risk of integrated publishing, especially if the news providers often use the same international or national news agencies. On the other hand, the different media do, after all, approach the news topics from slightly different angles, so IMU can also be considered to "*include diverse news on the same subject matter*". This is of great interest to many members of the public, especially to the so-called *news freaks*.

Integrated publishing also consists of combining different forms of media and means of communication, not just various sources of information. The interviewees understood that one concept of IMU is to include television footage with text-based news, that IMU is "*one medium containing different forms of media*". Only a couple interviewees perceived IMU primarily as a community communication tool, that "*IMU was mainly planned as a channel for neighbourhood associations*". Some did note the integration of news broadcasting with small-scale interpersonal communication.

The participants were interested in the trial both as a technical and journalistic experiment, although technical reasons were more important. Roughly 60% of those who answered the online questionnaire described their interest as technical and 52% as journalistic. One interviewee stated: "*journalistic products can be*

[3] Interviews made collaboration with Marjo Huusko

found easily everywhere, but technical experiments are less frequent". On the other hand, one participant was motivated by the fact that he had not subscribed to any newspapers and therefore needed a good news source. Other reasons for participation were general curiosity, the novelty of the service, and news addiction (Figure 42).

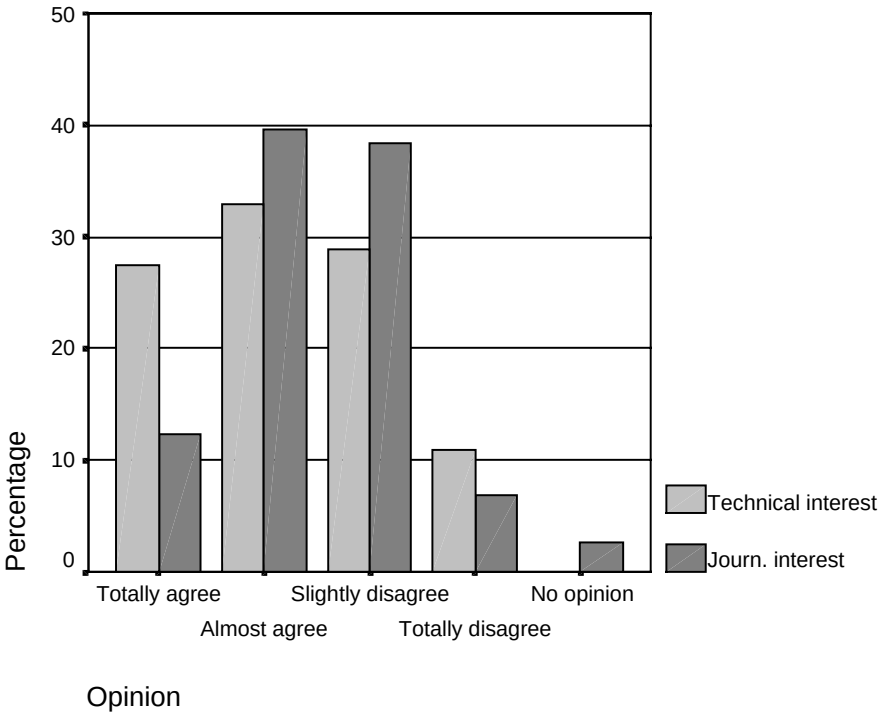


Figure 42. The interests of the participants in joining the trial.

7.2.1 Reflection on the users' experiences

The users especially liked the television news, mostly because a similar good quality service cannot yet be easily found on the Internet. However, television news can also be watched on some other web sites, and the text-based news especially can be read from a multitude of online publications. Some people also prefer to read the news in its original context rather than in an integrated and therefore slightly "*messy*" publication.

It seems that it is not enough just to "*shovel*" the news content into one package to be able to really attract the public. One interviewee said "*every medium needs tailored content meant specifically for the publication in question, not just insipid material gathered from different places*". Integrated publishing in IMU's case "*is still very much journalism on the web, not web journalism*". The IMU system just automatically collects existing material for a web site, which, according to one interviewee, "*is an example of mere delivery journalism*". The observations suggest that more value needs to be created from the integration of news content. Therefore, it is not enough that the mainstream news can be found in the same place. In the IMU2 project, adding value was done by providing news packages, a search function, personalisation, and thematic news channels. Also, the community communication feature was intended to provide more depth and more uses of integrated publishing.

One future enhancement would be to integrate a lot more publications, especially those that cannot be found so easily on the web or do not publish on the web at all. The content of the major Finnish newspapers that took part in IMU can easily be found elsewhere (on the web or in the actual newspapers). Also, their journalistic approaches do not differ very much, the main differences being in their regionality. Because of this, it might be wise to include a wider variety of media; one interviewee considered that just adding more regional newspapers and more television news programs (especially sports news) to IMU would be enough to make it a really "*killer application*". On the other hand, many web portals already seem to try to concentrate on all areas and create packages of content that are as versatile as possible. Therefore, many users might consider them to be too diverse and incoherent, "*heavy*", and would rather use portals that are more carefully focused. In the IMU context, this would mean concentrating on media covering specific interest fields, thus creating special interest IMUs.

One wish that emerged in quite a few interviews was the implementation of a media calendar. Ironically, a media calendar was introduced to the television platform, but was not included in the PC interface. Not knowing this, many PC users brought up the idea themselves of a channel providing information on different happenings, sports events, theatres, and television programs. Suggestions were also made to include the opening times of important venues, public transportation time schedules, etc.

The large majority (82%) of the respondents in the online questionnaire considered IMU to be reliable as a news medium. The accuracy of the news in IMU can be trusted because it comes directly from well-known and established media and no one alters the content in between ("*IMU is just a machine*"). Because the *original sources are trustworthy, then IMU is also trustworthy*. One interviewee mentioned, "*IMU is as reliable as it gets*". This situation could change if the IMU staff began to rigorously select the news and not publish all the content from the participating media, and therefore lose the neutrality. Now, IMU is a neutral and unbiased distributor, not a selective media apparatus (of course the current media have been chosen for IMU and others left out). *The media have opinions, not IMU.* Therefore, IMU is more neutral and varied than the individual media that provide the news for the system.

Many interviewees did not care too much about the source of each individual news article as they considered all the IMU media to be reliable. Some did, however, evaluate the media differently and therefore also rated the news depending on its original publication. This type of behaviour would probably have been even more common if the media assortment in IMU had also included, for example, political newspapers with stronger and more *subjective* opinions.

Around one fifth (22%) of the respondents in the online questionnaire agreed totally or partly to the claim *I prefer to read the daily news from IMU*. The rest of the interviewees relied more on other media, mentioning, for example, "*it would be too much of a change to abandon the newspaper*". It seems that many people are still very much accustomed to the traditional formats of a newspaper page or a television screen, or the newspaper they have been reading for decades. So instead of being a replacement, IMU was used as a complementary *second source*; thus it was a place to check back and retrieve more information on news that had already been heard or read somewhere else (Figure 43).

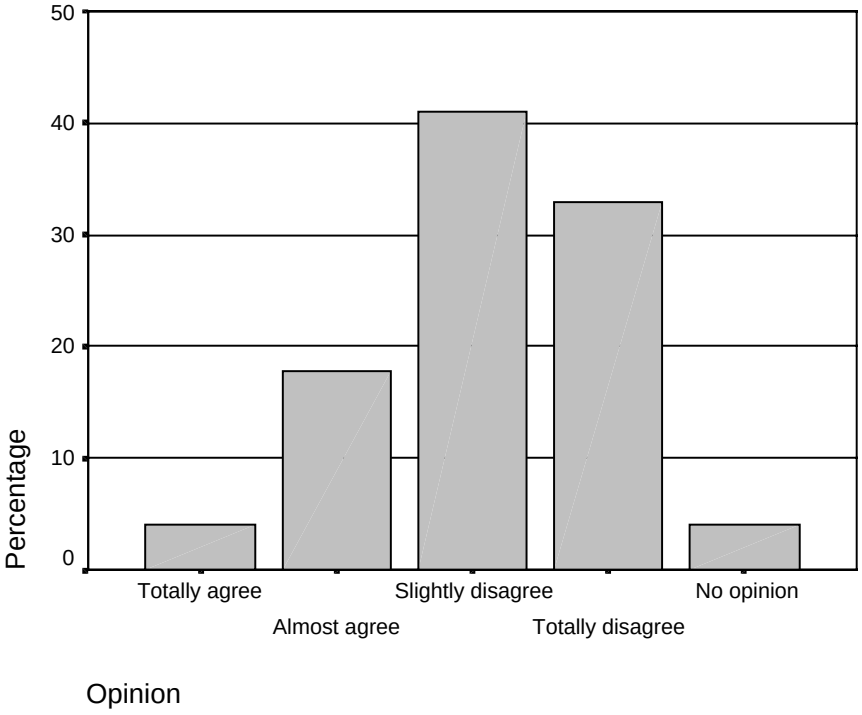


Figure 43. IMU as the most preferred news medium. N = 73.

7.2.2 Usage patterns

During the research period September 18th – December 3rd 2000, the PC users logged in to IMU on average 11 times (equalling one visit per week). Of the 3,479 logins, 643 were such that the user did not proceed further by selecting any channels or articles. The most active user logged in to IMU 152 times, and five users logged in at least every day. Fifty-five users visited the IMU system only once (Figure 44).

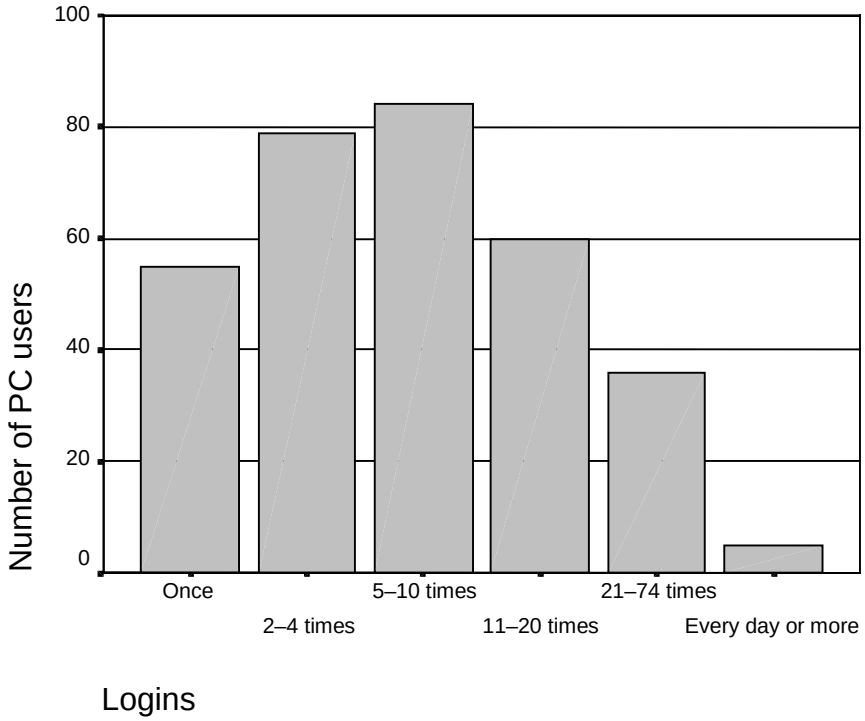


Figure 44. Amount of logins per PC user.

The sessions lasted on average 7 minutes. Half of the users spent less than five minutes in IMU during each session. The five users who logged in at least every day spent on average 8.5 minutes in the system. Only 12 users spent more than 20 minutes at a time in IMU. During each session, the PC users chose on average 3.2 articles to read or watch.

During the first week of the trial, the use of IMU was significantly more active than in the course of the following weeks. Almost 3,800 articles were retrieved during the first week, as opposed to approximately one thousand articles chosen per week later on. Towards the end of the study period, the amount of articles selected dropped even more, reaching 350 in the last week. The same kind of development is evident in the amount of logins, which dropped by 50% after the first week. It is interesting to see how the number of articles retrieved per session (ratio of articles to logins) during the first week is just under four, then decreases to two in the following week, and then begins to grow again. This trend is, however, mainly induced by the quickly diminishing amount of logins (Figure 45).

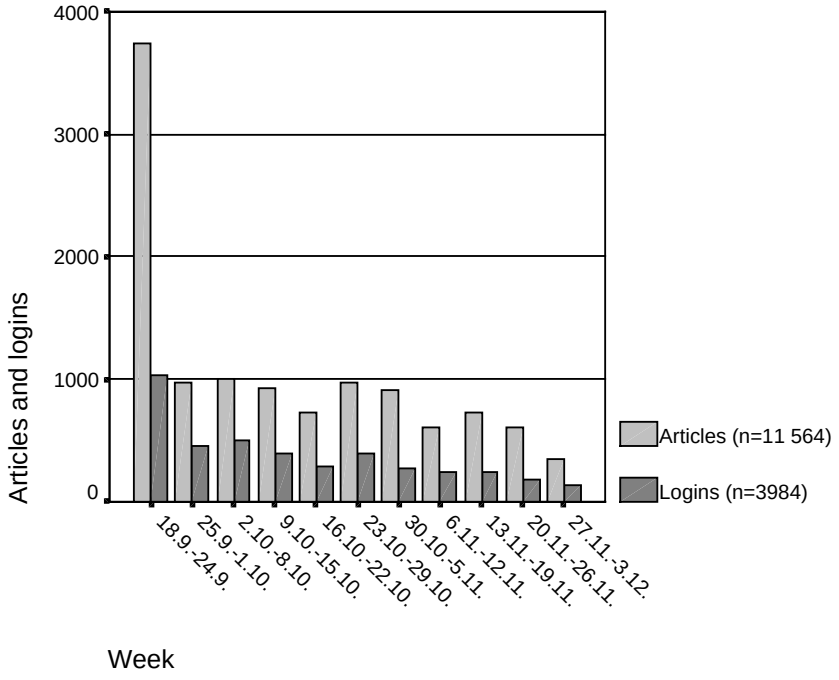


Figure 45. Amount of articles retrieved and logins per week.

There was a small rise in the amount of articles retrieved in late October and then again in mid-November. This might have been caused by motivational e-mail that was sent to the users, as well as some additions to the system (IMU community channel, news packages). Therefore, it can be concluded that it is important to *keep the users* by sending them direct mail from time to time. It can also be useful to inform the users of technical problems, so that when they know that a malfunction is only temporary, they might be more eager to try to login to the system later on and not dismiss it forever, frustrated by the problems.

The *prime time* for both PC- and STB-IMU users was between late afternoon and late evening hours (3 p.m. – midnight), which resembles the habits of television viewing. It can therefore be assumed that a lot of IMU use happened at home. The largest amount of logins during one single three-hour period occurred between 6 p.m. and 9 p.m., although the STB users also logged in as frequently between 3 p.m. and 6 p.m. Morning use was more common among the STB users than the PC users. In the statistics, weekdays and weekends are not separated (Figure 46).

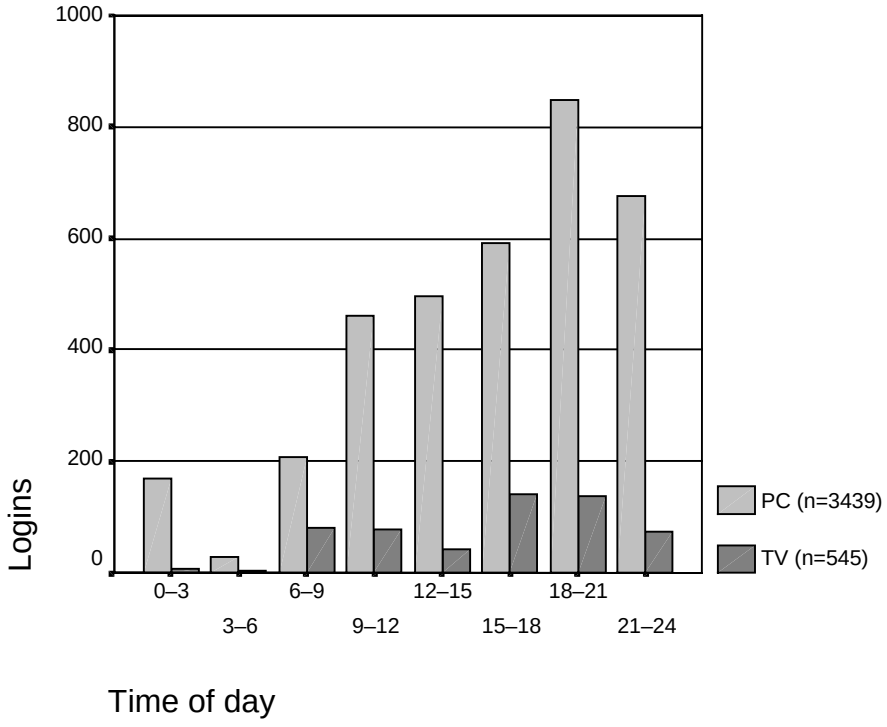


Figure 46. IMU usage at different times of day.

Popularity of the different channels

The majority (6,110) of the channel selections were made in the news channels, containing either television news or text-based news from the online newspapers (divided thematically into foreign news, sports news, etc.). The personalised channels were also very popular: the thematic news channels gathered about 1,500 selections and the users' own personalised channels roughly 1,000 selections. The publishers' channels and news packages also added to the popularity of journalistic channels. The non-journalistic channels (community channels, discussion forums and media calendar channels) were seldom selected. Obviously, the journalistic content (91% of channel selections) was the central point of interest for the users. A clear reason for this is that the content in IMU largely consisted of news material. In addition, the media calendar could be used solely in the TV interface, and the community users represented only a small minority of the users (Figure 47).

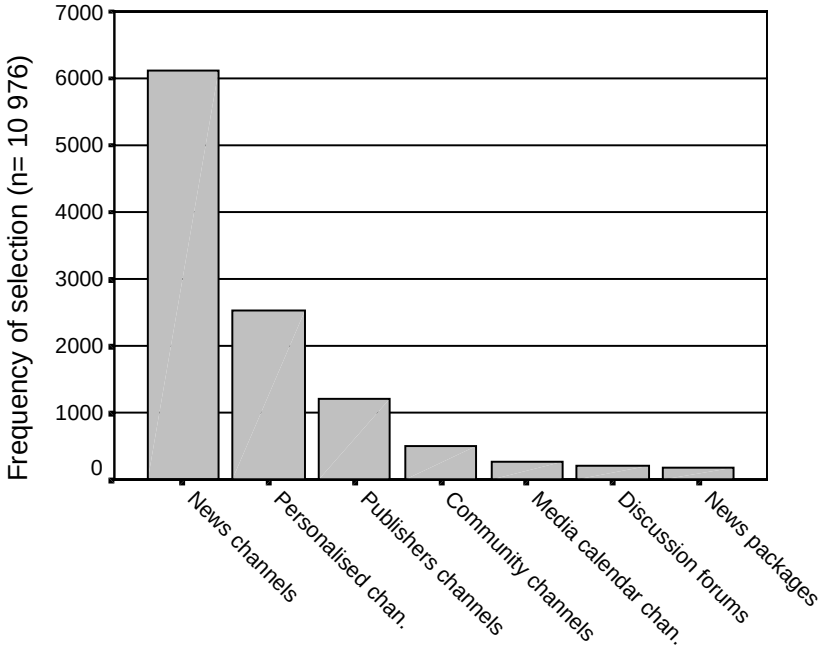


Figure 47. The popularity of different channel types.

The most popular individual channel in IMU was easily the television news; it can be considered to be the killer application in IMU. The IMU front page was the second most popular choice of the users, even though the front page was automatically shown to them every time they log in to IMU (these retrievals are not included in the statistics). Of the traditional news sections, sports is 3rd in popularity, weather 6th, economy 7th, domestic news 8th and newspaper columns 9th. Also in the top ten are the channels of the publishers Helsingin Sanomat and Aamulehti, which are the two biggest daily newspapers in Finland. Of the thematic news channels personalised by the IMU editors, the most popular was the *Mika Häkkinen* channel.[4] Of the community channels, the IMU community was the most popular (12th overall). These overall statistics reflect very accurately the selections made by the PC users, who formed the majority of the users (Figure 48).

[4] It is noteworthy that the IMU users were more interested in the Formula 1 driver Häkkinen than the weather.

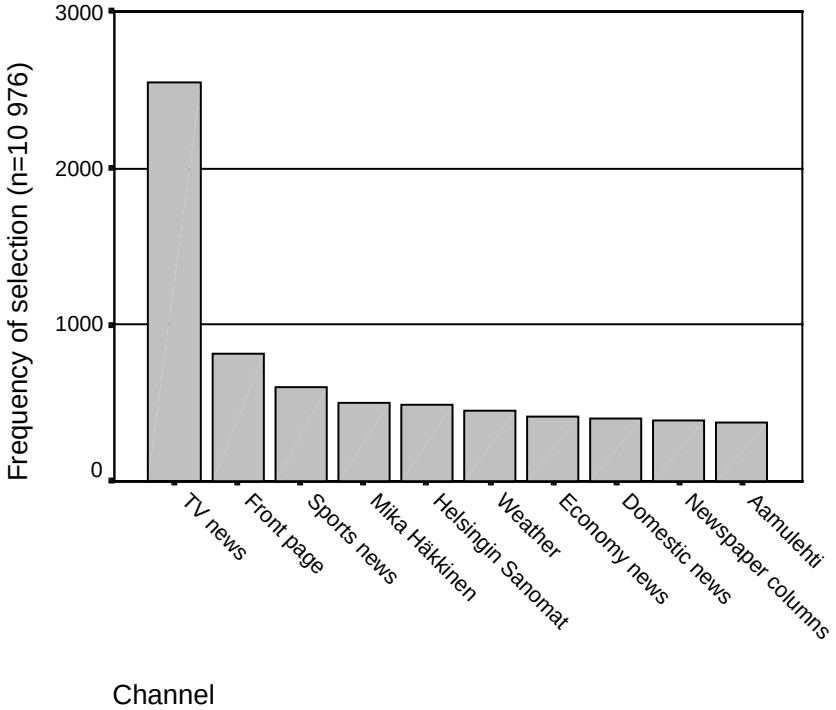


Figure 48. The top ten IMU channels.

The two most popular individual articles were two bulletins published in the IMU community channel (welcoming the user to the community channel and informing them about the news packages); the more popular bulletin was read 92 times. Other frequently read (or viewed) articles were several television newscasts from September, some Merihaka community bulletins and various news articles covering such topics as Sonera, globalisation and small IT companies. An interesting finding is that during the trial period the amount of channels and individual articles chosen were almost the same (10,976 selections compared to 11,564). From this it can be assumed that the users often entered a channel, checked the front page of that channel, but did not select any article for further reading. However, it has to be taken into account that the television news began showing automatically after entering the channel, so the user did not have to specifically choose any news story in order to see the television news.

Interest in television news

In the online questionnaire, almost 65% of the users expressed their opinion that more television content should be utilised in IMU. Some wished for sports news or magazine programs, and others for any kind of television material that could be viewed in IMU at any chosen time. Only 5% of the respondents were strongly opposed the idea of adding more moving images. Many people appreciated the independence from broadcast times that was made possible by the television news service, meaning that they do not have to be in front of the television set at a certain time but can watch the news from IMU whenever they want. People arriving home late in the evening do not have to miss the ritualistic 20.30 news. Many interviewees considered the newscasts of Yleisradio (the Finnish Broadcasting Company) to be a good product and such a familiar format that people really wanted to see them. It is also still quite rare to have an on-demand service of television news on the Internet, and especially of such good quality, as is the case in IMU. Written news, on the other hand, can be read from "*about a zillion places*". It is noteworthy that still so few online publications contain any kind of television material.

Another lauded aspect of the television news channel was that it is so easy to view only selected news stories, so the users do not have to follow the whole newscast to see a story of interest. Some people used the television news in IMU as a radio by listening to the news while working on something else. The compact television newscast (max 30 minutes) is often a faster way to get an update or overview of the day's events than reading various newspaper articles. Television material can also be said to be better suited for the web environment than long written articles, as moving images provide a more "*humane, emotional and interesting experience*" and are better suited for the computer screen. In IMU's case, the individual television news stories are also quite closely connected to their original context (the news-cast); on the contrary the newspaper articles have lost all contact with the other news on their original newspaper page.

Users' evaluation of the journalistic interface

Many interviewees considered the article menus to be too long and "*heavy*". One solution to ease such experiences would be to divide the news areas into smaller

departments based on more specific subjects (geographical areas, different sports). Then the article menus of the various channels would include ten headlines instead of 50. The main news and other important news items could also be highlighted, for example by the use of colours, so that they could be more easily separated from the article menus. Another option would be to add a couple of sentences from the beginning of each article to the headlines (as well as small pictures), thereby creating the possibility of quickly going through the *condensed* news material, however in a very limited manner. The headlines by themselves are not always very informative. Headline browsing seems nonetheless to be already quite common among the users. Apparently the users want to get a quick overview of the news. The slightly augmented headlines would also work well in the WAP interface, because of their shortness and low bandwidth requirements (see Turpeinen 2000).

The news banner was regarded as a good solution, but none of the interviewees expressed any great enthusiasm for it. For many users, the banner might not offer much new information as they have already read the same leading news in other media, and therefore the minor news included in the article menu might prove to be more interesting. On the other hand, the news banner is a good way to get a quick glimpse of the day's news agenda. One interviewee questioned the criteria for the selection of the news in the banner: "*Why were specific news articles elevated into a higher position, did they have something in common*" (the user in question did not know about the existence of the IMU newsroom). The order of the articles in the banner seemed to be quite irrelevant to the users, as they did not consider it to reflect journalistic reasoning.

The photographs and other images included with the news articles were regarded to be both of value and of no importance. According to some interviewees there could have been more images, as "*they would have enlivened the news service*", even together with the possibility of enlarging the images for better viewing. Also, animated projections of different events (such as the accident of the submarine *Kursk*) could have been useful, as well other educational and informational images and graphics. Images were considered to be providers of interest, and not so much of information. A good image is effective and evokes interest in the news story. In many cases, images determine which news items are chosen to be read, they motivate the users to click the news stories open. The use of images is also a way to tell the readers which news is of importance

(illustrated news is "*more important than others*"). Some users look first at the image but make the selection according to the written headline. Then there are those who do not consider the images to be important, and think that actually "*the images use too much valuable space"*.

7.2.3 Journalists' impressions of IMU

The eight journalists that assessed IMU had quite positive attitudes and opinions towards the service, although they did not expect it to "*save the world*" or be a huge leap in the field of online journalism. One said, "*it was an interesting experiment that proved to be an interesting experiment*". They did not have time to use IMU very much; the maximum amount of visits being about 15; some visited IMU only a few times. The journalists are already surrounded by news, so they mainly logged in to IMU to evaluate the system and not to read the news. A couple of the interviewees had used the earlier IMU1 system and considered IMU2 to be better, mainly because of the changes in the interface, although they didn't feel that the core functions and essence of IMU had changed greatly. Altogether, the impression was that the journalists were more excited about IMU as an experiment than the other interviewed users.

One journalist mentioned that "*in IMU the possibilities of a web medium have been very well exploited by combining text, moving and still images, sound, personalisation and links*". Another said that his positive feeling of IMU was comprised of many small experiences, such as the ease of finding information from the large media content using the search function. Also, the television news was mentioned as a good example of the strengths of IMU. Professional journalists can also benefit from IMU by being able to compare the ways that different media have dealt with various issues, using it as a tool for *media evaluation*. According to the journalists, the public can also exercise media criticism and comparison, because in IMU, the material from different online publications is placed almost side by side.

One journalist was critical that the incentives behind IMU were more financial and technical than journalistic, that "*the tool came before the content*", meaning that firstly the technical basis was constructed and only then did the creators begin to think about possible content that could be distributed in the system. He

felt that the content was too vague and not concise enough, that IMU was just a gathering of news, and not a tight package designed for the customer. He thought that the whole premise of moving content from one medium to another without alteration was wrong, similar to the idea of "*replacing radio newscasts with newspaper articles that have been run through a speech synthesiser*".

Many of the journalists were interested to see the competing media together in one online publication that merges their material as well as their brands. One thought that "*in IMU, the media are together for the first and last time*". Another doubted that the media would be so eager to let their news material be published in IMU if IMU were a real commercial product. The media would probably be too possessive of their own material to hand it out to a common publication. A super news service like IMU could also, at least in the minds of the chief editors and media executives, pose a threat to the popularity of the existing commercial online publications. Big media corporations would presumably be keener to use the IMU system to combine just their own news material and link their different journalistic content and media forms together.

One interviewee saw IMU as a sign of the direction where all journalism is heading. Big media corporations merge and integrate their journalistic products, the motives behind this being more economic than journalistic. Journalists fear for their copyrights, as the stories they have written are distributed to all kinds of publications outside their origin. The journalists cannot control where their stories are published and how the stories are edited. So, in this sense integrated publishing can have a negative effect on the journalistic profession.

The majority of the journalists were not bothered by the fact that the different publications are mixed in IMU, and their news scattered quite randomly in long lists of headlines. It was enough for them to be able to see the source in the heading of each news story. Nor did they feel the combination of the different media forms to be awkward. One interviewee did, however, consider the IMU composition to be "*a bit freakish*". He labelled IMU as a library instead of belonging to the mass media. Another said that "*in a newspaper or on a web site of one single publication, you can evaluate the separate stories as the whole, but in IMU, the contents can't be easily pieced together, as the reader has to jump from one context to another*".

Most of the journalists were delighted to notice how the brands of the different media remained strong, that the *images* of the different media have also remained clear in the IMU context. So when moving from one news story to another, the feeling changed according to the image or brand of the original source of the news material. Before the trial, a couple of the interviewees had suspected that mixing the media would "*transform their content into an amorphous mass, where everything would be insignificant*". However, some did have doubts about the media potpourri in IMU being a "*faceless and homogeneous*" ensemble that obscures the "*personalities*" of the different media. They suspected that the people want to read the news of a specific and familiar medium instead of reading IMU news that belongs to a more *hybrid* publication. One solution to this problem would be to build IMU into a strong brand of its own.

One drawback, according to some of the journalists interviewed, was the unequal amount of news retrieved from the various media sources. The share of IMU news provided by the biggest Finnish newspaper Helsingin Sanomat was far greater than, for example, that from the regional paper Karjalainen. In this sense, some news channels in IMU were "*overtaken and dominated*" by the sheer volume of the news from Helsingin Sanomat and the smaller media in a way disappeared into the wide IMU news pool.

In the study made in the autumn of 1999 (see chapter 3.5.1), many of the journalists were quite sceptical about the participation of *ordinary citizens* in the content production. In the second round of interviews, about a year later, they did not express any strong objections towards ordinary people producing material for the IMU system. The main reason is probably that in the implemented IMU interface, the news channels were quite noticeably separated from the community channels and discussion forums, so there was no danger of confusion in relation to the authors or sources of the different material. One interviewee did in fact consider the stories that were written by ordinary users to be the greatest advantage of IMU; they add much to the scope of IMU, and also integrate different sorts of writers (professionals with amateurs), as well as various publications and media forms. The community channels bring an "*aspect of small-scale publishing to the IMU complex, which does not have a lesser value than the content provided by the big media*".

7.2.4 Evaluation of the newsroom functions

Editors' experiences

The IMU newsroom's role was quite straightforward: to keep an eye on what the proxy server does, produce news packages, create thematic news channels, moderate the discussion forums and assist the community moderators. There was no editor-in-chief, as the two editors were equal in status and had the same job descriptions. The editorial office was geographically divided as one editor worked in Tampere and the other in Helsinki. The editors were researchers on the project (Marjo Huusko and Mikko Villi).

The news flow to IMU was not constant, because only the Yleisradio online service provided news in real time; all the others sent their news to IMU once a day in the early morning hours. Although the editors did not change the contents of the news articles fetched by the IMU system, they still spent quite a lot of time with the news channels, mainly monitoring the work of the proxy and selecting the news for the main news slots and the news banners on the different channels. The discussion forums did not require too much moderation as the users rarely participated in them (more on the subject in chapter 7.2.7). The community moderators almost never asked for co-operation and assistance. So, in addition to managing the news channels, the editors mainly concentrated on producing news packages and thematic news channels.

The rotation system worked quite well and no journalistic disasters were experienced. In fact, the interviewed users could not easily tell when there had been a journalist at work and when the machine had done the job by itself. One possible change in the work processes of the editorial staff would be to let the journalists concentrate more on their own content production and let the proxy take care of itself without any external administration. The automatic proxy system can do the monotonous news distribution and creation of links without human interference, and the editors can concentrate on tasks where they really are needed and which a machine cannot achieve.

The editing application was simple and worked well. The administration of the news flow did not create any difficulties for the editors, although sometimes the automatic rotation of the main news caused problems when some older news

with high rotation values repeatedly bounced back to the news banner. So, if the editors manually placed valid and fresh news on the banner, then the rotation system later changed the selection to a less adequate one. One solution would be to customise an algorithm for every channel, which would more effectively take the characteristics of each channel into consideration. At this time, the one algorithm used was not suitable for all the channels, as, for example, the sports channels received news at different times than the foreign news channel (sports events are mostly organised in the evenings). There were also some rather irrelevant news articles which had somehow received high rotation values and therefore were rotated to the news banner. The editors should be able to decrease their rotation values without having to erase the whole article from the IMU system.

Another slight problem was that updated news articles tended to lose their position as given by the editors. If the editors had placed an article in the banner, the new version was removed from the banner, as it did not automatically receive the prioritisation value given to the older version by the editors. Another problem was that the articles from Turun Sanomat and Karjalainen arrived to IMU quite early in the morning and were therefore placed at the end of the news list the editors worked with. The editors had to do a lot of scrolling to be able to select articles from those media for the banner. Of course, the editors could have decided to select only the most recent news for the main news slots, but then the news banners later in the day would only have included news from the Yleisradio online service, as it was the only news provider that updated its news offering throughout the day.

The editing application was functional in creating the news packages and moderating the discussions. Gathering the articles for the news packages was simple and fast. Placing the messages in the discussion forum banners or deleting inadequate ones was as easy as with the news articles on the ordinary news channels. The most inconvenience was caused by the text editor, which did not provide the possibility of editing the texts after publication. Thus, if the editors or moderators noticed an error in the news package lead articles or community bulletins, they had to rewrite (or copy and paste) the whole text, delete the old version and publish the message again.

Users' evaluation of the newsroom

The vast majority of the users consider the human editorial staff to be necessary. In the online questionnaire, three-quarters of the respondents thought that the news service could not be left solely in the hands of the proxy server (Figure 49).

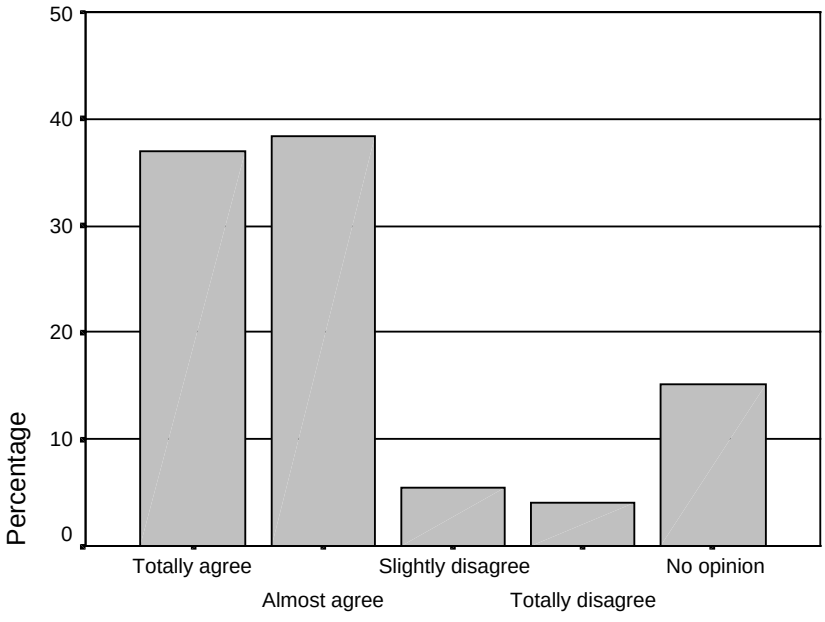


Figure 49. Human editors are needed as well. N = 73.

Among the interviewees, a popular opinion was that a machine does not provide the same sense of security and trust as a human editor. However, most people *did not notice any difference* in the functions or news selections in IMU between those times when the editorial staff was at work and out of the office (evenings, nights and weekends). The news rotation system apparently worked quite well and "*professionally*" and "*nothing went terribly wrong*". The people are also used to errors made by automated computer systems.

Still, many would prefer some kind of a human touch to be included in the decision process. It seems that it is often enough to create an illusion of a human editor making the choices and selecting the news on a secure journalistic basis.

The news "*feels more reasoned, trustworthy and sympathetic when chosen by a human"*. Many users want to be certain that a human can always correct the decisions made by the machine. However, to some it did not matter who is making the calls in the IMU system.

According to the interviewees, the editorial staff should mainly concentrate on making decisions on behalf of the people. The editors should pick the most important and meaningful pieces of news from the news flow, thereby creating the agenda. Journalists "*know better what is happening and what is important*". The notion that the journalists use their professional skills to provide the public with essential and valid information is, of course, the traditional idea behind journalism. In the context of the huge information mass of the Internet, this task might prove to be even more important. As one interviewee said, "*without a human editorial staff, IMU's journalistic importance would be on the same level as a library*".

News from a couple of online newspapers arrive to IMU in the small hours of the morning and are therefore hidden deep in the system by afternoon, as they are replaced by more recent news. The editors could then try to accentuate the scope of the IMU service by manually lifting older news to the news banners. Thus, those logging in to IMU in the evening could be more easily exposed to news from a wider variety of media. In addition, the staff could search for more background information from other web sites, link it or import it to IMU, and, in that, way enrich the IMU contents. One interviewee proposed that the editors could gather information to be used as references in the discussion forums. The public could also commission the editors to create news packages on certain subjects. Another suggestion was that the IMU system could even be left in "*autopilot mode*", so that the editors could concentrate on writing news stories on subjects proposed by the audience.

However, only a few of the interviewees expressed explicitly the opinion that the editorial staff should produce content of their own. Apparently, the editors should then mostly look after the proxy and bring in material from other sites, thus acting more as producers or moderators than journalists. Small editing jobs could include eliminating redundant articles and abridging or summarising some long news stories.

7.2.5 Aspects of integrated publishing

The users interviewed had fairly positive attitudes towards the idea of integrated publishing. "*It is not a problem to have several media included in one publication, as nobody is forced to acquaint oneself with all the content and the various media*." Neither did most interviewees appear to be too worried about mixing the contents of different media together, as "*it is quite the same where the news article comes from*". On the other hand, there were those users who considered IMU to be too disorderly, and therefore preferred to read the news from the familiar and well-defined context of an individual newspaper. Generally, the ordinary users were more tolerant than the journalists towards mixing different media and their brands together.

Many interviewees were excited about the possibility of obtaining the news from one single place, instead of having to search through various sites. The same was evident in the results of the online questionnaire, as 35% of the respondents were extremely interested in reading and watching the different media in IMU, and 32% were quite interested. However, nearly one-third expressed the opinion that the variety of media was not that important to them.

Of course, it is possible to visit different web sites or read different newspapers, but according to one interviewee, "*IMU is actually easier and faster*". Another called IMU "*an electronic multimedia news agency*". The users can find a second opinion on an issue of interest, or really explore the subject matter; the situation would be even better if IMU included material from, say, 30 different publications. IMU is "*a good tool if somebody wants to get more information on some news topic or possibly check what was said about it in some newspaper article or on the television*". Or "*in addition to reading just one newspaper you can read four*". And if they have not managed to see the television news or read the newspaper, then they can obtain the same news from IMU. The links to other news in the IMU system were also considered to be an advantage of integrated publishing.

Some interviewees saw IMU as some kind of *an island in the world wide web ocean*. The different media stand out in IMU better than in the formless mass of the web. IMU is like a *walled garden*, a library or an archive, when compared to the extremely vast information reserve of the Internet. The users know that IMU

contains certain kinds of information (news articles) and not just incoherent services ranging from clothes shops to MP3-files. The users know what they will get as they enter the IMU system. This feature can be enhanced further by narrowing the content of IMU, for example by concentrating on media that cover only specific areas of interest. IMU might therefore be a *weapon in fighting against the information overload in the web environment*.

The integration of the different media forms (text, images, sound) did not arouse any great sentiments for or against. Many interviewees mentioned the television news to be a compelling service in IMU. Some wished for even additional television material, which would be more directly linked to the text-based news; for instance "*a newspaper article on a goldsmith could be illustrated with a film clip of the goldsmith working on a trinket*". These multimedia news presentations could be constructed in the news package format. Also, the traditional still images that are used widely in online newspapers could be replaced with moving images. One interviewee did, however, fear that in integrated publications the moving images would overshadow the written material.

Reflecting on these observations, one could assume that a good use of an integrated news publication would be for Finns living abroad. Using IMU, they could easily get quite a good overview of what is currently happening in their native country. With IMU, they could also watch television news in their own language. The IMU content could be also distributed to hotels and holiday resorts frequented by Finns, where the news could then be printed for the tourists.

Scope versus speed

Based on the online questionnaire, the users were divided almost evenly when it came to the question of IMU's content being diverse enough. A stronger (and slightly self-contradictory) trend was that 63% of the respondents wanted other content in addition to the news (Figure 50).

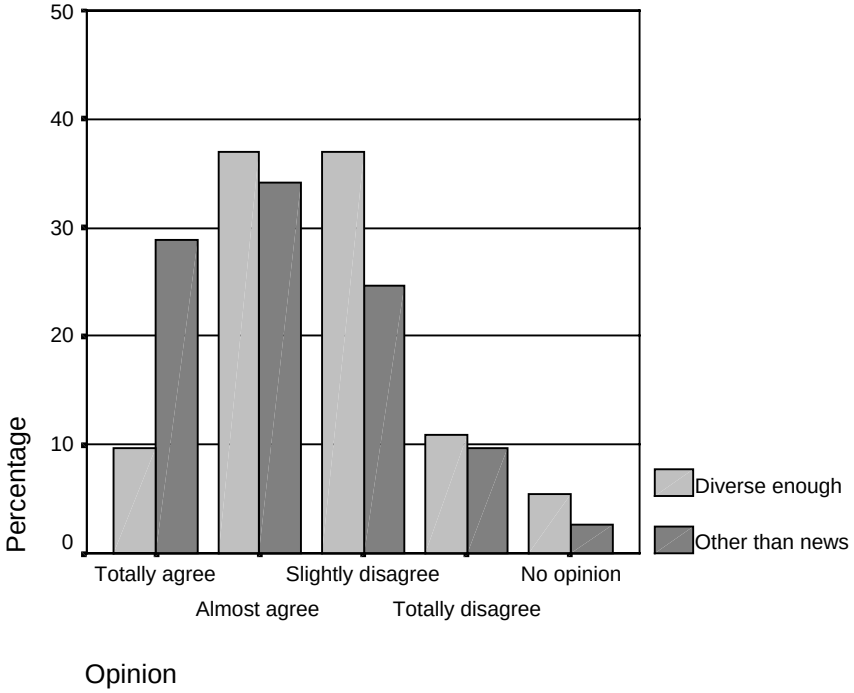


Figure 50. IMU content is diverse enough / IMU should also include material other than news. N = 73.

Of the IMU content providers, only one media (Yleisradio online) updates its news constantly; the material from the other media is gathered once a day (the television news three times a day). An overwhelming majority (88%) of the respondents in the online questionnaire rated the real-time news to play an important role in IMU. The interviewees mostly regarded the "*fresh*" news to be a very valuable asset to IMU and to online publications in general. Nobody "*wants to read old stories*" or "*read the news from the newspaper earlier than the Internet*". People are irritated "*when they hear the news on the radio but can't immediately read more about it in an online publication*". Many criticised IMU for being too slow. There were such arguments as "*IMU lives hours or days behind the other online media*" or that "*the news arrives to IMU too late in the morning*", and therefore the users have go to other sites to get the news. Another said that "*the IMU proxy should 'suck' the news straight from the news agencies to be fast enough*", that "*material collected from other media is already olds instead of news*" (the majority of IMU content comes from online newspapers which carry mostly the previous day's news) (Figure 51).

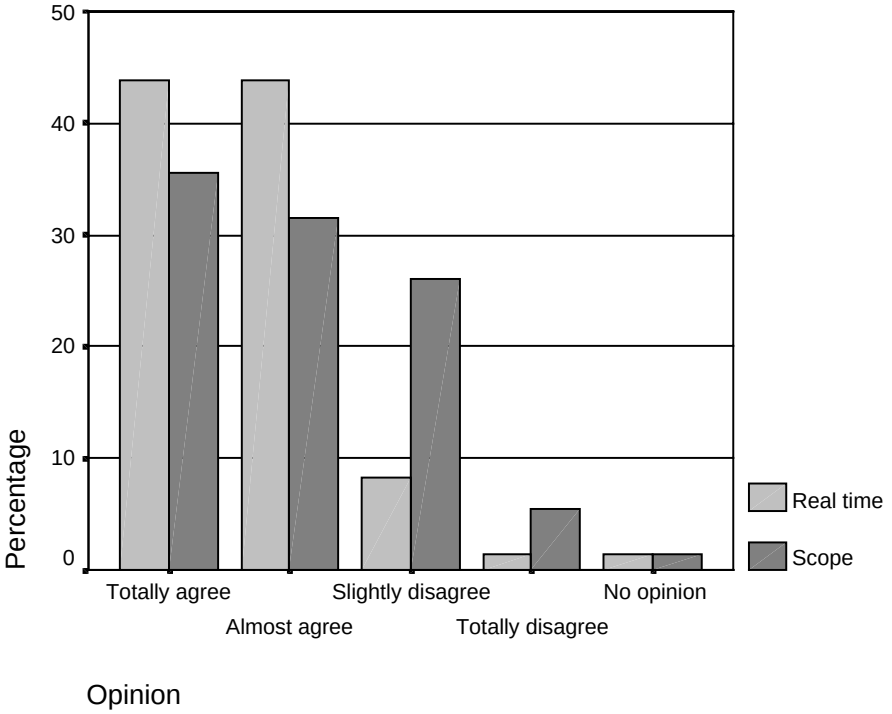


Figure 51. Real-time news service is important (real time) / It is interesting to follow different media from IMU (scope). N = 73.

On the other hand, there were a lot of test users who wanted to emphasise the wide variety of news sources available in IMU, as 67% of the respondents appreciated the fact that there are different media in IMU. What differentiates IMU from many other online services is specifically the width and depth of its content. In this sense, the *appeal* and surplus value of IMU is its scope, not its ability to provide little bits of information at lightning speed. IMU might not then be the place to read the latest news but to find background information and more in-depth articles on different topics. Therefore, it might be wise to rather gather such kinds of information that is not so vulnerable to ageing (National Geographic vs. the daily news).

The observations reflect and confirm the dual challenges for online journalism: there should be immediacy as well as depth available at the same time. Regarding the IMU concept, a good solution would then be to combine the elements of speed and scope by adding more real-time news providers to the

system, but at the same time also keeping the media that are updated on a daily basis. The users could, at will, move on (via links) from the short online news deeper into the system to read more about the events. Or there could be two different departments, one for real-time news and one for the slowly updated but more profound news. In every case, the users could get both speed and scope, which would be a great asset for IMU. People probably want to know almost instantly if something important happens, but on the other hand, it would be futile for IMU to compete only with short and superficial *telegram news*.

Enhancements to the IMU concept

The current IMU is ideal for "*news junkies*", but others might find it too uniform to really attract them. In the interviews, the users expressed wishes to add comics, food recipes, sports statistics, presidential speeches, and also bank services, e-mail, etc. However, the interviewees wishing for more entertainment were in the minority. It seems that many consider the web to be already full of "*mumbo jumbo*" and therefore IMU should be more a "*strictly business*" environment. In our trial population, stock market information was mentioned as an example, but more generally the question is about topics relevant to users. Many hoped for more material on marginal or special subjects (e.g. scientific information). Some also mentioned that "*the mainstream news can be heard or read everywhere, so IMU should gather more specific information*".

Some interviewees appreciated the fact that IMU included newspapers that can be considered as regional (Karjalainen, Turun Sanomat) and are not so easily encountered every day. However, many yearned for the contents of even more regional media (e.g. the small local newspapers) to be distributed alongside the news from the major newspapers. They felt that the content of the current IMU is too unilateral, homogeneous, general and basic (indeed provided by the *mass* media), and the media focus much on the same issues (sometimes even publish almost identical news). As one said: "*There are interesting stories in other publications too*". The smaller media would probably also be more eager to see their contents published in a big integrated publication as otherwise they are not so easily heard in the public domain. Yet, some interviewees considered it important that IMU would not contain just marginal and local news, but that it also should benefit from the wider news offering of the national media.

Radio channels were also seen as a possible addition to the media assortment; for instance the regional radio stations could be attractive to people living in other parts of the country. However, other interviewees considered IMU to be already too vast, that "*IMU shouldn't try to offer everything to everybody, but to focus on different groups and choose the media accordingly*". One option would be to offer more media but take from each only a couple of the main news stories, in a way creating a press summary.

A very sensible future solution for the IMU concept would be to apply it to more specialised areas of interest. Instead of dealing with quite general topics, IMU could be more like a magazine covering a certain theme closely (environment, economy, technology, ageing, etc.). IMU could act as an *interest portal*, or a tailored news service. Mixed with written articles gathered from special interest publications, there could also be television programs covering the same topics. These tailored IMUs could be targeted at smaller audiences, thereby probably also being more attractive to advertisers interested in focused population segments. By using the mechanisms of community modelling, which capture the identity and interests of each community, content can be efficiently targeted to fairly small groups. This is where customised news services have large potential [Turpeinen 2000].

One original idea in IMU would, however, fade in the special IMUs, as the specialised news sources would not necessarily provide any striking world news. The users of a special IMU would easily miss the news, for instance, of a nuclear power plant disaster somewhere in Europe. Of course it can be debated whether any such *journalistic big brother* is needed to supervise what news people should read.

The specialised IMUs would supposedly be quite applicable for communities, as they could get information more suited for them than what is available from the very generic content in the current IMU. Several communities and publications could join forces in a special interest IMU. For instance NGOs (non-governmental organisations) acting on the same issues could have their own IMU in which the news content would come from publications covering the same themes. The different NGOs with mutual interests could also engage their own IMU correspondents to write articles or shoot video to be distributed in their IMU system.

Another, quite different way of further developing the IMU concept would be to keep adding more and more information providers (and also foreign publications) to the system. As one interviewee said, "*I would like to see all the essential things in one service*". Or "*IMU would be a brilliant service if it included all information on some topic, so that the users could depend on not missing anything*". The news customer might have a preference for sources that have different takes on the story from a local news source, national newspaper, newswire services, and global news organisations [Turpeinen 2000]. To ease the information overload, the users could *customise* (personalise) their own channels according to their interests. So, if a specialised IMU resembles a magazine, this mega-IMU would be more like a library, but with very good possibilities for customising and filtering, and thus finding the relevant sources quickly.

7.2.6 Users' evaluations of the new journalistic features

Experiences of the news packages

The news packages got a fairly positive, but restrained acceptance. Most interviewees considered them to be a good concept, but few had actually visited the packages. Altogether, 106 visits were made to the news package channel, but only 47 packages were chosen for further inspection, the most popular being *What do you dare to eat?* Subjects that the editors thought to be compelling (animal rights, genetic engineering) interested only a couple of users. Many had not even noticed the existence of the news packages. Additionally, only 13 articles were chosen for further reading. Despite the disinterest towards the implemented news packages, the respondents in the online questionnaire expressed their wish for more ample packages on different subjects (64% were in favour of the packages, and only 4% strongly opposed). So, the news packages are supportable and attractive as an idea, but this time the implementation of the packages in the IMU service and the topics chosen for the packages were not a success (Figure 52).

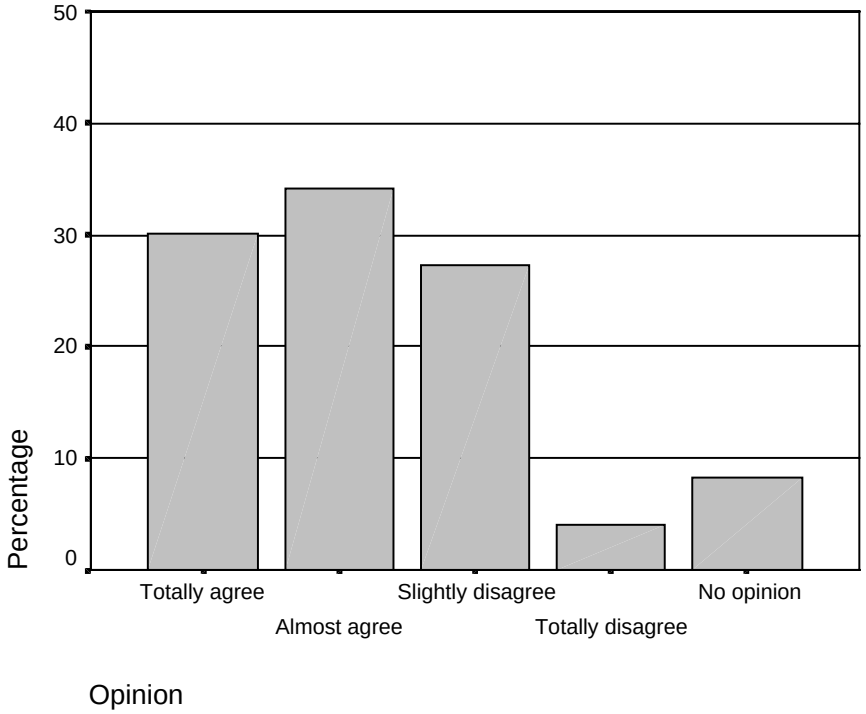


Figure 52. IMU should contain news packages on various subjects. N = 73.

In principle, the news packages are valuable, because they combine both the news and also different media forms (for instance, television news can be accompanied with newspaper articles on the same subject). The users can easily read the news on a certain subject from the package instead of having to search for them all over IMU (or the whole Internet for that matter). One interviewee said "*it is better to gather several shorter stories into one package instead of publishing one incredibly long story, as people prefer to read shorter articles*".

The news packages can also be used as a good source of background information for the news topics; the packages could be a location to review the course of events and the progress of news stories. In the same spirit, one interviewee yearned for more explanations instead of just descriptions of the events. During the trial we made efforts in this direction by adding a short introductory lead article to each news package. The editors could also have undertaken more challenging journalistic work and written longer articles of their own, or interviewed people with valid or interesting opinions. Another option would

have been to add media that include more in-depth articles in lieu of mostly short news agency stories. In this way, the users would not have to read ten times that 30 people died in a train crash, but could instead get articles on the causes of the crash or about railway safety issues in general. The material could also include television footage from the site of the accident, or information graphics.

One reason for the disinterest towards the news packages during the trial was presumably that the topics chosen were not interesting enough. The subjects were maybe too obvious and already familiar, and therefore not very surprising or engrossing. Some interviewees considered the material provided in IMU to be too limited to really make the news packages worthwhile (the packages were too "*general")*. One journalist suspected that "*on the web the people just follow the surface and don't crave the deeper information provided by the packages*". Also, many news events are topical only for a couple of days and then fall into oblivion, and thereafter the packages on those subjects "*interest only journalists, researchers and students*".

Experiences of the personalisation of channels

Seventy-three users personalised channels of their own (altogether 130 channels). This means that only a fifth of the participants in the trial took advantage of the possibility to implement *narrowcasting* in a broadcasting environment. Some of the interviewees did not even know that such feature exists; when told about the possibility they thought, "*it would probably be quite useful*". Others did not know or understand how to personalise their own channels, or thought it to be too difficult. Some tested the feature but did not actually personalise any channels of their own, although they considered it to be a good idea. Others discovered that the Personalisation Wizard was not flexible enough for their specific subjects of interest.

Only one-third of the users who completed the online questionnaire thought that they had acquired useful information from their personalised channels. Eleven per cent were extremely positive about this, one mentioning that he always checked his three personalised channels before any other channels. Interestingly, almost 24% did not have any opinion on personalisation (Figure 53).

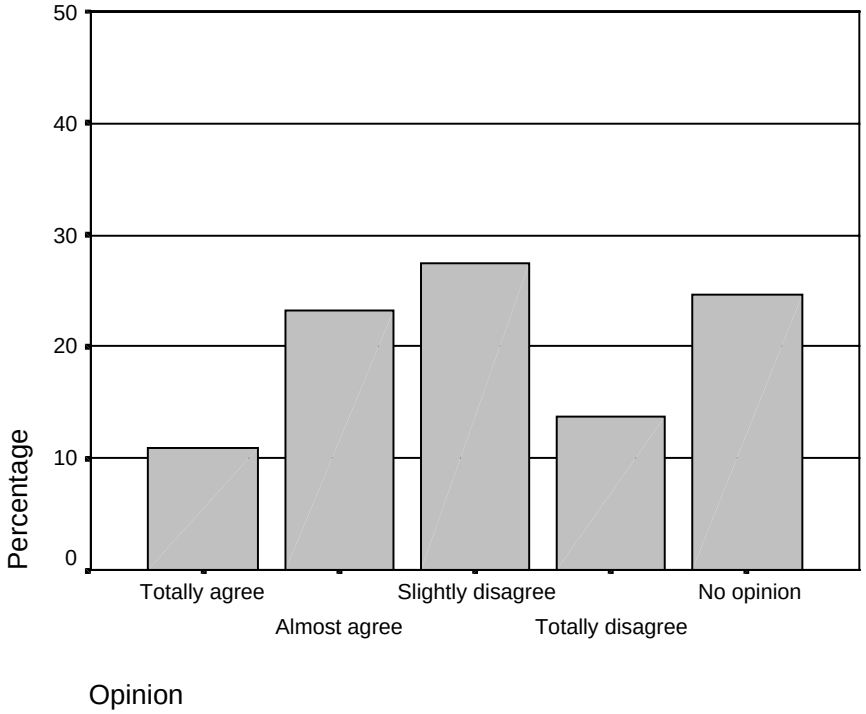


Figure 53. Personalised channels as sources of valuable information. N = 73.

The subjects of the personalised channels ranged from ice hockey teams to individual persons. There were a few personalised channels whose creators checked them almost 100 times. On average, each channel was visited eight times. So, apparently the users were quite interested in finding out what kind of news would be caught in their own personalised channels. Some even proposed that the whole IMU system could be personalised so that they could, for example, avoid sports news totally (thereby also removing them from the news window). The users could customise a whole IMU of their own that would include a certain selection of media, thus creating their *personal IMUs instead of just personal channels*.

The personalisation feature was clearly a reason for using the IMU system often. The five users that logged in at least once every day were very active in utilising personalised channels. They created in total 27 channels of their own (20% of all personalised channels). They also checked the contents of those channels quite often. Like everybody else, their most popular channel was the television news,

but after that their selection of channels consisted very much of their own personalised channels. Thus, it can be assumed that a very important reason for them to visit IMU so frequently was the interest in seeing what had been *caught* in their personalised channels.

Some users brought up the imperfections of the system gathering material for the personalised channels. They were irritated by news that did not match the theme, for example "*in the Nokia channel there was news on the city of Nokia as well as on mobile phones*". Or all the relevant news was not "*caught in the net*". One interviewee described himself as a person "*who does not want to choose anything, because then I would miss something*". Another said that she did not have any area of interest that would cause her to personalise a channel. Also, the media in IMU only offer news from a narrow field, so channels personalised on a very specific subject would not necessarily receive any content.

Despite all the criticism, the personalisation feature seemed to have lots of potential. The feeling was that personalisation would be more useful if only the media assortment in IMU were larger. Personalisation is good in the way that it introduces the individual users to news from media that otherwise would be seldom visited.

Generally, the people are very interested in at least a couple of subjects and really want to follow them. At the same time, many feel that the information overload in today's society begins to go over the limit. There are citizens who "*pressured by their hectic working life already consider the daily newspaper as an attack against their mental peace*", as one interviewee described the situation. For these individuals, it might be a relief to let somebody else (or some machine) screen important and interesting information. They would also presumably be willing to pay for peace of mind, when they know that they are catered for with an adequate collection of information.

This "*informational guardian angel*" would take care of the user by informing her instantly of anything new, preferably on the run (to the mobile phone). One enhancement to the filtering system would be that the user could tailor the information mass in even more detail, and order the system to inform her of only some specific piece of news. For instance, if a rise in the interest rate is expected during the day, the user could in the morning activate only that subject. This

type of an agent service might prove to be of enormous advantage and use. However, it would definitely require that the number and scope of the media included would be remarkably greater than in the current IMU, because a person's items of interest are often very specific. They do not want to read news specifically on Nokia, but maybe their own small company or their rare hobby.

During the trial an effort was made to offer the users ready-made agents by creating the thematic news channels, which turned out to be quite popular. As was mentioned earlier, the Mika Häkkinen channel was in the top ten of all channels. Also, the thematic channels of *Nokia, Sydney, Presidents on TV,* and *Tarja Halonen* were of interest to the users. However, it was impossible to cater for all users: one interviewee said, "*none of the thematic channels felt personal*". An additional suggestion made in the interviews was to create whole thematic IMUs that would resemble magazine publications. So, once again the *idea of more focused special IMUs* surfaced.

The thematic channels need to cover very topical subjects in order to interest the public. It was quite easy to make a popular channel concentrating on Mika Häkkinen, but that channel also lost a lot of interest after the Formula 1 season ended. A channel covering the Finnish cross-country skiing doping scandal would probably be very popular in the spring of 2001, but not next Christmas. The staff should therefore constantly create new channels covering emerging news events, and then remove the channels when they are not topical anymore. These *intensive channels* could live for just one weekend, or for an entire sports season. The thematic channels are a lot better suited to quick news happenings than the manually updated news packages. On the other hand, the content of the thematic channels is not hand picked and can therefore contain excessive amounts of trivial information.

Experiences of the search features and links

Many of the interviewees admitted that they had not noticed the possibility of searching the IMU contents. Many others knew about the search function but had not used it. Those who had used it considered it to be helpful. Some used IMU mainly for specific information searches, applying it "*when some issue comes to mind*". Altogether, the search function was used 376 times, so on average every user did one search.

The search function brings the mass of news closer to the users by creating a straight route to the various media and the older news in the archive. A very important aspect of the web environment is that the information is cumulative, but also can be well filed in archives [Kuusisto and Sirkkunen 1999]. IMU forms a very valuable archive, which includes diverse content, but at the same time is limited in a positive way when compared to the wide information mass of the Internet. The IMU searches do not therefore produce an exorbitant amount of results.

The automatically generated links attached to the news articles were considered to be a very good feature in the IMU system. Altogether, 2,828 linked articles were selected (only 67 on the TV platform). This is a major share (25%) of all the 11,564 articles that were retrieved during the trial.

Although a couple of interviewees complained about irrelevant links, the users generally did not seem to be irritated by the *wrong* links, as they are used to failed searches and links in the computerised Internet setting. The exploitation of links is a very basic element in the net environment. Those interested in more information can click the links; others do not need to bother about them. In IMU, the links are also a very good way to quickly track how the different media have covered the topics. In a way, the links cause people to read articles they would otherwise never come across. One suggestion was that there could be links to other online media as well, because "*the content in IMU is too uniform*".

One user admitted to being a bit "*afraid*" to use the links, because then he would easily get lost in the jungle of hyperlinks; on the contrary, it's very hard to get lost while reading a newspaper. Suddenly the user could be reading a news article that dates from a month ago or is from a totally different media. On the other hand, some might consider this in particular to be the strength and attraction of the IMU system. One option is that the linked news could open in a separate window in order not to disorient the user. Another idea that emerged in the interviews was that the links could be more focused and would lead mainly to articles containing background information or counter arguments, not just any corresponding piece of news.

7.2.7 Evaluation of the discussion forums

The discussion forums turned out to be a feature that did not attract users. Both the forums included in the community channels and those attached to the news packages caused only a few users to write messages. Although messages were posted infrequently, the forums were visited quite often, the most popular being the IMU community forum (102 visits). The Merihaka discussion forum was visited frequently (60 times) compared to the small number of registered members (19). The Iidesranta forum was a lot less popular (25 visits) and the forums attached to the news packages were even less frequented; altogether only eight visits were made to them during the whole trial and not a single message was posted. In the Merihaka forum, ten messages were written, but only two were by ordinary users and the rest were questions or comments from the moderators. The Iidesranta forum did not include any messages. Some kind of communication emerged in the IMU community forum as four users discussed IMU matters with members of the IMU staff.

Interestingly there was a difference between *the users' opinions and the actual practices*. Many users (42% in the online questionnaire) agreed that the discussion forums are useful, but then did not find any need to visit them often or write something in the forums. One community user described the situation as follows: "*I visited some forums, but did not actively take part. I had nothing to say. I just checked the forums*". The community users especially acted as "*submarines*", visiting the forums but never participating (Figure 54).

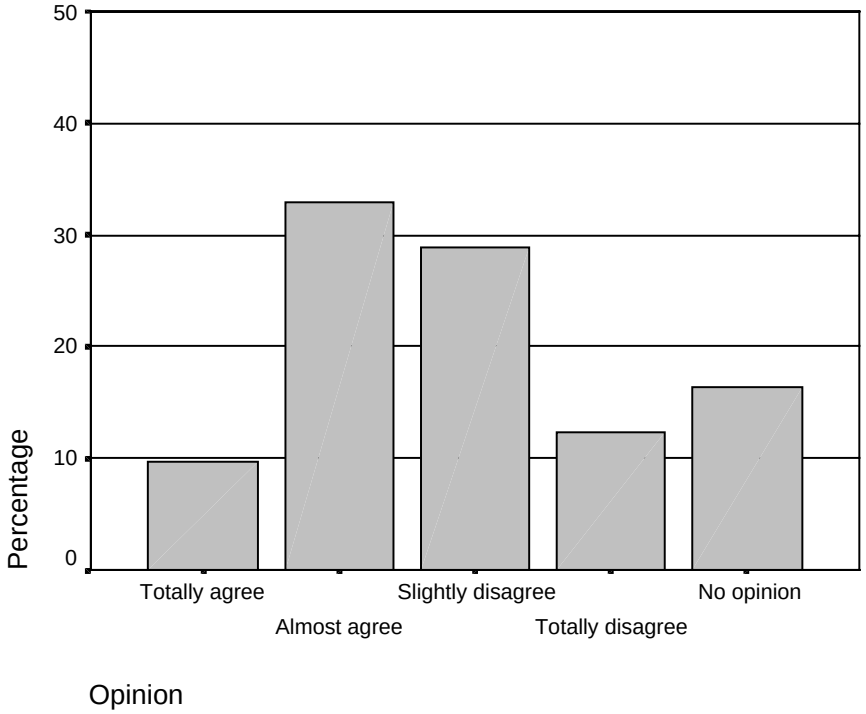


Figure 54. Discussion forums are a useful feature. N = 73.

Reasons for passive discussion

In the interviews, we especially tried to find out why the discussion forums attached to the news packages did not cause much enthusiasm. The most common suggestion was that only a few people actually have a need (or the courage) to state their opinions in a public forum. According to one interviewee, "*in many newspapers the letters to the editor are written by only a handful of readers*". Also, in the web forums "*five per cent write 75 per cent of the messages*". So in this sense, the phenomenon is universal rather than specific to the IMU concept. To create functional and active discussion forums, IMU would have probably needed "*40,000 users instead of 400 users*". The critical mass in IMU was just not big enough to stimulate lively discussions.

The forums in the big and popular online media can include tens of thousands of messages, even if only 1% of the visitors write anything. There are probably also

many established discussion forums and news groups where some IMU users prefer to participate instead of stating their opinions in IMU. In addition, one interviewee criticised that "*the forums were hidden too deep in the IMU interface*", so perhaps many users did not notice their existence and thereby were not inspired to take part in the conversations.

One interviewee suggested that the users should see the actual number of the "*submarines"*. Then they would know how many other people potentially read the messages and thereby build up the courage to write something in the forum. The users are probably not very interested in posting anything if they feel that no-one ever reads the messages, that they are alone on the message boards (three or four posted messages do not create a sensation of active participation). The feeling of togetherness is very important to any virtual community; for example "*the television audience is more stimulated the more people they know to be watching the program*". Maybe the web environment often lacks this feeling of togetherness, as "*you easily tend to feel lonely on the web*".

Another remark was that in the web environment many people "*want to proceed quickly and effortlessly and therefore prefer to state their opinions in some one-question questionnaires*". If they find an interesting *conversation community* they might stay there for a longer time and possibly write a message or two. There also arise spontaneous and emotional arguments that really attract people to take part. These conversations can often begin from very minor details or ideas, as "*people are not so much attracted by comprehensive or abstract topics*". Therefore in the IMU project, we might have made a slight mistake when we tried to launch discussions on quite official and formal, "*dusty*" subjects. Even provocative discussion openings did not do the trick, as people presumably were not too excited about the ready-made subjects.

It seems to be very difficult to provoke or manipulate a discussion, as the discussions should begin spontaneously and not by an editor's request to write messages. It is very hard for a second party to create the need for people to debate with each other. One interviewee suspected that the somewhat provocative lead-ins written by the editors "*made the users feel that they were taken to a playground and then urged to play with each other*". It might be wise to let the audience start the discussions by themselves. On the other hand, the

lead-in could offer the essential facts and thereby enable a better discussion to develop.

One observation was that many "*Discussions about the news"* forums are often quite unpopular. Many people might assume that "*the messages on news topics need to be written in news language, which creates pressure to form finely phrased sentences*". Also, "*the news context in some way implies reasoned arguments*". Therefore "*many people prefer to discuss informal subjects in a more chat-like manner*". The subjects chosen by the IMU editors "*were not common themes of everyday conversations*". In an elitist manner it can be thought that "*people prefer to talk about the kind of sausages they should sell during hockey game intermissions*".

In every case, it can be questioned whether the majority really want to begin writing analytically about *genetic engineering*, rather than quickly commenting on something important happening in their own lives or that day's main event (some emotionally laden national subject), such topics as emerge in coffee table conversations or can be seen in the day's tabloids. Maybe the subjects in the IMU discussions should have been more topical or more closely connected to the agenda of the day (and thereby more short-lived). They could probably have worked better had they been attached to the thematic news channels instead of the more static news packages.

It might be wise to aim the discussion forums at particular groups. Sports fans would probably have been eager to discuss such a simple subject as which "*team is the best*". Many IMU users were technically oriented so therefore discussions on themes centred on web technology or computers could have been started. These focused discussion forums would probably work even better in the context of the special IMUs, as the news contents and discussion themes would better support each other. An IMU concentrating on baby magazines would probably attract a wide range of parents to read the stories and also take part in the conversations in the baby forums. As one interviewee described it, "*you need only to open the tap and the chatter begins*".

Dialogue journalism

One aim in IMU was to ponder the idea of *dialogue journalism*: how could the participants in the discussion forums better benefit from the journalistic resources. One action was to directly link the forums to the news packages, thus closely connecting the discussions with the news items. Another intention was to ask experts to participate in the forums, where they could have complemented the discussions with their special knowledge. However, this idea was never implemented, mainly because the discussions never came to life in the first place. Of course, announcements of *special guests* joining the discussions and answering questions could have tempted more people to take part in them. Also the IMU editors (working as intermediaries) could have garnered different opinions and supplied them to the forums to form a basis for the discussions. For example, in the forum on *the New music house in Helsinki*, the discussion could have been augmented with general insights from different city officials and NGO volunteers.

A third way of implementing dialogue journalism is the active participation of the journalists themselves in the discussion forums. Firstly, they write the news stories and then they discuss them with the public. The journalists can complement the discussion with their expertise on the subject and also get direct feedback from the audience. In this sense, journalism itself would be put on the stage, as the journalists would have to discuss their journalistic selections with the public. Of course the readers have for a long time been able to give feedback by sending mail to the editorial offices, but in the discussion forums, the dialogue would be more active and would also enable interpersonal communication among the whole audience and not just between one reader and one journalist.

It follows that the journalists' new skill requirements would also include a social dimension: the new medium means that there is a more immediate, more frequent and also more edgy contact between the journalist and the audience than is the case in traditional media. Ultimately, this kind of interaction may even require journalists to be able to work together with the readers of their work and really treat them as collaborators rather than as an *audience* or *sources*. [Heinonen 1999].

In dialogue journalism, the original text produced by the journalist would form just one part of the final news story, as it would be augmented with the audience's comments and discussion and thereby develop into a more diverse and comprehensive story produced by many parties [Kuusisto & Pippuri 1998]. If the collaboration between the public and the journalists could be made even more profound, then some members of the public could act as semi-journalists who could take part in producing the journalistic content. However, in the IMU context, this type of co-operation would have been quite hard to accomplish, as the IMU editors were not the actual writers of the news stories, and the original creators did not necessarily have anything to do with IMU. If they did, it would still have been uncertain whether they would have wanted to mingle with the public very much. Nevertheless, the interactive features of Internet communication mean that the audience *can* become a genuine co-producer of journalism [Heinonen 1999].

Most of the interviewed journalists regarded the idea of taking part in the discussions to be acceptable, a "*nice id*ea". They would prefer not to do it themselves, but would not mind if someone else did. However, a couple did oppose the idea of journalists participating. One reason was that they "*are professional writers who could easily be superior in their argumentation and amount of knowledge*". The situation between the journalists and the public would therefore be "*unfair*". Some ordinary people would rather say nothing if there were a professional writer in the same "*playground*".

Also, it is questionable how many journalists would want to use their valuable time to quarrel with the public about their stories, their own journalistic products. By stating their personal opinions in the discussion forums, they might also risk breaking the illusion of objectivity, which is often associated with the work of journalists. On the other hand, the articles written by journalists are never perfect, so in the discussions, the journalists could improve them in association with the public and possibly get new ideas. The original story would conjoin with material partly produced by the public. Still, some journalists would prefer to remain as providers of information and let other people moderate the discussions.

None of the ordinary users who were interviewed strongly opposed the idea of journalists attending the discussion forums. Most had the same neutral attitude

as the journalists themselves. Some did not consider the participation of journalists to be of any special advantage. They had no specific needs to deal with the journalists or to mix the roles of the producer and the consumer. Of course, some stories annoy them, but it is very uncommon to approach the writer of the story. Maybe the situation would be different if the public could easily get in contact with the writer by simply joining a discussion forum. They could then complain to the journalist or ask clarifying questions for additional facts. They could also try to influence the opinions and viewpoints of the journalists.

Discussion in the community forums

The discussion forums in the community channels did not become very popular either. The main reason for the passive use was probably the small number of community members taking part in the trial. If the maximum number of people who can read the messages is about 20, then the motivation to write something is quite low. In the Merihaka community, most of the users could talk to each other in many other circumstances as well. The situation would have been different if the amount of participants amounted to hundreds. The discussion forums contained only communication in a very small circle, or no communication at all. It is also questionable "*how inspiring as subjects of discussion are the happenings in a dormitory suburb?*"

One possible reason for the passivity was that many community members used IMU via their television sets, which some regarded as an awkward tool for posting messages. The television is considered to be a medium of passive use, so to many people, active content production using their television can feel a bit strange. This notion should be carefully considered in the context of interactive television; how quickly people can learn to *lean forward* while using their television sets and to actively modify things other than just the channel or the volume.

However, the forums do have potential. A discussion forum can be an easier way to get information than calling a board member or some other community executive. One interviewee said "*in the forum, a wider public could bring forth questions and subjects that would not otherwise surface*". This would, of course, require that somebody actively responds to the questions and proposals. Different people (house managers, famous residents, etc.) could be appointed to

answer the questions, thus creating a *profile* for the discussion forums. People could then more easily direct their questions or comments to the appropriate persons *(Ask the landlord* forum). Forums could also be centred more closely around certain important topics such as rent increases, building renovations and so forth.

7.2.8 Evaluation of the STB

Patterns of STB use

Those using IMU via their television were more active than the PC users. According to the log statistics, the set-top box (STB) users logged in as many as 73 times on average (PC users 11 times). This amount can seriously be doubted because in the interviews, the STB users estimated that during an 11-week period they logged into IMU 1–2 times a week, on average. A few had only used IMU a couple times due to lack of time or technical problems with the STB (the statistics show, however, that the same persons they logged in over 80 times). Most of the logins were then automatic logins (to retrieve television trailers) technical tests or other experiments (715 logins were made without making any further selections). Therefore it is very hard to say what is the exact number of those *real* sessions when the STB families actually used the IMU system. A rough estimate is that there were about 545 of them (slightly under eight minutes long on average). During each session, the users selected on average1.4 channels.

The main difference between the users on different platforms was that the STB users followed the IMU news channels less frequently, although television news was their second most popular channel. Over half of the STB users who answered the online questionnaire would have strongly opted for more types of information besides news to be added to IMU. All of them also disagreed on the claim that IMU is their most preferred news source.

The TV users were able to use the Media Calendar during the whole trial, which was apparent in their habits of using IMU. Among the TV users, the most popular channels were channels showing television program schedules (all TV programs and MTV3 channel programs) and information on movies and different events. The media calendar could also be used in conjunction with the

video features (using the program guide to set recording times). Most of the TV-IMU users were members in two of the communities taking part in the trial, which can be noted in the popularity of the community channels. The most popular individual articles were various bulletins and messages from the Merihaka community channel (roughly 20 readings). The most frequently read news article (on *Michael Schumacher*) was in 15th place with 9 readings (Figure 55).

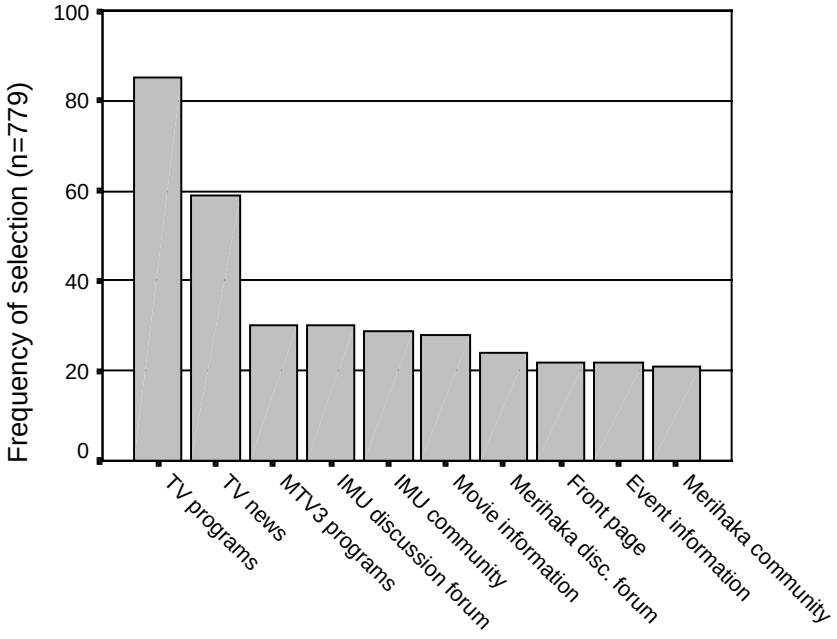


Figure 55. The STB users' top ten IMU channels.

According to the interviews, only one member of most families (usually the parent) used IMU actively. The rest of the family either did not use IMU at all or sometimes utilised it to record a television program or watch a movie from a DVD. Altogether, 63 programs were selected for recording. The most active household was responsible for over half of this number(36 recordings).

During the interviews, many people complained that technical constraints affected their use of the set-top box. Many considered that the STB started up too slowly, which caused them to use it less frequently. One family had

problems with the antenna and therefore experienced poor image quality. According to some interviewees, their motivation to use IMU was hindered more by the technical aspects than by deficiencies in the content. Many compared the television to a newspaper and regarded the newspaper to be a more convenient and "*comfortable*" medium to *read* the news. The STB would therefore probably work better as a substitute for the PC than for the newspaper. People could surf the web, pay their bills or write e-mail with the STB.

One great advantage of the STB is that almost everybody already has a television. The objective of enabling the participation of the largest possible number of members in community communication can only be achieved if people can use IMU via their television sets. Elderly people especially tend to prefer televisions to computers, and only a small minority has a PC at home. One PC user mentioned that she would probably use IMU more if she had an STB at her home. IMU is more special in the television context than the PC context.

One way to bolster the popularity of the STB is to enhance its status as the foundation of a home entertainment and information system. With the aid of the STB, people could use their television sets to read the news and other information (the media calendar), communicate with each other, watch and record television programs, etc. As one interviewee said "*if it had it all, IMU would be a brilliant system*". People would not have to separately boot up their computer if they wanted to find a certain piece of information. The services offered by IMU could also be used during the gaps between interesting television programs.

It can be asked, what advantages does the implementation of the *current IMU* to the television have? For the STB to be a really attractive appliance, more services and features (video-on-demand, more types of information and content providers, etc.) probably need to be included in IMU. One interviewee described the current situation in the following manner, "*I don't use the teletext to read news. I don't use the ordinary video appliance to record television programs either. I already have the newspapers, the television and the phone. Therefore, there are no needs IMU could answer*".

STB in comparison with the PC and teletext

When compared head to head, the PC seems to be to the preferable platform for IMU use. Those who used IMU both on the PC and the STB considered the PC to be easier and more stable. As one interviewee remarked "*I do not see the reason for inventing such a difficult appliance [STB] to use the web*". The STB was considered to be too unstable and difficult to use, "*you have to press several buttons and still nothing happens*". On the contrary "*everything works on the PC*". Many believed also the PC to be quicker than the STB.

One important difference is that people probably get the urge to obtain information more often when working with the PC, rather than when they are sitting passively on the couch. This, naturally, is a question of habit, and can change with time. To sum up, it seems that the context of use and, even more importantly, the early phase of development of the STB tip the balance in favour of the PC. Some interviewees remarked that it would have been wiser to test the STB (and maybe the whole IMU system) for a longer time and then "*go to the field only when all the pieces are in place*".

When asked to compare IMU with the teletext features included in almost every television set, the interviewees found some superior aspects in IMU. First of all, IMU provides more in-depth information. The teletext articles are mainly short news bulletins, whereas IMU contains longer news stories as well as pictures. An IMU page is also "*more informative than a teletext page*". IMU is therefore "*profound*" and teletext is "*shallow*". On the other hand, the advantage of teletext services over IMU is the wider scope of information they provide (lottery numbers, schedules of arriving flights, etc.).

Many interviewees considered IMU to be the next step from teletext on the way to digital television, some kind of a *super teletext*. They also mentioned that they usually spent longer times in IMU than skimming the teletext pages. The more in depth and larger information mass in IMU probably causes the sessions to be longer.

One interviewee was surprised at how easy it was to read long articles from IMU. He thought that they were shorter versions of the same articles published in the newspapers, but found them to be identical. The contents in IMU can be found easily using menus or links, compared to the quite "*clumsy*" use of

numbered teletext pages, which often "*have to be remembered by heart*". Thus, navigation in IMU is a lot easier than between teletext pages. In this sense, IMU is a lot faster than the teletext (the pages also change more quickly). However, the speedy aspects of IMU are overshadowed by the slowness of starting up the STB. People can switch to teletext instantly, but have to wait minutes for the STB to boot. The STB should therefore start automatically when the television set is switched on. Also, the general technical difficulties with the STB caused many users to consider the use of IMU to be slow.

7.2.9 Evaluation of the WAP-IMU

The WAP-IMU provides a very ample collection of news for the mobile phone compared to many other news services. The IMU news channels can be read from the WAP phone alongside the personalised channels. The WAP trial took place at a late stage of the IMU trial. Between January 26th and March 22nd, the WAP IMU was used 20 times by the seven registered users. During four weeks of the test there were no logins at all. Altogether, 41 channel selections were made, the most popular being news channels (economy, domestic, foreign, and sports news). The rest of the selected channels were personalised channels. In all, 43 articles were read. All these numbers are quite small, so it can be concluded that despite the wide variety of news provided, the WAP-IMU was not attractive enough to overtake the existing WAP news services. Future solutions could therefore include, for instance, delivering images and television footage to the next generation of mobile phones.

7.2.10 Evaluation of the ADSL users

There were five ADSL users registered as participants in the trial. However, they did not take too much advantage of their high-speed Internet connection, as they logged in only nine times altogether (one did not use IMU at all). The sessions were quite long, lasting on average half an hour. The ADSL users selected 24 channels, including quite a large number of personalised channels.

7.3 IMU in communities[5]

For different communities, IMU has the potential to be a newsletter, a conversational forum and a notice board, therefore being a primary source of information. In IMU the information is in one place, so people do not have to search for it on different web sites or message boards in different physical places. The information can be updated constantly, and IMU can also be used as an archive for different news and pieces of information. IMU is also "*a step towards civic society*". It can democratise the decision making in communities by enabling more people to take part in the communication process. Of course, it can be asked, why could the communities not achieve the same by building a normal web site, what do they need IMU for? One answer is that IMU provides the communities with a ready-made infrastructure. The level to start communicating in the web environment is lower for many communities if they do not have to create the sites themselves.

Originally, it was planned that three communities would take part in the IMU trial. The Merihaka and Iidesranta local communities did participate but the Montaasi film society never really engaged in the trial. Also, the Iidesranta community was passive in producing material for their channel. One reason why the Merihaka community was most intrigued by IMU was probably because they did not have any existing activity on the web. Iidesranta and Montaasi already had their own mailing lists/news groups and web sites (Montaasi almost exclusively used electronic means of communication). Therefore, the services and possibilities provided by IMU had most novelty value and advantage to the Merihaka community. Previously they had communicated only by telephone, wall bulletins and a newsletter. IMU was quite a leap in the (technical) development of their means of communication. Also, the general communicational needs seemed to be the strongest in Merihaka.

[5] Interviews made in collaboration with Marjo Huusko

7.3.1 Reflection on the community users' experiences

As was already seen in the analysis of the community discussion forums, the biggest problem in the community communication trial was the small number of participants. IMU was advertised quite well, as leaflets were distributed to every household in Iidesranta and to the lobbies of the buildings in Merihaka. Yet only a very small percentage of the residents joined the trial. Reasons for this that came up in the interviews were "*the failed registration procedure*", "*technical problems*" and "*the dependence on Microsoft Explorer*". IMU could therefore have been more successful if it had been a normal web site instead of a closed system. A site like *www.merihaka.fi* could have attracted a considerably larger number of participants (without the hassle of registration). IMU could also have functioned well as an intranet system with a terminal (PC or TV) in every home.

There is also the question of whether people need such a means to communicate with the other members of their local community or receive information about the community activities. Some interviewees remarked "*people don't necessarily want to talk so much to their neighbours*". Also, the community activities comprise mainly "*Christmas parties, barbecues and other meetings, which are only of interest to a minority of the residents*". Most of the information can be read from the message boards in the lobbies. New communication technology is not meaningful without existing, *real* social needs. In this sense, it might have been better to try to focus on geographically divided interest groups and communities. They would have had a greater need for the aid of modern technology and also probably would have formed stronger communities than people who just happen to live in the same area.

The 36 people who were registered either as Merihaka or Iidesranta community users, visited the community channels 161 times. Quite often (85 times) they continued to their community discussion forums, although they only wrote a few messages. The personalised news channels and the bulletin areas were checked less frequently (the bulletins were shown by default when entering the community channel). From the statistics, it can be concluded that the possibility for community communication was not utilised very much. IMU in itself did not make the community members communicate any more actively than before. If the community does not organise many activities in the first place, then there is not much to inform the members about. *First comes the action, and only then the*

communication. As one interviewee described it, "*if there are a lot of things going on in the community, the ways to pass on the information will be easily invented*".

The resident leaders probably have the strongest desire to form a community, as the majority of the residents just "*passively*" live in the neighbourhood without any passionate communal emotions. They "*might say hi*" in the elevator but not necessarily write to their neighbours in the IMU channel. Of course, newcomers to the district might want to integrate themselves better by visiting the community site.

The Merihaka neighbourhood is almost the size of a small town with several thousand inhabitants. Therefore, interest in *communality* could be enhanced by dividing the big community into smaller sub-communities, even by individual apartment buildings. On the other hand, the Iidesranta community consisted of only two buildings (one resident considered it to be *too small* for functional communication). One interviewee suggested that the IMU community communication feature could be applied even in the small-scale context of individual families, so that family members, relatives and friends could easily communicate with each other.

In defence of IMU, it has to be said that the trial setting might not have done justice to the concept. The content and services offered by IMU did not match the needs of the three communities involved, but with some other communities they could have been adequate. The chosen communities did not seem to have huge informational needs and the community members were not so eager to participate in the interaction (similar observations in Mäkinen 1999]). Of course, the technical shortcomings and the small number of people hindered their communication, but it can still be asked how much the design or the infrastructure of the IMU system actually prevented the community communication from succeeding. Naturally, more abundant communication in the community channels or new types of information could have drawn more users and could also have motivated the existing participants. This time the few bulletins consisted only of invitations to resident meetings, excursions or parties, and some news about the communities. The meagre or non-existent content didn't attract the users to visit the community channel very often. However, as

one interviewee said "*in principle the IMU system would be very useful as a place to distribute information and converse with others*".

7.3.2 Experiences of linking community channels and journalistic content

One additional advantage of the IMU concept could be the inclusive journalistic content. The users can achieve two goals by being able to read the news and check the community information on the same site. The attached news content can be useful also to such communities whose own information otherwise would not attract too many people (the news being the primary *bait* for the visitors). The pattern can also work the other way round; one interviewee said that she "*primarily logged into IMU to check the community channel, and then also read the news*".

However, many interviewees criticised the mismatch between the media and the communities. The participating media did not provide much useful material for the communities, mainly because they were too generally focused and also from somewhat different geographical areas than the communities. The community that would have gained the most from the content provided by the mainstream media in IMU would probably have been a political party. On the contrary, the local communities would have benefited much more from local news instead of articles on mainly national matters.

This was evident, for example, in the personalised channel of the Merihaka community, which caught only a few relevant news articles during the trial (keyword being *merihaka*). If the media had been more local, they would have provided more news on Helsinki and its different districts, and therefore more news on Merihaka. With a wider and more suitable variety of media, the personalisation feature would have been a lot more useful to the communities. The business environment scanning application could also have been useful for the communities, which could have made very in-depth scans of their operational environment.

IMU is a system with different types of services, which the community can take advantage of. In this trial, setting the surplus value of the direct link with

journalistic content was not very important for the communities, as the interests of the local communities and the national media did not really converge. In a way, the journalistic environment was not "*useful*". More important than the news context was the infrastructure provided and the communicational tools it was equipped with. The journalistic content was just one piece in the system, which was not of very much use but did not do any harm either. One interviewee asked quite sharply *"why should you aspire for synergy between the different services, can't they just be joined in the same system?"* The community channels were reached only by going through the main news page so, in a way, the journalistic content in IMU was prioritised over the community communication.

7.3.3 The moderators' experiences

The moderators of the community channels seemed to have motivational problems. As only a small minority of the community members joined the trial, the moderators had a rather small audience for their work. "*We had ideas but were too lazy and apathetic."* To increase their spirits, a digital camera was also offered for their use. In the beginning of the trial, some of the moderators were quite interested in IMU, but as the users did not contribute to the content production in the community channels, their enthusiasm faded way. The moderators felt that they could not help the success of the channel by moderating it. One moderator noted quite sarcastically that "*the moderator's job was an easy one, as there was nothing to moderate*". Any spontaneous contributions from the users could probably have motivated the moderators at least a little bit.

The ordinary users did not necessarily even know that there were any moderators at all. One interviewee remarked that "*the community channel would require an administrator*". Others wondered why there were no articles about interesting and very local subjects, such as "*the wave of vandalism in our neighbourhood*". The moderators could therefore have acted more like journalists and written articles on *local news* (this was one of the original ideas) instead of just informing about board meetings or barbecue parties. The moderators could have sought information from the city officials or house managers and then published the news in the community channel. Thus, they could have acted as human *information brokers* in distributing relevant material to other members of the community [Turpeinen 2000]. Some users proposed the

possibility of sending mail straight to the moderators, for instance to make requests for handling various themes. The moderators could also have worked as mediators between the city officials and the residents, by gathering ideas from the citizens and sending them to the city administration.

The moderators considered the community tools of the editing application to be rather straightforward and easy to use. The maintenance of the IMU channels was therefore somewhat easier than it would have been with an ordinary web site. The non-technical moderators appreciated the fact that they did not have to do any programming, as they could enter the information directly into the system. "*The functional and practical templates in the editing application are very important, because they encourage ordinary users to produce material without the need for great technical skills*." Subjects of criticism were the slight slowness and clumsiness of the editing application. The moderators considered the guidance by the IMU staff to have been sufficient.

Almost all of the moderators criticised the web browser bias, because "*90% of the residents use Netscape*". The compulsory use of Internet Explorer seemed to be a great handicap in finding voluntary IMU users. The moderators also considered the problematic registration process, technical difficulties in the beginning, the slowness of the STB and "*general clumsiness in the system*" to have hindered the communication and the success of the trial. Also, the IMU system did not offer as much added value compared to other web services as they would have expected.

A couple of the moderators were quite doubtful before the trial of large-scale content production by community members (mainly because there were so few). The question was how much information do the communities actually have for distribution? For example, during the trial all the bulletins of the Merihaka neighbourhood association were published in IMU, but they did not add to a large amount. As the residents were also inactive in other respects (the Iidesranta resident meetings normally attract only 3–5 people), they did not develop any more fervour in the IMU context. In principle, the IMU system "*would have had lot to give to the community*", but in reality the people did not find it very worthwhile. Again, it has to be stressed that perhaps with some other communities involved and a longer trial period the community communication feature in the IMU concept could have been a lot more advantageous.

7.3.4 Enhancements to community communication

Interest communities

One way to better exploit the community communication feature in IMU would be to offer it *to interest communities*. Communities formed around a mutual subject of interest would be well suited for an application like IMU. The members of more geographically divided (*virtual*) communities could take better advantage of the communication tools in IMU than people who see each other quite often on the way to the local grocery store and can thereby communicate with each other without the aid of any technical devices. "*The IMU features would be more applicable to a hobby group than those living physically close to each other*." It also seems that the interest communities might have a stronger feeling of communality than the local communities, because they are formed voluntarily and not because people live in the same place. As one interviewee said, "*the community of residents is a bit of a 'forcibly cranked' thing*".

It was unfortunate that the Montaasi film society never really participated in the trial. Therefore we could not directly compare the functions of local communities and interest communities in the IMU context. Based on the disinterest of Montaasi, we can suspect that the interest communities might expect more from IMU than the current system can provide. Montaasi already has a functioning mailing list and also their own web site (which is not very actively updated). Montaasi would have, for instance, been very much interested in the possibility of publishing their own film clips in their IMU channel (only still images could be published). Also, the media in IMU did not provide much interesting news on film-making. Thus, an IMU system filled with film journals might have really attracted the members of Montaasi.

Therefore we have to reconsider what is the surplus value of the IMU system for a (local or interest) community? Very generally focused news content combined with communication tools does not necessarily have anything to offer to a community who already have their own web site. However, a communication infrastructure equipped with a package of specialised journals might appear very attractive to a community that has not yet joined the Internet age, but are planning to do so. One interviewee saw a market opening for IMU as "*the present portals are too general and do not offer any specially tailored*

information or tools for communities". Another advantage could also be the IMU context, where the community channels are situated in an environment in which members of other communities as well as ordinary news readers sojourn. Thus, the communities could get publicity in a public environment (this of course requires channels that are open to non-members as well).

We tried to create an interest community in IMU by introducing the IMU community channel, which was meant for all IMU users. The channel turned out to be more popular than the other community channels (299 visits). The users checked its discussion forum 102 times, but did not participate very actively in the communication by asking questions or posting comments in the discussion forum. Maybe the trial and the whole IMU concept was not interesting enough for people to write about it or read the information. One interviewee saw that "*the IMU community channel did not contain anything as such, and therefore it was quite indifferent*". Thus, we were not able to create a functioning community formed around IMU. One manner of creating a community existing only in the IMU environment could have been to create a *thematic community channel* concentrating on some event, for example the Olympic Games. The channel could have provided sports news and a discussion forum, where people could have talked about the Olympics, and thereby feel at least some togetherness and communality (although temporary and virtual).

Inter-communal communication

Another direction in developing the IMU concept would be to employ *inter-communal* communication. One idea that surfaced frequently in the Merihaka interviews was a collective IMU of different neighbourhood associations. The individual communities could have their own channels within IMU, but also a general discussion and information area should be added, where everybody could participate in the dialogue. Of course the individual channels could also be open to everybody, so the members of other associations could take part in discussions with people living in other parts of the city, and the different communities could exhibit their activities.

The neighbourhood associations could strengthen their co-operation with the aid of IMU. They have mutual interests, especially in city planning, for example the planned city tunnel in Helsinki. Similarly, the Iidesranta community could take

part in an inter-communal IMU comprising different buildings administrated by TOAS (Tampere District Student Housing Foundation). There, the residents could discuss mutual subjects of interest (living and studying in Tampere) and also read announcements of renovation projects and other news. This type of a bigger community might work better in the IMU context than the small individual associations acting alone. People are also interested in a larger area than just their local neighbourhood. The community channels were maybe too *insider oriented* ("*mere information about the meetings of the neighbourhood association is not very interesting*") and therefore engaged only the active members and not the rest of the residents.

The information for the inter-communal IMU could be provided by the community members as well as local newspapers and the city administration. The city might be more motivated to provide information for this bigger co-operative than for the sites of individual associations. For example, the decisions made by the city council and different plans made by city officials could be published in IMU. There, the residents would also have a very public platform to present their ideas. Also, the organisers could provide information on various city festivals and local happenings.

In this way, IMU would form a very informative package to those interested in urban matters. It would be much easier to visit IMU than to flip through the local newspapers and city information pages. Also, the information would be well archived in IMU for future reference (the search functions in IMU being very useful in these cases). The information "*would not be lost forever in a collection of waste paper*". This type of integrated publishing would mean that the information provided (also the journalistic content) and the interests of the community members would be more closely associated than in the current IMU.

Additional services

The interviewees came up with a considerable amount of suggestions to improve the infrastructure of the IMU service, although many were happy with the three current community sub-channels (bulletin area, discussion forum, personalised news channel). One substantial addition would be to include a channel for permanent information, such as important phone numbers (fire department, police, janitor), public transport schedules, services provided by the city,

business opening hours and so forth. The interviewees would also have appreciated information on renovation projects, traffic arrangements, the special offers in grocery shops and other (very) local news. This information could be provided by the local business people, the city officials, local newspapers, and the janitors, house managers or service companies (it is yet another question as to how they could be encouraged to voluntarily submit all the information). One central observation is that most of this information cannot be obtained from the national news media. This again underlines the gap between the needs of the communities and the journalistic content offered in the current IMU.

Individual residents could use IMU to sell items for which they no longer have any use, advertise childcare services or organise volleyball games. Some interviewees would have also appreciated the possibility of sending e-mail to the other community members via IMU (or even having video links), instead of just posting messages to the discussion forums. Through IMU, it would be easy to inform of breaks in water supply and also of more important things, which do not require a resident's meeting. Currently, these pieces of information often are not communicated well enough or conveyed at all. For example, it would be quite easy for the service company to inform the residents using IMU channels, and might result in residents getting information more quickly and directly. The residents could also inform the service company or janitor of things that are in need of repair, or then make complaints or proposals to the house manager. In IMU, questions or feedback from the people and the answers they receive could be presented publicly. All the subjects that are important in the daily lives of people would probably also activate discussions in the forums.

Many interviewees would have liked to receive information on city planning, or even to have a direct link to the city administration and other central organisations. However, most of the interviewees were neighbourhood association members who are interested in this kind of information and in matters of municipal democracy in general. It can be questioned how common the same wish would have been amongst the ordinary residents. They would probably be quite satisfied with *low profile information*, such as the special offers in the local grocery store, or the sauna reservations. Still, most citizens certainly would also be interested to know if someone is planning to build a ten-story building in front of their house.

In a nutshell, the best that IMU could offer the community members would be "*to give the them the feeling that all vital information can be found in IMU*". All the services, contact information, links and communication channels would be available in a neat package, a *community portal*. The residents would presumably prefer to only log into the IMU system, instead of having to check phone books, call different people, read various message boards or surf around the web to obtain the same information. If the potential amount of users was big enough, the house managers and service companies would probably be quite eager to provide the information to IMU. The public could reach the IMU information mass either with their computer or their television. IMU terminals could also be placed in strategic sites in the neighbourhood (shops, schools, kiosks).

7.4 IMU in business environment scanning interviews 2001

Six corporate users of IMU were selected for interviews in January/February 2001. All interviewees were men. Three represented SMEs and three represented large companies.

Interviewees had not used IMU very frequently and as a channel for continuous environmental scanning. "*Let's say that I would like to use more, but my time is limited. As an estimate, I could say that I have used IMU weekly, but sometimes daily.*" Lack of a proper tutorial hindered the use of IMU. One user thought that IMU should have an alarm-function, which would alert him to interesting news. He believed that he would have used IMU more if there had been such a function.

Television news was not very interesting to corporate users. There were also many technical problems in watching the news. One stated that text is enough. When he was shown a picture of television news with text, he commented "*I think this text would be enough. As an idea, it works.*"

None of the corporate users had created their own personalised channels. One could not personalise, because his navigator did not support java. Another was afraid that personalisation would narrow down the news material too much. "*No,*

I have not done such a thing. I saw it, but started to think that it would narrow down the material too much and maybe it would leave out some news that I would like to read." When the user was told that his own channels would not affect other channels, he thought they were a good idea.

The personalisation function should be improved. *"When I think of the personalisations that I have carried out, some results were not so accurate."*

The function of selecting channels was beneficial. "*I think they are practical in a way that when you first go to IMU, it is full of everything. When you can select between different media and themes, it is practical. You can leave out all the things you do not usually read."*

The tool for environmental scanning was considered to be a good idea, but the categories should have been more specific and related to a distinct business area such as information technology or advertising. It is important for corporate users to be able to find historical backgrounds to news. There should also be more news material in the publication in order to get more data from which the user could scan.

The interviewees were asked whether they had used IMU to find important business information. Some had tested the publication only because it is a new innovation and introduces new technologies. *"As a matter of fact no, partly because the news material is such that there is no information relevant to our business. I'm more interested in this concept. I mean, how it works." "I have tried television news, because the LAN features are new."* One had used the publication to find information on competitors. He found out that there was not much news of their competitors since their business area is so narrow and there are only a few companies involved.

Usually, the corporate users find important business information from the newspapers' economics pages, specific financial journals, trade magazines, Internet (both general pages and e.g. customers' homepages), bookstores, commercial registers, fairs, personal contact with experts in the field, directly from customers, or research institutes such as universities. The most common search issues were technology and economics.

What are the benefits of using IMU in companies? IMU is a news medium, which collects material from the different media. *"You quite often search for news concerning your own company and business area. You can get all the information from different media collected in one publication."* If one is interested in the whole of Finland, then the IMU is a good medium. One user had not received any new information via the IMU. *"All the same information could have been read elsewhere. Personalisation of your own channels is the best feature of IMU."*

Interviewees listed the following products as IMU's competitors: general portals, business-related portals, newspapers on the Internet, local newspapers, digital television and good search engines. *"I think that there is nothing like IMU at the moment, but something quite similar would be the different portals, some of which have started to experiment with LAN features, and perhaps digital television in the future."*

Who could use IMU? IMU would be suitable for many different target groups. Students would like to use it since it is free. IMU would also be suitable for corporate use. There is room for improvement though. There should be more news material from different media. *"The product idea fits well to a company's needs. The problem is that this is a pilot project which does not have enough news sources."* Economics and information technology would be especially interesting topics for corporate use. People who need an overview of the field, but not specific information, could benefit from the publication. One person did not like to comment on this question since he did not believe that IMU will become a product.

Interviewees found it hard to define a price for IMU. Estimates varied from nothing to 1,000 FIM. If IMU was improved, e.g. if there were more media, then interviewees could pay more. The price then could be several thousand FIM. *"I'm not sure, but could the service be such that I could pick up my selection of news material and pay accordingly? This way everyone could find a good selection of material and news."*

Most of the improvements suggested for the publication were connected to expanding the supply of news material. The interviewees wanted more trade journals, newspapers, business magazines, etc. They mentioned the following

media most often: Kauppalehti, Talouselämä, Taloussanomat and Markkinointi & Mainonta (three economics, one marketing and one advertising paper). There should be a clearer focus area, e.g. business or information technology. Also, the grouping and personalisation of the material should be developed further. If the news was in real time, it would be very useful. An alarm feature should send e-mail to the user when important news was published. One user wished that IMU could easily print articles. He could then read them on his way to work or home while sitting on a train.

7.4.1 Corporate users – log files 18.9.2000–28.2.2001

Twenty-three users could have been classed as corporate users. Eight of these had logged in only once. The other corporate users had logged in 2–33 times. Only one had used the WAP-IMU. The WAP trial started in January 2001. Six corporate users had ordered channels and eight had made personalisations, i.e. their own channels. These eight people had made on average three personalisations. Only three had used the search engine. One person had used the channel for environmental scanning, and it had been selected 10 times. The channel for environmental scanning was in use in January 2001.

In Figure 56, it can be seen that the five most popular channels were TV-news, sports, front page, weather and economy. The channels that contained the five most often read articles were front page (selected 49 times), TV-news (45), sports (26), economy (5) and culture (5).

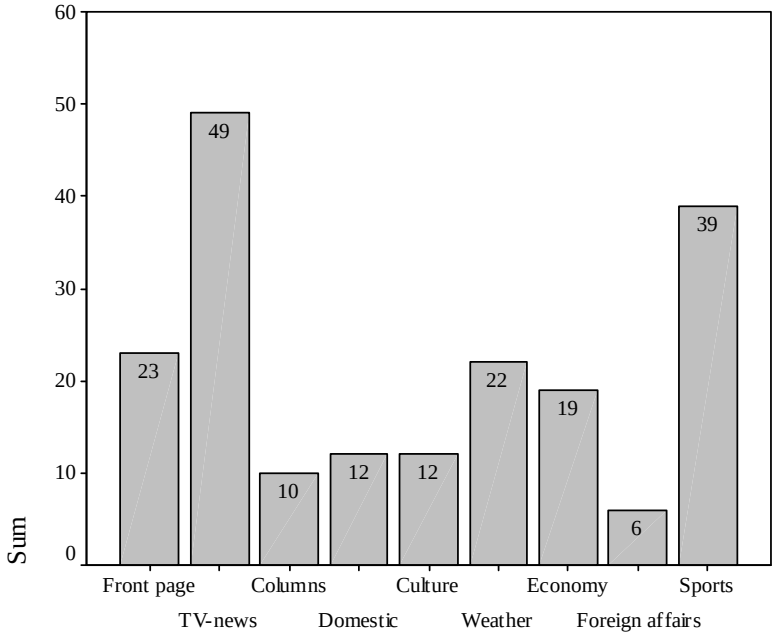


Figure 56. The frequency of selection of different channels for 23 company users.

Not all of the IMU's features were used, even if they were considered to be necessary. Therefore, it is hard to estimate the full potential of the IMU as a product for companies. The actual use of the IMU did not conform to the results of the telephone interviews in 2000. As in the corporate interviews of 1999 (see results in chapter 3.8.1 above), content was considered to be the most important component in the publication's success. Personalisation, the possibility of selecting different channels and integration of the different media were the most important features in interviews before and after the user trial. The post-trial interviews emphasised the feature of on-demand news whereas the pre-trial interviews highlighted the feature of collecting news from the different media. There was a similar situation as regards competitors. The results give guidelines for further development.

7.5 Commercialisation and advertising interviews 2000

Interviews concerning concept testing and advertising took place in November/December 2000. The interviewees were 2 students from Otaniemi (a female and a male), 2 male students from Tampere, and users of HTV cable modems (a female and a male). Interviewees had used the IMU 10–40 times.

It was not clearly remembered where advertisements are situated in the publication. Only one remembered correctly "*there is something that blinks in the top right-hand corner."* If there are advertisements in the IMU publication, they should not blink. "*Well, I really don't like those blinking ads. They should at least be in a separate place." "You notice them, but they don't get any positive attention"*. One of the interviewees said that the Internet is a completely wrong media for advertising.

Targeting advertisements, according to one tester's background knowledge, created positive feedback. "*Well, why not. It is better that way than to have just any kind of ads." "Yes, then the ads would be something that interest me."* Advertising is acceptable, if it does not hinder the use of the IMU.

One respondent thought that advertisements would be current if they were connected to news topics. People who read the news are interested in the topic and therefore would also be interested if the advertisements are related to the same subject. Some thought that the news topics that a user reads do not reflect his/her true interests and some advertisements would be shown for no reason. "*If I had to choose between those two options, I would choose the own profile option."* There is also the possibility that advertisements are mixed with news material if they are presented according to news topics.

A channel dedicated to advertisements did not get enthusiastic reactions. If there was more information about products, contests or local advertisements, interviewees would visit the channel.

The most obvious benefit of using IMU was the possibility of watching the news whenever it suited the user best. "*This is a good news option because you don't have to care about the clock any more."* The IMU's feature of gathering

different media to the same publication was also considered to be beneficial, since this feature saved time. The IMU publication is not extremely important. "*It is not so important, because there is so much of that kind of news everywhere."*

The IMU's competitors could be newspapers on the Internet and portals, teletext, newspapers and television. "*It does not have only one competitor, because it has so many functions."* The definition of a competitor depends on the user's interests. "*It depends on what a person is interested in and what kind of information he wants."* Some information, e.g. economics, is easier to get from specialised newspapers. No exact competitor was named.

The IMU's marketing should be targeted at people who have the basic skills of using a computer and the Internet. Basic skills are a more important factor in targeting than age. Some respondents thought that young people could start using the IMU more easily. "*Surely those who would start using it would be young people rather than older people who are used to a certain way of getting the news."* People who are busy belong to the IMU's target group, because IMU can be used whenever one wishes. "*I think that a user could be a person who doesn't want to be tied to television programme schedules, but still wants to watch news on television."*

A network (LAN) connection was considered necessary when using the publication.

The price of the IMU should not be too high. As a monthly payment, the price could be one hundred FIM at maximum. Two interviewees would not pay anything. "*It would have to be a very good service, if I were to pay anything. This version of IMU doesn't offer me any special benefits." "If I don't see the news, it's not the end of the world. I can, if I want, read the news from the Internet."*

Advertisements could be shown in order to cut the price of IMU, if they do not distract the user. Advertisements should be clearly separated from the other content and most preferably targeted.

IMU should expand the variety of different media rather than cut it. *"Its strength lies in its supply of different media. The real question is how to group different themes and how to make it easy to read." "I think it would be good if there were more newspapers." "If there could be something more, then I would choose more information technology news."* Cartoons could be a new feature in IMU.

These interviews alongside all the other interviews suggest that the product should be developed further. According to these commercialisation interviews, the developers of the next IMU-like product should especially concentrate on the feature of on-demand news. This was a unique feature of IMU.

8. Conclusions and further work

The IMU2 system automates parts of the news content acquirement and processing work of the news service provider, typically a portal web master. The IMU active proxy server extracts the metadata from news web sites and – through video analyses – also from the television news broadcasts. This makes an automatic classification and linking of related articles and TV clips possible. The deeply integrated material is partitioned into news composites called channels, which can be personalised by the user. The automatically computed event and media calendar allows for a new type of integration of news and information about up-coming events. The news content is also utilised by setting up personalisation procedures for monitoring the business environment. Through the interfaces for PC, TV, WAP and MP3 terminals, the user accesses the same news content in various contexts. In spite of the merits of automatic procedures, machines cannot overtake journalistic skills and judgement. Therefore, we have developed an applet-based editor for journalists to control and override the automatically made operations. The journalistic team set up in the trial also created their own news packages. The community feature enables groups to produce and share their own news and to discuss topics internally.

The trial included households with fast network connections through cable modems, ADSL or campus networks. 335 trial users tested the service during a 6-month period. In addition to the PC users, 12 households used the service through their TV-sets. Some used the service from their WAP phones. The interviews showed that the service was appreciated; one in five users could even imagine themselves using it as their only news source. The interest in the service was fairly stable over the test period; the average use was a 7-minute session with three article retrievals once a week, whereas the heavy users viewed it every day. The integration of news was praised by two out of three users; this was also reflected in the fact that one in four articles were retrieved through the automatically computed links. The users generally thought that integrated sources save time, are convenient, give depth and help to show topics from different angles.

Only one in five users personalised channels and furthermore only one-third thought that they got important information from their personal channels. However, personalisation showed clear potential, because the personalised

channels were often used and the heavy users created many channels. For these, personalisation was a main reason to return to the service. Searches were rare – on average one per user.

The television set user retrieved twice as much material as the PC user. However, most of those who used both PC and TV thought that the PC service was more convenient. The WAP use was marginal. Television content interested most, both television news and program schedules. News packages made explicitly for IMU, interested users, but did not launch discussions. Navigating the TV-IMU application with the remote control was felt to be a bit cumbersome.

The choice of advertisements based on personal profiles got support from the users, but not the linking of the advertisement type to the news article read or an advertisement channel. The company users utilised the tool for environmental scanning only occasionally, even if it was considered to be a good idea. The reason was that the categories should be more specific and related to a distinct business area such as information technology or advertising. There should also be more news material in the publication.

The users thought that the service would benefit from adding more news publications – maybe also international ones – as sources. Company users especially need a large variety of financial sources. Some of these sources – but not all – should provide news in real time. In-depth information on certain items should be supplied. A targeting of the content towards well-defined interest communities could also be an idea. The personalisation should be more finely tuned and possibly even have alarm features. With these enhancements, there should be possibilities to bill for the integrated service. Important extensions include schemes for the management of Intellectual Property Rights, payment mechanisms as well as broker-type architectures, where only the source metadata – not the content – is stored in the proxy.

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Appendix A: The news pachages, the thematic and personalised news channels

The news packages created during the trial:

Ahtisaari's stock options
Animal rights activism
Euro money
Collapse of the Hague climate conference
Gay marriages
Genetic engineering
Helsinki music house or the old storehouses?
Stores opening on Sundays
What do you dare to eat?

The thematic news channels personalised by the IMU staff:

Doping
Fifth nuclear power plant?
Hanno Möttölä (basketball player)
Jari "Litti" Litmanen (football player)
Mika Häkkinen
Nokia
Presidents on TV
President Tarja Halonen
Situation in the Middle East
Sydney Olympic Games

Most selected personalised channels.

Channel name	Times selected
Ilmasto (Climate)	90
Ydinvoima (Nuclear power)	80
Internet	58
Vuosaari (Part of Helsinki)	43
Datex & co	42
Merihaka (Part of Helsinki)	41
Sivari (Person doing non-military service)	36
Metsät (Forests)	34
TENNIS	33
Kulttuuri (Culture)	29

Appendix B: Browsing themes and type of computer processors

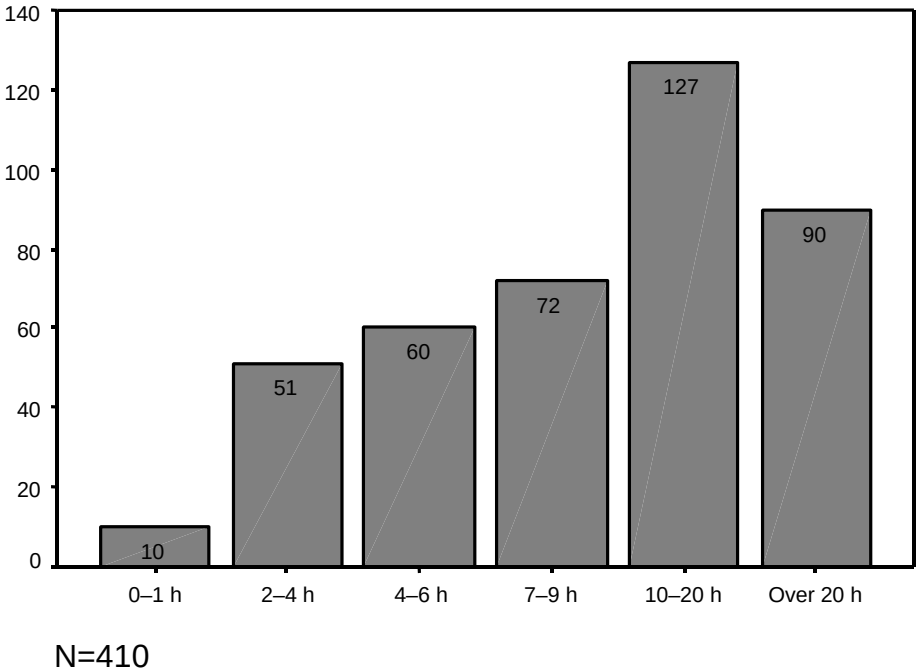

Figure 1. Time spent browsing WWW pages per week.

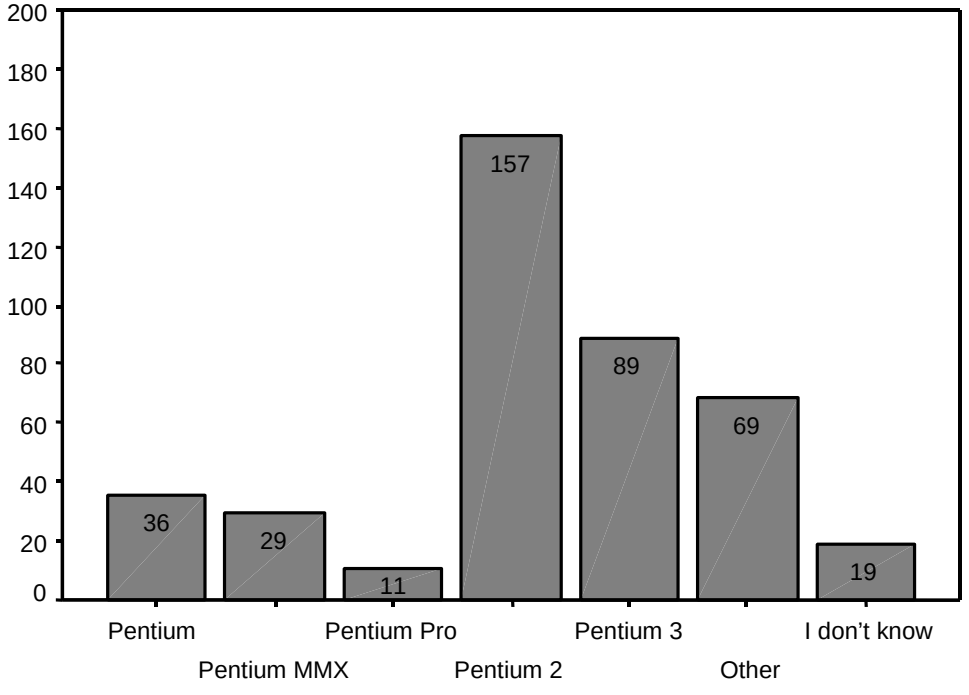

Figure 2. Type of computer processor.

Appendix C: The browsing times and the type of computer processors (First interview)

Interviewee name:

Age:

Occupation:

User group:

Size of family:

Weekly time spent browsing www pages:

Experience in using computers:

Results of usability form:

Other uses of IMU:

1. Appearance and clarity

1.1 Describe IMU? What kind of elements is it composed of?

1.2 Open the channel "Domestic News"? Describe how to use the channel.

1.3 Are the names of different functions clear and descriptive? (e.g. Search or Personalise)

1.4 What do you think of following characteristics of IMU?

- colours
- clarity of texts and pictures
- general impression? (would you describe it as distracting, calm, or otherwise?)

1.5 What is your opinion of the rolling bar?

2. Ease of Use

2.1 Personalise a channel of your own, simultaneously describe what you are doing and state if something is difficult or unclear.
(Ask if he/she has used the function previously and about problems with the first usage if the task was completed without problems.)

2.2 Choose some new channels or cancel those already chosen.

2.3 Search for a news article about violence toward women. (There was a TV-news item among the results. Interviewees were asked to open it. The next questions concern the news.)

- what do you think of the fact that while listening to the TV news there is also a text about the same news item on the bottom screen?
- what do you think of the fact that when choosing an individual news item the transmission ceases at the end of that report?
- speed
- reliability – does the result match the search terms?

2.4 Is it easy or difficult to use IMU?

2.5 What is the easiest aspect of IMU?

2.6 What is the most difficult feature? (Interviewee can specify his/her opinion)

2.7 Has anything odd or surprising occurred while using IMU? What was it?

2.8 Has IMU worked quickly enough?

2.9 Has IMU worked reliably?

3. Legibility

3.1 What is it like to read news from IMU compared to e.g. newspapers or other printed text?

3.2 Are there too many links available when concentrating on e.g. reading articles?

3.3 Open a news article. Where are the heading, subheading, headline, caption and links related to the news?

3.4 What is IMU like as a reading experience?

3.5 Do you remember what you have read?

3.6 What do you think of newspaper articles that are spread across one or two columns

- Which one do you prefer?

3.7 Can you quickly get to the top of page from the end of a long article?

4. Learning

4.1 How long did it take to learn to use IMU?

4.2 What things where the easiest and the most difficult to learn?

5. Implementation of IMU

5.1 How often do you use IMU?

5.2 Which part of IMU do you use most?

5.3 Which part do you use least, why?

5.4 What would you change in IMU?

5.5 What is the strongest feature of IMU?

5.6 What is the weakest feature of IMU?

5.7 Do other members of your family use IMU? Which part of IMU do they use?

5.8 Do you see IMU as useful?

5.9 Would you use a service like IMU if there were one available?

Have you any additional comments?

Appendix D: IMU usability interview PC (Last Interview)

Interviewee name:

Age:

Occupation:

User group:

Size of family:

Weekly time spent browsing www pages:

Experience in using computers:

Results of usability form:

Other uses of IMU:

1. Appearance and clarity

1.1 How often and for how long at a time do you use IMU?

1.2 Which kind of elements is it composed of?

1.3 What do you think of IMU's

- colours?
- clarity of texts and pictures?
- general impression? (would you describe it as distracting, calm, or otherwise?)

1.4 How would you change the appearance of IMU?

1.5 Have you noticed changes? What do you think of them?

1.6 What is your opinion of the rolling bar?

2. Ease of use

2.1 Personalise a channel of your own, simultaneously describe what you are doing and state if something is difficult or unclear?

- personalisation dialogue
- Is the word "muokkaa" descriptive?

2.2 What is the difference between the "edit" tab and "create new" tab?

2.3 Choose some new channels or cancel those already chosen. Is the word "muokkaa" descriptive?

2.4 Search for a news item about violence toward women. Can you easily find the "search" button?

- do you easily notice instructions about Boolean operators?
- what do you think of the fact that while listening to the TV news there is also a text about the same news in the bottom of the screen
- what do you think of the fact that when choosing an individual news item the transmission ceases at the end of the article
- search dialogue
- speed
- reliability – does the result match the search terms?
- is the word "search" descriptive?

2.5 Is it easy or difficult to use IMU?

2.6 What is (easiest to use now – ask previous interviewees) the easiest feature to use?

2.7 What is (most difficult to use now – ask previous interviewees) the most difficult feature to use? (Interviewee can specify his/her opinion)

2.8 Has anything odd or surprising happened while using IMU? What was it?

2.9 Has IMU worked quickly enough?

2.10 Has IMU worked reliably?

3. Legibility

New interviewees

3.1 Where are the lead, headline, subtitle and caption?

All interviewees

3.2 What is it like to read news from IMU compared to e.g. newspapers or other printed text?

3.3 Are there too many links available when concentrating on e.g. reading articles?

3.4 What is IMU like as a reading experience?

3.5 Should articles be spread over one column or two? Why?

3.6 How does scrolling affect your reading experience? If interviewee answers that it disturbs ask why?

3.7 Can you get to the top of the page quickly enough from the end of a long article?

4. Learning

New interviewees

4.1 How long did it take to learn how to use IMU?

4.2 What where the easiest and the most difficult features to learn?

Test users interviewed at the first interview

4.3 Do you still consider the same things hard to learn as in the first interview?

5. Implementation

5.1 Which part of IMU do you use most?

5.2 Which part do you use least, why?

5.3 What would you change in IMU?

5.4 What parts would you use in the future/ not use in the future?

5.5 Do other members of your family use IMU? Which part of IMU do they use?

5.6 Would you use a service like IMU if there was one?

5.7 Have you given up or curtailed use of any information source since the test?

5.8 Would you prefer using IMU by TV or PC?

5.9 Would you prefer either one in certain situations? (for example searching with TV and reading news from PC)

5.10 In what kind of situation would you use each one?

5.11 Are there certain features in IMU that you would prefer to use with either terminal?

5.12 Have you any other comments?

Appendix E: IMU usability interview WAP

Interviewee name:

Age:

Occupation:

User group:

Size of family:

Weekly time spent browsing www-pages:

Experience in using computers:

Results of usability form:

Other uses of IMU:

Appearance and clarity

1. How often and for how long at a time do you use IMU?
2. What can you do with IMU?
3. Connect to the service. (Pay attention to the way the user arrives at the point where user identification and password are requested)
4. What is starting the IMU service like? Is service a logical point to start the IMU service?
5. What was logging in like? (Did he/she notice the OK button at once or are 3 OK buttons too many?)
6. Has the service been quick?
7. Has the service been reliable?

Ease of use

8. Choose a channel.
9. Choose an article.

Legibility

10. Do you have problems with reading articles?
11. How do the size of the screen and splitting the text across several screens affect your use?
12. What is the service like as a reading experience?

Ease of use

13. Choose another channel and article. Give comments about the usability of the service, how could usability be improved?
14. Do the words article and channel describe the functions well?
15. Rework the channel menu. Give comments.
16. Search for articles about viruses. Comment on use and moving in the service.
17. Save the search as a channel.
18. Does the service give enough feedback? How could usability be improved?
19. Which are the hierarchical levels of service? What parts constitute the WAP-IMU?

Implementation

20. When have you used the service? When would you use the service?
21. How long did it take to learn how to use IMU?
22. What things were the easiest/ most difficult to learn?

Appendix F: IMU usability interview TV (First interview)

Interviewee name:

Age:

Occupation:

User group:

Size of family:

Weekly time spent browsing www pages:

Experience in using computers:

Results of usability form:

Other uses of IMU:

Appearance and clarity

1. Describe IMU. What kind of elements it is composed of?
2. Are the names of different functions clear and descriptive?
3. What do you think of following characteristics of IMU?
   - colours
   - clarity of texts and pictures
   - general impression? (would you describe it as distracting, calm, or otherwise?)

Navigation and remote control

4. Leaf through the front page, glance over the different parts. Describe how you are navigating on the screen and is it straightforward? Does the use feel effortless and easy or difficult and cumbersome? Is the navigation on the screen logical?

5. How do you use the remote control to?
   - tune in to the TV
   - tune in to the IMU-TV and change channels of the TV
   - adjust volume
   - tune to the IMU system
   - change the page of the news
   - choose an article
   - choose a link

   Ask if he/she has used the function previously and about any problems with the first usage if the task was completed without problems.
6. What do you think of the functions of the OK button? If you hold the button down, the article is automatically chosen. If you press it quickly, the title is activated first and the article opens after the second press. Have you noticed this? Does the term OK properly describe the function of the button?
7. Comment on the appearance of the remote control.

Ease of use

8. Search for articles about a prime minister, describe the way you work and whether there is something difficult or unclear?
   - speed
   - reliability (Do results correspond with the search term?)
9. Search for movies playing in Tampere today? Describe what you are doing and state if there is something difficult or unclear. Read some movie critiques
   - What is the Event and Media Calendar like? What can it be used for?
   - Compare usability to the news channels

   If there were no problems in achieving the task, ask if interviewee has used the function previously. Did any problem arise during the first usage?

10. Choose a TV program.
    - record it
    - cancel it

    If there were no problems in achieving the task, ask if interviewee has used the function previously. Did any problem arise during the first usage?
11. Choose the TV news channel
12. Watch topic number 5 and return to the initial stage.
    - what do you think of the fact that the news ends after the single news item is finished?
13. What do you think of the use of the two different control devices? (remote control and keyboard)
14. Is it easy or difficult to use IMU? Rate it from 1 to 5.

    A) ease of learning

    B) ease of use

    C) ease of remembering

    D) functionality

    E) pleasantness of use
15. What is the easiest function?
16. What is the most difficult function? Why?
17. Has anything surprising or odd happened while using IMU? What was it?
18. Has IMU worked quickly?
19. Has IMU worked reliably?

Legibility

20. Are there too many links available when concentrating on reading news?
21. Open a news article. Where are the title, subtitle, an overview, a caption and other links related to the topic?

22. How do you like the outward appearance of the text? Should there be an option to change font size?
23. How do you rate IMU as a reading experience?
24. Do you remember what you read?

Learning

25. How long did it take to learn how to use IMU?
26. What things were the easiest/ the most difficult to learn?

Implementation of IMU

27. How often do you use IMU?
28. Which part of IMU do you use most?
29. Which part do you use least, why?
30. What would you change about IMU?
31. What is the strongest feature of IMU?
32. What is the weakest feature of IMU?
33. In what kinds of situations have you used or would use IMU-TV?
34. Do other members of your family use IMU? Which part of IMU do they use?
35. Could IMU become as natural a part of life as TV or stereos? In what kinds of situations would IMU then be used?
36. Have you any other comments?

Appendix G: IMU usability interview TV (Last Interview)

Interviewee name:

Age:

Occupation:

User group:

Size of family:

Weekly time spent browsing www pages:

Experience in using computers:

Results of usability form:

Other uses of IMU:

Appearance and clarity

1. How often and for how long at a time do you use IMU?
2. What elements is it composed of?
3. Are the names of the different functions clear and descriptive?
4. What do you think of the following characteristics of IMU?
   - colours
   - clarity of texts and pictures
   - general impression? (would you describe it as distracting, calm, or otherwise?)
5. How would you like to change IMU's appearance?

Ease of use

6. Some problems to solve:
    a) Change the page in a news article.
    b) Choose an article.
    c) Choose a link.
    d) Watch the TV news.
    e) Change to the TV screen.
    f) Change to IMU-TV and change the channel of the TV.
    g) Change back to IMU.
    h) Search for a community channel like IMU community or TOAS.

    Describe how you search for a channel and state if there is something difficult or confusing? What is in the community channel?
7. If there were no problems carrying out these exercises, ask if he /she has used the function before previously and if there were problems with the first usage.
8. Search for articles about Juhani Tamminen (fired ice hockey coach). Describe how you work and state if there is something difficult or unclear.
    - speed
    - reliability. Do the results match the search term?
9. Have you used the search function or some other special function previously? Reason for disuse?
10. Search for movies playing in Tampere today? Describe what you are doing and state if there is something difficult or unclear.
    - usability compared to the news channels
11. Are you ready to use both the keyboard and remote control? (Ask about using several control devices)
12. Is it easy or difficult to use IMU? Rate it from 1 to 5.

A) ease of learning

B) ease of use

C) ease of remembering

D) functionality

E) pleasantness of use

13. What is the easiest feature?
14. What is the most difficult feature? Why?
15. Has anything surprising /odd happened while using IMU? What was it?
16. Has IMU worked quickly?
17. Has IMU worked reliably?

Navigation, remote control and feedback

18. Leaf through the front page, glance through the different parts. Describe how you are navigating on the screen and is it logical? Does the use feel effortless and easy or difficult and cumbersome? Is the navigation on the screen logical?
19. Does the term OK properly describe the function of the button?
20. What do you think of reading articles using arrow buttons? What is easy and difficult about it?
21. Is moving on the screen easier now than in the beginning of the test? (habituation)
22. a) Adjust volume to the loudest possible setting. Record a TV program.

    b) Does IMU give enough feedback to the user? What do you think ofthe red frames of chosen articles or links? What do you think of activated text that turns to red and voice feedback? Is there enough feedback?

23. Have you noticed any changes in the appearance or feedback given? Do changes help the use?
24. What buttons should be on the remote control? Should the remote control have more functions such as the ability to choose articles or change pages?

Legibility

25. Are there too many links available when concentrating on reading news? Do you read any other articles related to the same topic?
26. Compare the layouts of IMU and a newspaper. How easy is it to for example find a title, subtitle, a caption?
    Have you noticed a change in subtitles? Has it affected legibility?
27. How do you like the outward appearance of the text? Should there be an option to change the font size?
28. How do you rate IMU as a reading experience?
29. What do you think of the space reserved for articles? Is it sufficient? Is the screen divided into an adequate number of parts?

Learning

30. How long time did it take to learn how to use IMU?
31. What can you do now that you could not at the beginning of the test?
32. What do you think are the easiest and most difficult things for beginners to learn?

Implementation of IMU

33. Which part of IMU do you use most?
34. Which part of IMU do you use least, why?
35. What would you change about IMU?
36. Do other members of your family use IMU? Which part of IMU do they use?
37. When would you use IMU? (for example during commercials, in the morning/evening, etc.)?
38. How often would you use IMU lying on the couch (use it for relaxation)? Would you use it at work?
39. How would you like to pay for the service? Monthly payment, annual fee, paid by advertisement, pay per view (käyttökertoihin perustuva maksu-järjestelmä)? How much would you pay for the service?
40. Have you any other comments?

Appendix H:

WHAT DO YOU THINK OF IMU'S USABILITY?

There are some statements below. Consider each statement based on your experience with IMU. Choose the most appropriate alternative

Do not answer questions 8 and 9 if you have not used the functions concerned.

		Completely disagree	Almost disagree	Slightly disagree	Agree slightly	Almost agree	Completely agree
1.	IMU is too slow.	○	○	○	○	○	○
2.	IMU crashes too often.	○	○	○	○	○	○
3.	I easily learned how to use IMU.	○	○	○	○	○	○
4.	I easily remember how to use IMU.	○	○	○	○	○	○
5.	Most people probably learn to use IMU very quickly.	○	○	○	○	○	○
6.	In my opinion there are too many inconsistencies in IMU.	○	○	○	○	○	○
7.	When using IMU it is easy to understand how to get to a certain point.	○	○	○	○	○	○
8.	I don't have problem using IMU's personalisation feature.	○	○	○	○	○	○
9.	I think that IMU's search function is easy to use.	○	○	○	○	○	○
10.	I don't consider IMU to be very useful.	○	○	○	○	○	○

11. Describe in detail the kind of problems you have encountered when using IMU

_____

_____

_____

_____

_____

Appendix I:

WHAT DO YOU THINK OF TV-IMU'S USABILITY?

My name: _____

Consider each statement based on your experience with IMU. Mark the most suitable alternative with a tick.

	Completely disagree	Almost disagree	Slightly disagree	Agree slightly	Almost agree	Completely agree
12. IMU functions reliably.	○	○	○	○	○	○
13. IMU crashes too often.	○	○	○	○	○	○
14. I easily learned how to use IMU.	○	○	○	○	○	○
15. I easily remember how to use IMU.	○	○	○	○	○	○
16. I think that IMU is overly complex.	○	○	○	○	○	○
17. In my opinion there are too many inconsistencies in IMU.	○	○	○	○	○	○
18. When using IMU it is easy to understand how to get to a certain point.	○	○	○	○	○	○
19. It is easy to move from one part of the screen to another part by using the remote control.	○	○	○	○	○	○
20. When moving on the screen I'm very much aware of where I am going.	○	○	○	○	○	○
21. Choosing an article is complicated.	○	○	○	○	○	○
22. Two control devices are (remote control and keyboard) too many.	○	○	○	○	○	○

23. Describe in detail the kind of problems you have encountered when using IMU

_____

_____

_____

_____

_____

_____

Appendix J: Telephone interview

1. How often have you used IMU?
2. Do you consider IMU to be useful?
3. What do you think of IMU's appearance?
4. Have you found the "Muokkaa" buttons?

   - do you know what they are for?
5. Have you personalised channels of your own with the "muokkaa" button?

If the answer is no

- why not?

If the answer is yes

- what kind of problems have you encountered?

6. For which topics would you personalise channels?
7. Have you used the "search" function?

If the answer is no

-why not?

If the answer is yes

- tell about your experience?
- did you find the "search" button without any problems?
- did you consider it as an entity, separate from for example instructions?

8. What kind of inconsistencies have you noticed in IMU?
9. What kind of problems have you had with using certain features of IMU?
10. Have you any other comments?

Appendix K: The themes and main questions of the interview focused on the journalistic and community features

IMU in general

Did IMU match up to your expectations?
What was the best aspect of IMU?
What could have been done better?

IMU as a news medium

How does IMU stand out in comparison with the other media?
Does IMU have journalistic significance?
Is the IMU newsroom necessary?
Which should be emphasised more, the speed or the scope of the news service?
Is the integration of the news and media worthwhile?
Should more content providers be added to the service?
How do you regard the news packages?

Other aspects of IMU

What is your opinion on the discussion forums?
What do you think of dialogue journalism?
Is the personalisation feature useful?

IMU in communities

What can IMU provide for your community?
What do you think of the community channels?
In which direction should the community features be developed?

Set-top-box users

For what uses have you employed the STB?
How does the STB stand out in comparison with the teletext and the PC IMU?

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Integrated news publishing – Technology and user experiences

Report of the IMU2 project

Abstract

Fast networks and multipurpose terminals enable the integrated delivery and use of media content originally targeted at different media. The emerging multiple media portals accessed by a variety of terminals require semi- and fully automatic procedures for managing the content. News services benefit from an integration of news sources that goes deeper than mere listings of links provided by many current Internet portals. This deep integration groups news articles from different sources and media into common and personal categories as well as interlinks the articles.

The IMUsystem, developed in this work, automates parts of the news content acquirement and processing work of the portal web master. The IMU active proxy server extracts the metadata from news web sites and also – through video analyses – from television news broadcasts. This makes an automatic classification and linking of related articles and TV clips possible. The deeply integrated material is partitioned into news composites called channels, which can be personalised by the user. The automatically computed event and media calendar allows for a new type of integration of news and information about up-coming events. The news content is further utilised by setting up personalisation procedures for monitoring the business environment. Through the interfaces for PC, TV, WAP and MP3 terminals, the user accesses the same news content at work, at home in the living room and on the move. To balance the automatic procedures with journalistic judgement, we created web tools for human editors to control and override the automatic operations and for creating new content. The community feature enables groups to produce and share their own news and to discuss topics internally.

The trial included households with fast network connections through cable modems, ADSL or campus networks. The trial users tested the service over a 6-month period. In addition to the PC users, several households used the service through their TV sets. Some used the service from their WAP phones. The interviews showed that the service was appreciated; one in five users could even imagine using it as their only news source. The interest in the service was fairly steady over the test period; the average use was a 7-minute session once a week, whereas the heavy users viewed it every day. Most users praised the integration of news sources, because it saved time and gave complete information – this was also reflected in the fact that one in four articles was retrieved through the automatically computed links. Only one in five users personalised channels – however personalisation showed clear potential, because the personalised channels were used often and the heavy users created many channels.

Even though television set users retrieved more material than the PC users, they thought that the PC service was more convenient. The use of WAP and the environment monitoring was marginal. Television content interested most users, both television news and program schedules. News packages made explicitly for IMU, interested users, but did not launch discussions. Navigating in the TV-IMU application with the remote control was felt to be a bit cumbersome.

The users thought that the service would benefit from adding more news publications as sources. Some of these sources – but not all – should provide news in real time. A targeting of the content towards well-defined interest communities would be appealing. With these enhancements, there should be possibilities to bill for the integrated service.

Keywords

integrated publishing, integrated delivery, news services, multiple media, personalisation, IMU

Activity unit

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Tiivistelmä

Nopeat verkot ja monikäyttöiset päätelaitteet mahdollistavat sellaisten mediasisältöjen siirtämisen ja käytön, jotka on tarkoitettu alun perin eri medioille. Syntymässä olevat monimediaportaalit, joihin kytkeydytään erityyppisillä päätelaitteilla, vaativat puoli- ja täysautomaattisia proseduureja sisällön hallintaan. Uutispalveluissa on tarve yhdistellä lähteitä tavalla, joka menee syvemmälle kuin nykyisten Internet-portaalien tarjoamat linkkilistat uutisjulkaisuihin. Tällainen syvä integraatio ryhmittelee artikkeleita eri lähteistä ja medioista sekä yhteisiin että henkilökohtaisiin luokkiin ja linkittää artikkelit keskenään.

IMU-järjestelmä, joka on kehitetty tässä hankkeessa, automatisoi osan verkkopalvelun ylläpitäjän suorittamasta uutisten hankinnasta ja käsittelystä. IMUn aktiivinen välipalvelin irrottaa metadataa verkkojulkaisujen palvelimista ja videoanalyysin avulla myös television uutislähetyksistä. Tämä mahdollistaa artikkelien ja TV-uutisaiheiden automaattisen luokituksen ja keskinäisen linkityksen. Syvästi integroitu aineisto on jaettu uutisyhdistelmiin – kanaviin – joita käyttäjä voi personoida itselleen. Automaattisesti muodostettu tapahtuma- ja mediapäivyri mahdollistaa uudentyyppisen integraation uutisten ja tulevien tapahtumatietojen välillä. Uutissisältöä hyödynnetään myös muodostamalla personointimekanismeja liiketoimintaympäristön luotaamiseen. Hyödyntämällä kokeilujärjestelmän liitäntöjä PC-, TV-, WAP- ja MP3-päätteisiin käyttäjä voi hakea samoja uutisia työssä, kotona television ääressä ja liikkeellä ollessaan.

Saadaksemme aikaan tasapainon automaattisten proseduurien ja toimituksellisen arvioinnin välillä loimme toimittajille välineitä automaattisten operaatioiden valvomiseen ja korjaamiseen sekä uuden sisällön luomiseen. Yhteisöpiirre mahdollistaa sen, että ryhmät tuottavat ja jakavat omat uutisensa ja keskustelevat uutisista sisäisesti.

Kokeiluun osallistui kotitalouksia, joilla oli nopeat tietoliikenneyhteydet kaapelimodeemien, ADSL-modeemien tai yliopistoverkkojen kautta. 335 koekäyttäjää testasi palvelua puolen vuoden aikana. PC-käyttäjien lisäksi muutama kotitalous käytti TV-IMU-palvelua TV-vastaanottimiensa kautta. Muutamat käyttivät palvelua WAP-puhelimiltaan. Käyttäjähaastattelut osoittivat, että palvelu otettiin hyvin vastaan: yksi käyttäjä viidestä katsoi jopa voivansa käyttää sitä pääuutislähteenään. Kiinnostus palveluun oli aika stabiili testikautena. Keskimääräinen istunto oli seitsemän minuuttia kerran viikossa, kun taas aktiivikäyttäjät katselivat IMUa joka päivä. Useimmat käyttäjät pitivät uutislähteiden integraatiota hyvänä piirteenä, koska se säästi aikaa ja antoi monenlaisia näkökulmia; tämä näkyi myös siinä, että yksi neljästä artikkelista haettiin automaattisesti luotujen linkkien kautta. Ainoastaan 22 % käyttäjistä personoi omia kanavia – toisaalta personointiin osoittautui olevan halukkuutta, koska personoituja kanavia käytettiin paljon ja aktiivikäyttäjät personoivat ahkerasti.

Vaikka television käyttäjät hakivat enemmän artikkeleita kuin PC:n käyttäjät, he pitivät PC-palvelua kätevämpänä. WAPin ja ympäristöluotauksen käyttö oli marginaalista. Televisioaineisto kiinnosti eniten – sekä televisiouutiset että ohjelmatiedot. IMUlle tuotetut uutispaketit kiinnostivat mutta eivät synnyttäneet keskustelua. Navigointia TV-IMU-sovelluksessa kaukosäätimellä pidettiin jonkin verran monimutkaisena.

Useimmat haastateltavat olivat sitä mieltä, että palvelu paranisi, jos siihen lisättäisiin useampia uutisjulkaisuja – mahdollisesti myös kansainvälisiä. Joidenkin lähteiden – ei kuitenkaan kaikkien – pitäisi tarjota uutisia reaaliajassa. Syvällistä tietoa tietyistä aiheista on oltava tarjolla. Myös uutissisällön räätälöinti hyvin määritellyille kiinnostusryhmille voi olla aiheellista. Näillä laajennuksilla voitaneen myös laskuttaa integroidusta palvelusta.

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