A snapshot of the EBU's Webcasting activities

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The EBU recently carried out a survey of its Members to establish the extent of their Internet and webcasting activities.

The results are reported here and offer a valuable snapshot of the webcasting activities of EBU Members in late 2001.

1. Introduction

In October 2001, the EBU launched a survey on its Members' activities on the Internet and in webcasting [1]. The survey was initiated by EBU Project Group B/BMW (Broadcasting of Multimedia on the Web). It was subsequently approved by the Interdisciplinary Group, On-Line Services (I/OLS), and the Broadcast Management Committee (BMC). The EBU Strategic Information Services (SIS) conducted the survey among the EBU Member organizations and performed the analysis of the results.

A questionnaire on Members' webcasting activities was sent to all active EBU Members. Responses were received from 42 Member organizations from 29 European countries. Practically all European countries, with one or two minor exceptions, duly responded to the questionnaire. Unfortunately, few responses were received, within the deadline, from our North African and Near East Members.

2. Background

As the internet activities of EBU broadcasters are relatively new, it is worthwhile reviewing the Internet value chain and defining the main players and elements of that chain. These definitions will be used extensively in presenting the results of the recent survey.

The Internet can be defined as a collection of packet-switched networks, interconnected by routers, along with TCP/IP protocols that allow these disparate networks to function logically as a single, large, virtual network. The Internet is a global (in the real sense) network which connects millions of computers such that they can exchange information. **Webcasting** is a multimedia extension of the Internet. As audio and video signals can be digitized into a stream of "1"s and "0"s, and then be put into containers ("packets"), they can travel over the Internet just like any other information.

1. The word "webcasting" in this article is defined as "the publishing of audio and video files and/or streams on websites, for live and/or on-demand delivery to the general public.

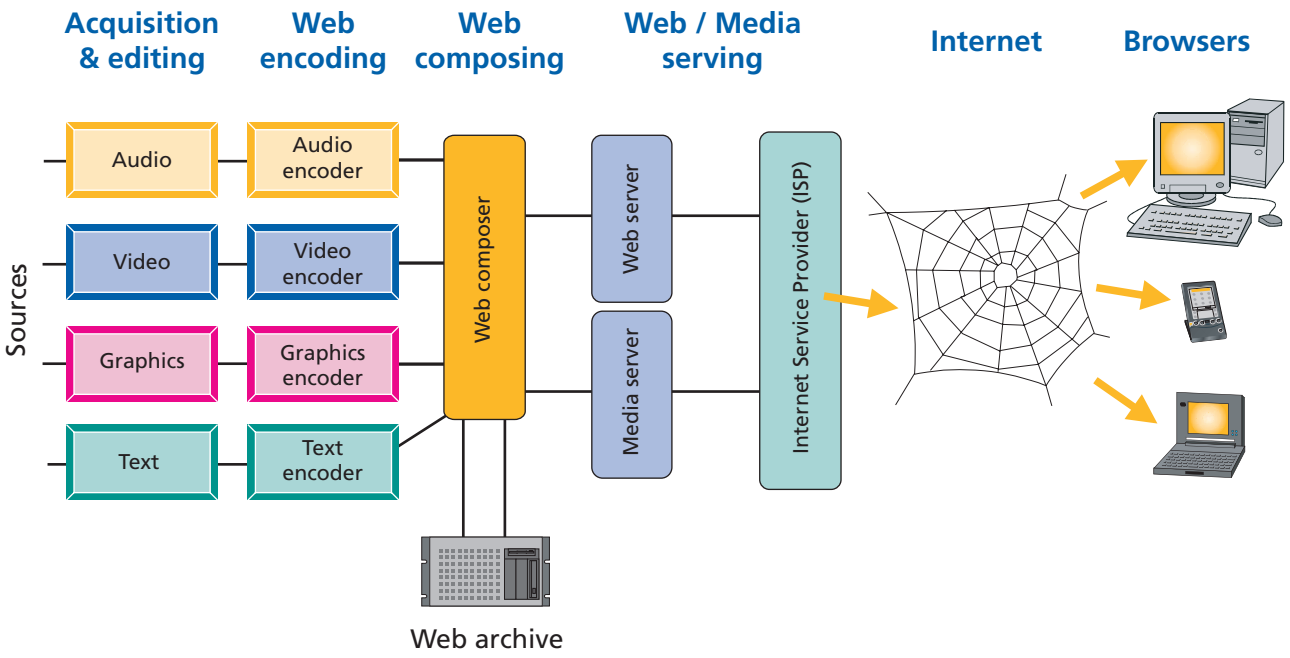


Figure 1
A simplified diagram of the Internet value chain

A simplified block diagram of the Internet value chain is given in *Fig. 1*. The definitions of the different elements are taken from the EBU Webcasting Handbook [1] and are reproduced below for completeness:

- **Acquisition:** The process of acquiring different audio, video, textual, graphical and other content sources. This represents the first step in the overall webcasting chain.
- **Audio sources:** Analogue and digital tape recorders (CD, MiniDisc, DAT) and routing systems, audio files available in different formats (e.g. MPEG-1, MP3) from CD-ROM, audio servers, Intranets and the Internet.
- **Video sources:** Analogue tapes (VHS, S-VHS, Betacam), digital tapes (DV, DVC, MPEG-2), analogue or digital cameras, video (with audio) files available in different formats from CD-ROM, DVD, A/V servers, etc.
- **Textual sources:** Office word processing systems, news wires, teletext, e-mails, databases, Intranets and the Internet.
- **Graphical sources:** Still cameras, picture libraries, scanners, digital or analogue video sources, CD-ROMs, Intranets and the Internet.
- **Encoding:** The process of bit-rate reduction (compression) of digital audio or video signals to produce bit streams or files in a given format. The most common compression formats for distribution over the Internet are presently the proprietary standards, *RealNetworks* and *Windows Media*. In future, the open standard *MPEG-4* may take their place.
- **Web adaptation of text and graphics:** The process of adapting and optimizing textual and graphical information in order to present it in a format (e.g. JPEG, BMP, GIF, SVG) that is suitable for publishing on the Internet.
- **Web composition:** The process of producing a complete website in HTML.
- **Web server:** A computer that runs a software application and sends web pages over the Internet. For a traditional broadcaster, a server could be considered as a transmitter. However, a server communicates with the end users and identifies them.
- **Media server:** A computer that runs a software application and sends media (audio, video or a synchronized package of both) streams or files over the Internet. Media can be streamed or downloaded. If media is *downloaded*, it is first copied to a client computer and then played locally. *Streaming* media, on the other hand, allow the users to see/hear the video/audio files as they are being received by the client machine, without lengthy download times.

- **Internet Service Provider (ISP):** The entity (usually a company) that offers a personal or business Internet access to the end user. For example, an ISP may operate media servers to stream media clips over the Internet. An ISP may also provide subscription services such as online information-retrieval software, bulletin boards and electronic mail (usually for a fee).

3. General information

The first part of the questionnaire asked EBU Members various general questions such as:

- how many websites do they operate;
- when did they start their webcasting operations;
- how much audio/video streaming do they perform;
- how do they see the relationship between Internet and traditional radio/television broadcasting;
- what are their main motivations for providing online services.

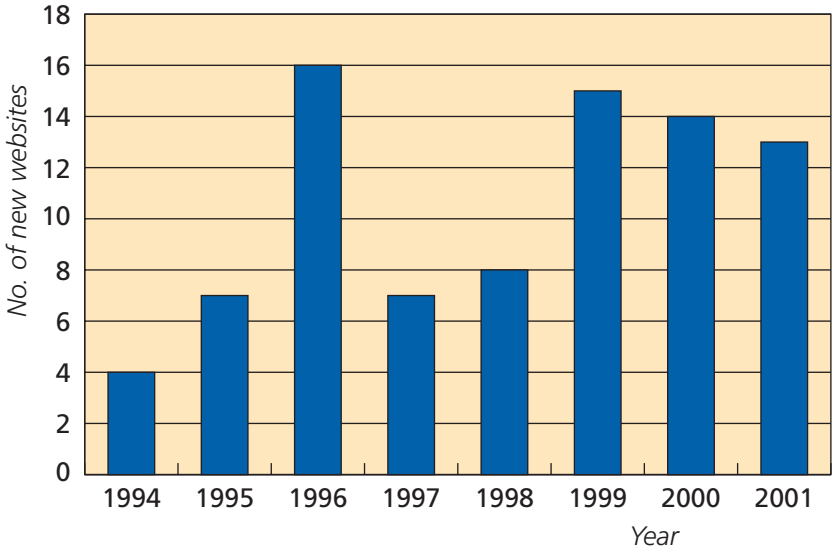
3.1. How many URLs do the Members operate?

The survey showed that currently 42 EBU members operate 177 sites: a large majority operate one or two websites. However, large EBU members covering national territories may have **several regional and local stations**, each having a separate URL/website address. Examples:

Broadcaster	No. of websites
ARD	67
ZDF	6
Radio France	23
VRT	10

It is estimated that today there are around 10'000 radio stations on the Web. About half of them provide continuous audio streaming, while around 200 are Internet-only webcasting stations.

3.2. Launch year of Members' websites



The chart above shows when EBU Members started their websites. Out of 84 responses received on this question, four EBU Members reported that they launched their websites as early as 1994. The number of sites has grown every year but the peaks of growth were achieved in 1996 and 1999.

3.3. Audio and video streaming

Radio and television broadcasters use their websites not only to post textual and graphical information but also for webcasting, i.e. for audio and/or video delivery. It is true to say that webcasting is still in its infancy, both in terms of the audio/video quality achievable as well as the number of concurrent users that are able to receive the streams on their computers at home or in the office.

The survey revealed that many EBU Members operate websites that are enhanced by audio and/or video streaming. However, as EBU Members may generally operate several websites, not all of them may carry audio or video streams. This holds true for about one third of the websites operated by EBU Members.

The table below summarizes the results obtained from this part of the survey.

Number of responding Member organizations	42	
Total number of EBU Members' websites in operation (end of 2001)	177	
Number of websites without any streaming	56	32%
Number of websites with audio streaming only	52	29%
Number of websites with video streaming only	16	9%
Number of websites performing both audio and video streaming	53	30%

These results show that about 60% of all sites operated by EBU Members are enhanced by audio streaming and about 40% with video streaming.

3.4. Language used

A large majority of Members' websites (about 64%) use their national language only. However, as the Internet has a global reach, some 25% of Members provide English as a second language. About 11% of Members provide a third language (that may be spoken by a local minority) or even more languages. Radio Vatican, for example, is available in 40 languages! The Finnish site < **http://www.yle.fi** > operates in five languages: Finnish, Swedish, English, Saami and Latin. The latter language is certainly an international web curiosity.

3.5. Is the Internet an independent or complementary broadcasting medium?

13% of Members consider the Internet as an independent medium, implying that a website may have its own programme content that is not necessarily linked to the station's core radio and television programming. About 35% of Members established their websites in order to support and complement their core programming business. More than half the EBU Members (52%) are of the opinion that the Internet can be considered as both an independent and a complementary broadcasting medium.

3.6. Motivations

The survey revealed the following ranking of the motivation behind carrying out web activities:

Rank 1: To give information to the general public about Member's radio and TV programmes, together with programme schedules and EPG-like information.

Rank 2: To provide streaming of live audio and TV programmes.

Rank 3: To provide local, regional and world news items.

Rank 4: To reach people beyond the coverage area of existing terrestrial radio and TV networks.

Rank 5: To provide more detailed or additional information that is not available on regular broadcasts because of the intrinsic time constraints.

Rank 6: To present the Member's profile in terms of history, achievements, coverage, staff, statistics on the audience, plans for the future, etc.

Rank 7: To enhance communication with regular viewers and listeners via e-mails and chat rooms.

Rank 8: To engage the public in the content-enhancing process.

Rank 9: To provide traffic messages ... air, rail and other travel information ... information about events ... weather information ... SMS messages ... webcams ... and other information that is not related to the scheduled radio and TV programmes.

Rank 10: To develop a one-stop Internet portal.

Rank 11: To enable users to play (interactive) games, and enable voting, bidding and auctioning.

Rank 12: To provide a platform for e-commerce transactions between Members, involving CDs, DVDs, books and other merchandise.

The response from the German broadcaster, ARD/MDR, provided a good summary of the main motivations for traditional radio and TV broadcasters to establish their own on-line offering, and is repeated here:

> ***" The main function of web services is to support the core radio and television programmes and make them more attractive to the general public. On-line services enable new forms of interaction and communication with the viewers and listeners, not available in conventional radio and television. MDR uses on-line services in order to enhance the relationship with the target groups and to acquire new target groups for MDR radio and television broadcasts. On-line services are a valuable cross-promotional tool. "***

4. Production tools for webcasting

As webcasting is a relatively new activity for broadcasters, some specific tools for production, distribution and consumption are therefore needed. As there has been no concerted and harmonized effort by EBU Members in this area of technology, diverse solutions can be found.

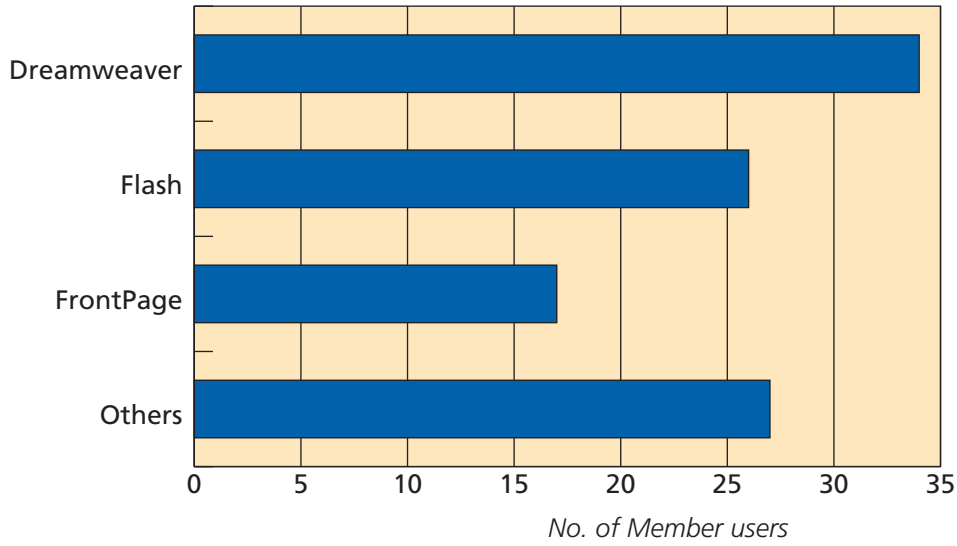
The web production tools can be divided into:

- **Web composing tools** – to create a complete website and individual HTML pages.
- **Streaming tools** – to capture and encode audio and video media streams. Compared with linear (non-compressed) signals, streaming tools compress the signals considerably (usually by a factor of 50 to 100), so that they can then be distributed over the Internet to the users.
- **Multimedia production tools** – to insert graphics, illustrations, photographic material, animations and ticker bars in web pages.
- **Databases and web reporting tools** – to keep media, metadata and web archives as well as statistical records about web accesses.

In some cases, it may be advantageous if the production tools for webcasting are combined with the existing tools for radio or television production. To this end, the survey explored which technologies are being used for integrated digital TV/webcast production.

4.1. Web composing tools

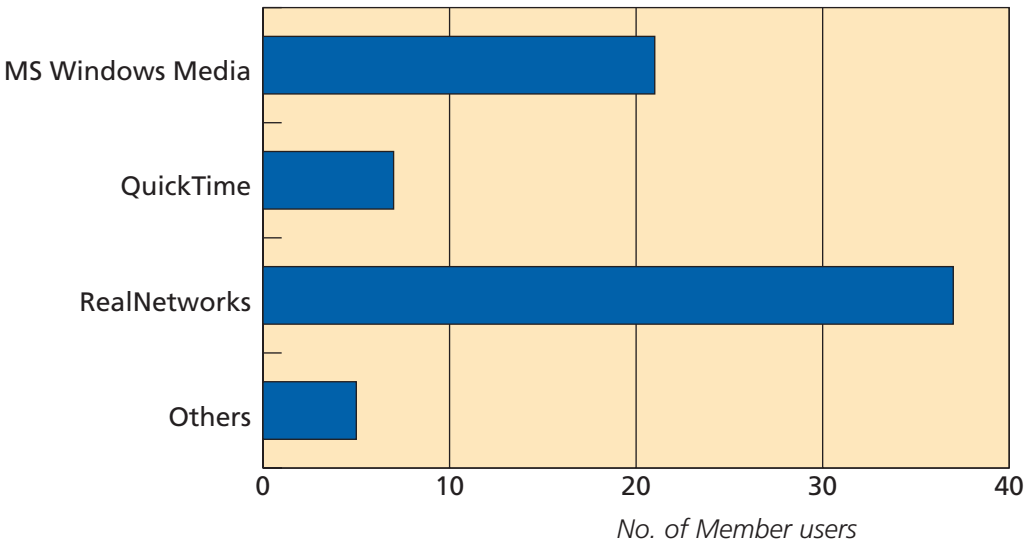
As shown in the chart below, the most popular web composing tools used by EBU Members are Macromedia *Dreamweaver*, Macromedia *Flash* and Microsoft *FrontPage*.



Some proprietary tools – based on generic technologies such as XML and XSLT – were also found to be in use.

4.2. Streaming tools

It had been expected – and the survey confirmed *(see the chart below)* – that most Members use *RealNetworks* streaming tools. The survey in fact revealed that an aggregated total of some 52'000 RealNetworks encoding/streaming licences had been acquired by EBU Members at the end of 2001. Microsoft's *Windows Media* was found to be the next most popular streaming format, followed by Apple's *QuickTime*. The trend, however, is largely moving in favour of MS Windows Media – as no licence fee is required, unlike with RealNetworks.

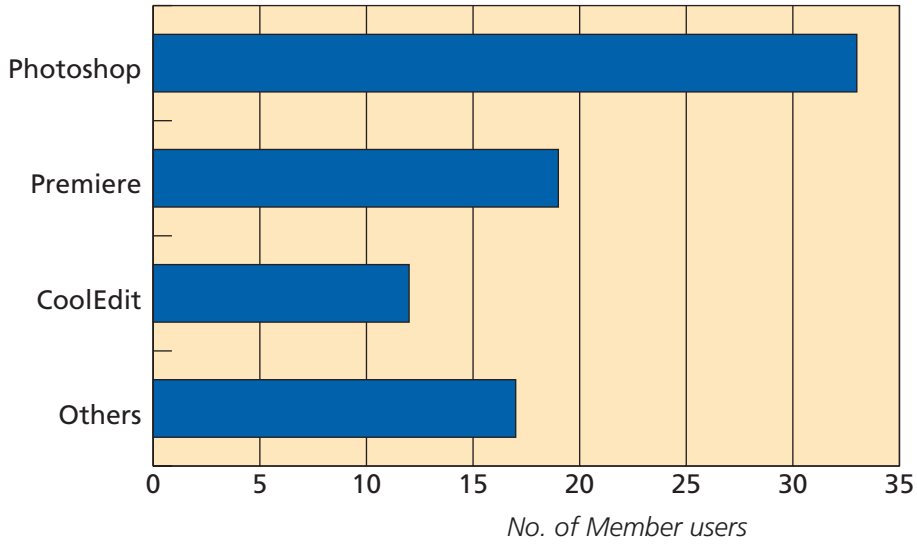


MP3 [2] and Ogg Vorbis [3] were found to be widely used for audio-only encoding and streaming.

There is a new standard, MPEG-4 [4], which may become increasingly popular for webcasting in the forthcoming years, but the survey showed that it is not yet part of the webcasting market at the present time.

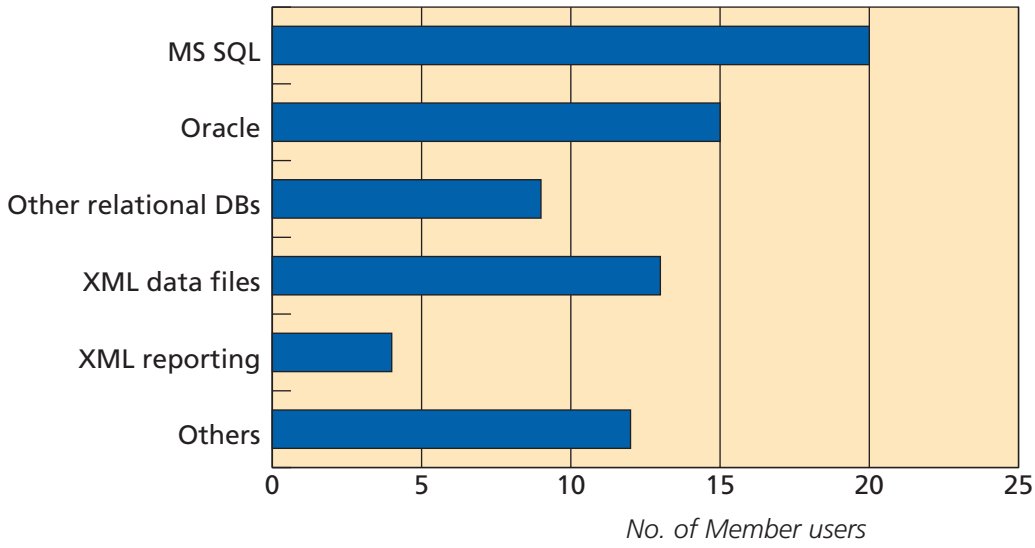
4.3. Multimedia production tools

Among multimedia production tools, Adobe *PhotoShop* seems to be most widely used, followed by Adobe *Premiere* and Syntrillium's *CoolEdit*, as shown in the chart below. However, a wide range of other multimedia production tools were also found to be in use across the EBU Membership.



4.4. Databases and web reporting tools

The survey showed that Microsoft SQL database is more popular than Oracle. However, it was also evident that XML data structures are increasingly being used for web production, archiving and the exchange of media files – and also for the reporting of media traffic.



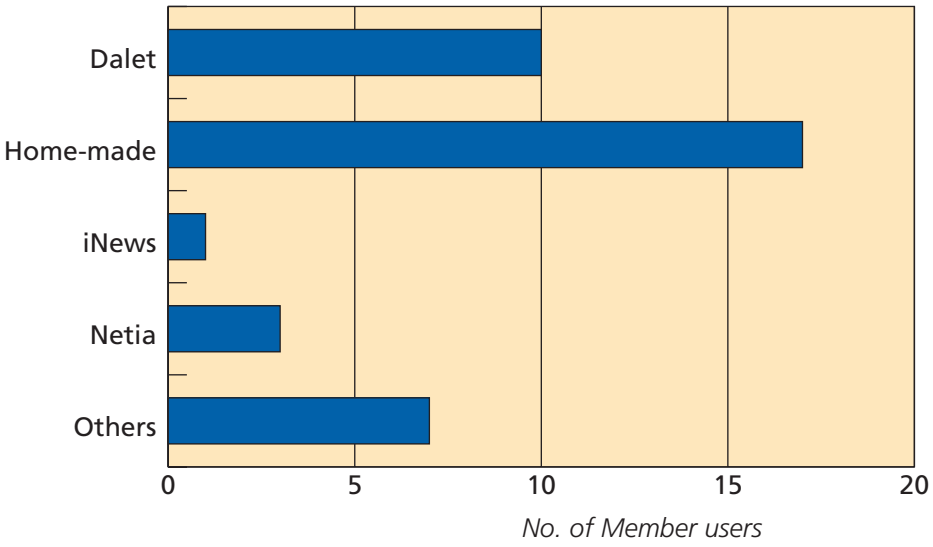
Abbreviations

A/V	Audio / Video (Visual)	**MPEG**	Moving Picture Experts Group
ADSL	Asynchronous Digital Subscriber Line	**PDA**	Personal Digital Assistant
BMP	(Windows) bitmap image	**PNG**	Portable Network Graphics
DAT	Digital Audio Tape	**SMS**	Short Message Service
DSL	Digital Subscriber Line	**SQL**	Structured Query Language
GIF	Graphics Interchange File	**SVG**	Scalable Vector Graphics
GSM	Global System for Mobile communications	**TCP/IP**	Transmission Control Protocol / Internet Protocol
HTML	HyperText Markup Language	**URL**	Uniform Resource Locator
ISP	Internet Service Provider	**WAP**	Wireless Application Protocol
IT	Information Technology	**XML**	Extensible Markup Language
JPEG	Joint Photographic Experts Group	**XSL**	Extensible Style-sheet Language
LAN	Local Area Network	**XSLT**	XSL Transformation

4.5. *Integrated radio / television / web production*

On the chart below, Dalet, Avid iNews and Netia are the most-often-used commercial packages for providing integrated production facilities among EBU Members. However, it is interesting to note that the share of home-made packages seems to be quite high. There may be at least two reasons for this: a) the commercial packages do not always satisfy operational needs and b) the cost of the commercial packages is often prohibitively high.

The market for off-the-shelve integrated production units is growing and also presently includes DPS Velocity, Iconmedia Lab, Imperia, Lost Boy and Xobix.



5. Webcasting distribution

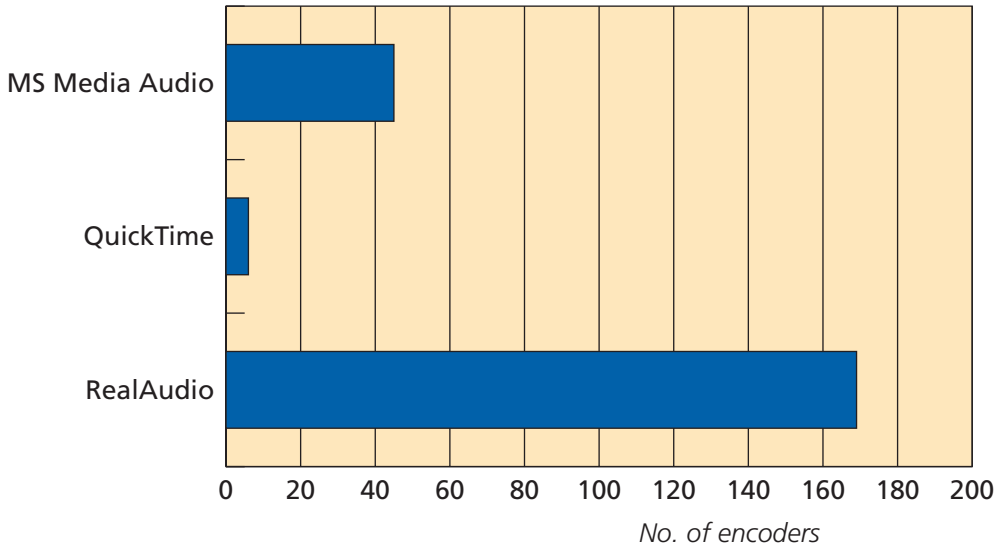
Webcasting distribution systems are the elements that broadcast media files and media streams over the Internet. Distribution is arguably the most complex and costly element in the webcasting value chain. It is also the most critical element – because it determines the quality of the received audio and video programmes and the number of concurrent users that are able to access these programmes.

With the development of broadband (high-speed) networks, based on cable or ADSL technologies, both the quality of the audio/video streams and the number of users are growing steadily. At the present time, there are

about 8.5 million broadband consumers in Europe, of which 58% use cable connections and 42% are ADSL subscribers. The forecasts predict that DSL technology will overtake cable and widen its lead over the next five years.

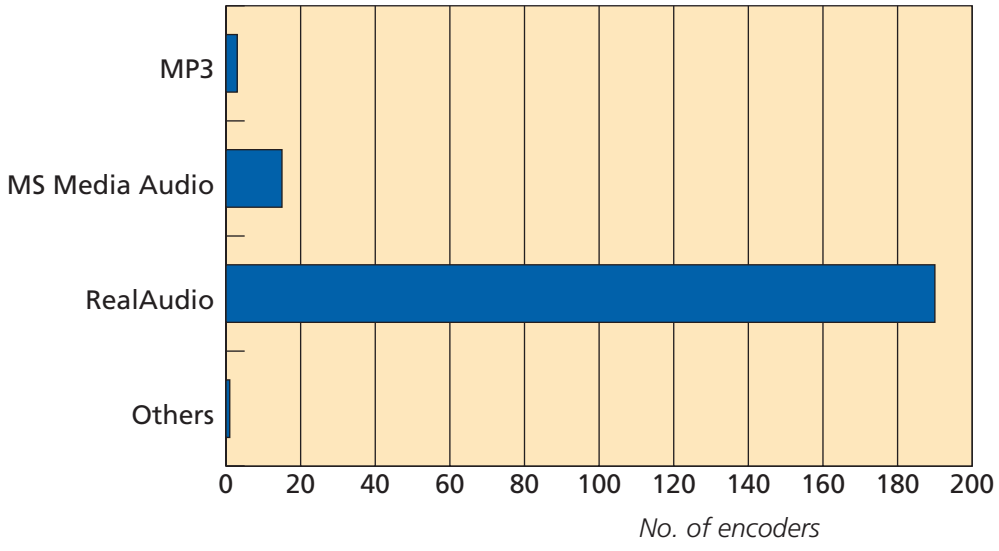
5.1. Live audio streaming distribution

The chart below depicts the number of encoders in use by EBU Members for live (real-time) *audio* streaming over the Internet. As expected, the survey shows that *RealAudio* is still the first choice, with Microsoft *Media Audio* and Apple *QuickTime* lagging behind. Whereas the total number of RealAudio streamers in the EBU Membership was 169 at the end of 2001, the BBC alone had 60 units which was, by far, the largest "media farm" in Europe.



5.2. On-demand streaming audio

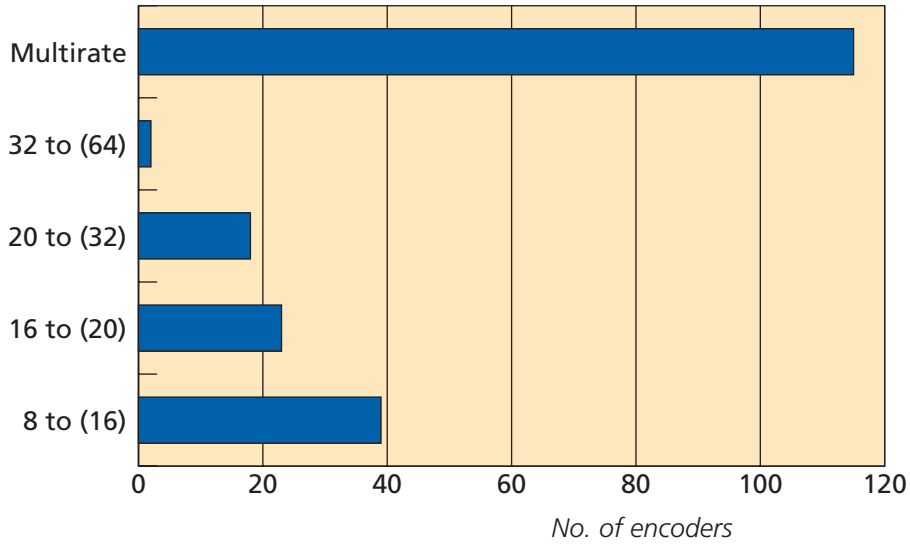
On-demand audio is very popular on the Internet, especially for music downloading and sharing, because relatively good quality can be achieved. Again, the most popular format at the moment is *RealAudio*, but both MP3 and Microsoft *Media Audio* seem to be growing *(see the chart below)*.



5.3. Streaming audio encoding bit-rates

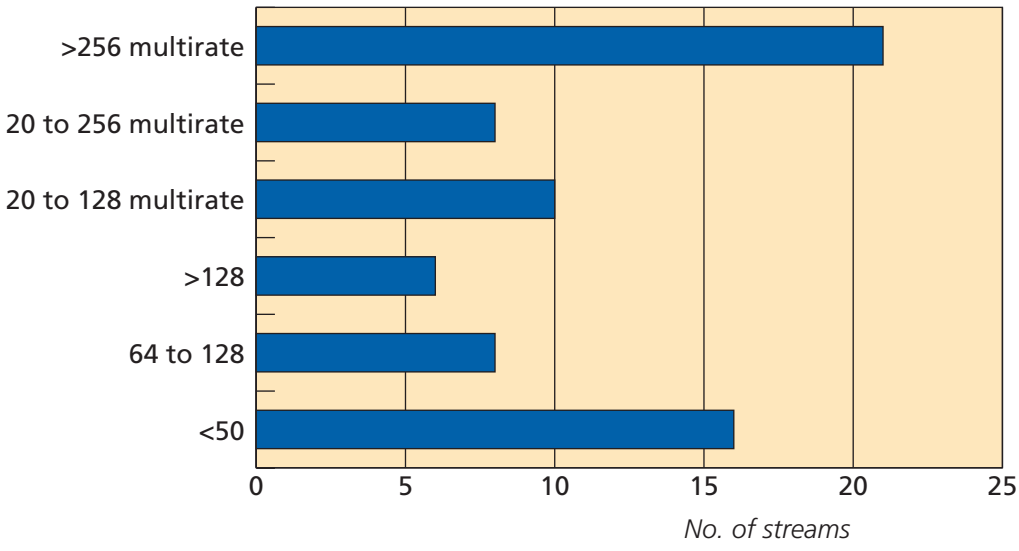
The survey showed that most EBU Members use the lowest bit-rates practicable (i.e. between 8 and 16 kbit/s), and therefore offer relatively poor quality for audio streaming over the Internet. It seems that good quality is not the primary objective, in order not to compete with their core radio business. Using such a low bit-rate enables broadcasters to reach more simultaneous users and reduces their distribution costs per user.

Nevertheless, the survey also showed that a large majority of broadcasters use variable audio bit-rates. For example, if the demand for a programme is high during peak times, the bit-rate-per-stream could be reduced. On the other hand, when the demand is low, the bit-rate – and thus, the quality – may be increased.



5.4. Streaming video encoding bit-rates

As a rule of thumb, the required bit-rates for video clips delivered over the Internet are generally higher – by a factor of 10 – than is required for audio clips. Consequently, the required network bandwidth and the user's modem speed must be proportionally higher for video than for audio.

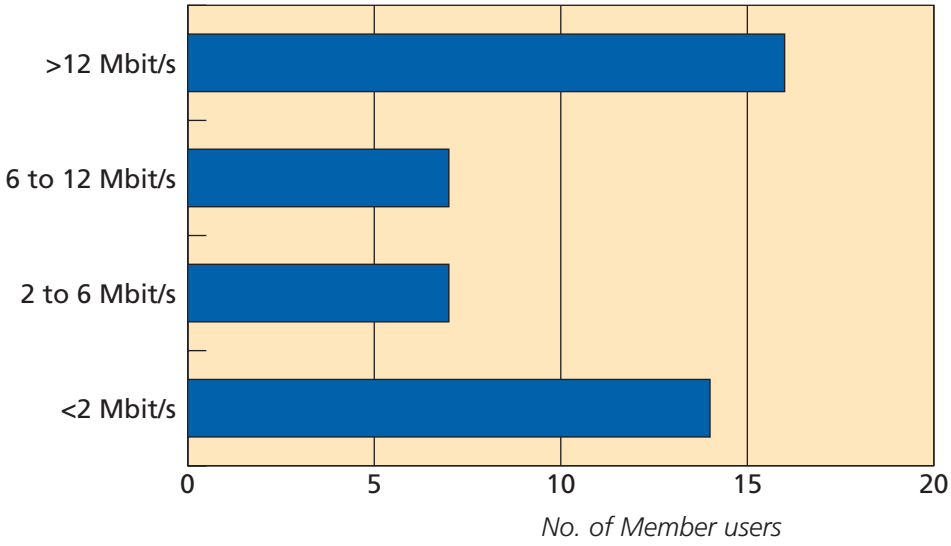


The survey showed that EBU members use relatively high levels of compressions – not only for audio but also for video – in order to maximize the number of concurrent users that can access a given video clip. However, it is surprising that the most common compressions are so drastic, offering bit-rates below 50 kbit/s per video

stream. Such a low bit-rate is only suitable for relatively static video, low colour resolution, small size and small resolution displays. It is interesting to observe that most broadcasters make use of variable (multirate) video bit-rates above 256 kbit/s whenever possible.

5.5. Connection bandwidth

The chart below shows the bandwidth that connects EBU Members to the Internet. The higher the connection bandwidth, the more concurrent users can receive Members' webcasts. For example, if a 2 Mbit/s link is used, about 200 users (only!) – each receiving a 10 kbit/s audio stream – can be served.



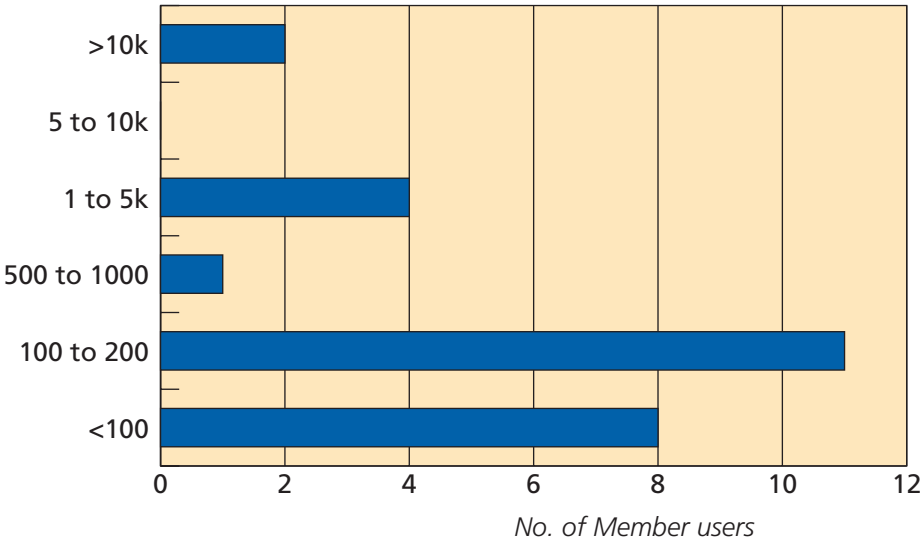
There are two categories of EBU members:

a) Those who outsource streaming to an external Internet Service Provider (ISP). These would normally need only a narrow pipeline to the Internet, say 2 Mbit/s or even less).

b) Those who perform streaming by themselves. They would need a larger link to the Internet.

The survey showed that 17 EBU members fall into the first category and 12 Members into the second one. 16 Members perform a combination of the two scenarios.

5.6. Maximum concurrent streaming connections



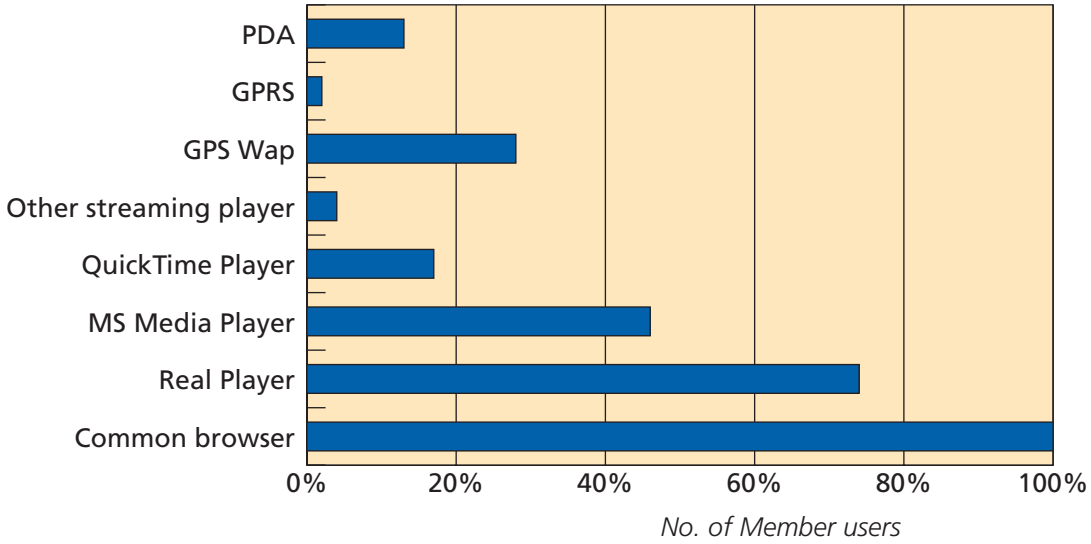
One of the principal drawbacks of webcasting over the Internet is the relatively small number of concurrent users that are able to connect to the Member's media server.

The survey showed that the majority of Members can serve no more than 200 concurrent users with the same audio content (at about 10 kbit/s). The largest number of concurrent connections – 17'100 – was achieved by the BBC in September 2001. It is clear that the Internet is not (yet) suitable for reaching millions and millions of people, as is broadcasting. However, some new techniques – broadband via cable, fibre and satellite, wireless LAN, caching and multicasting – are under development and may significantly increase the Internet broadcasting capability (i.e. one to many) in the not so distant future.

6. Target web terminals

One of the questions in the survey was formulated to identify webcast terminal types for which web information is produced. It was felt useful to find out whether or not EBU Members provide Internet services not only to desktop (wired) computers but also to wireless handheld devices such as mobile telephones and PDAs. The difficulty here is that content has to be adapted and repurposed to suit the characteristics of different device displays, depending on their size, resolution and colour rendition.

The answer of the respondents was clearly positive: 28% of Members already provide wireless Internet WAP services to GSM telephones, and 13% of Members repurpose their audio/video services such that it can be presented (displayed) on PDAs. The responses confirmed the primacy of RealNetworks player as the principal streaming format at the present time.



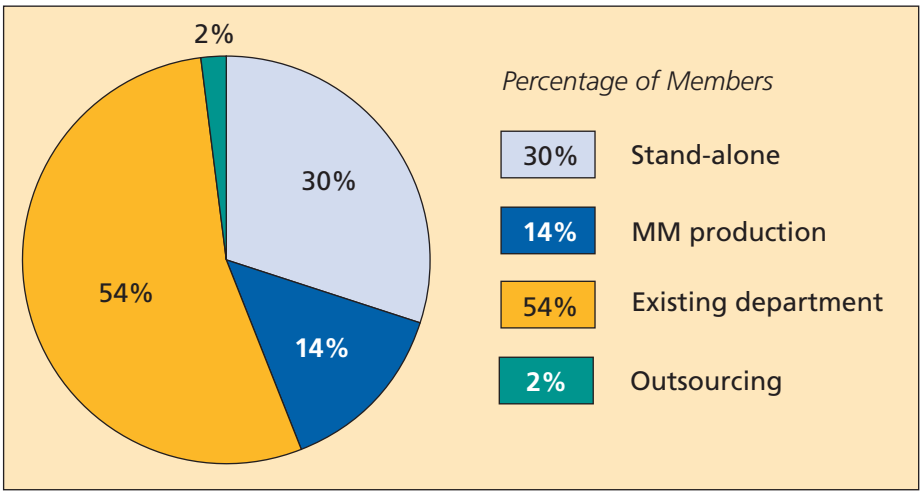
7. How web services are organized

This section of the questionnaire attempted to find out how web services are organized by EBU Members, how many staff are involved in webcasting activities and what is the approximate cost of their web operations.

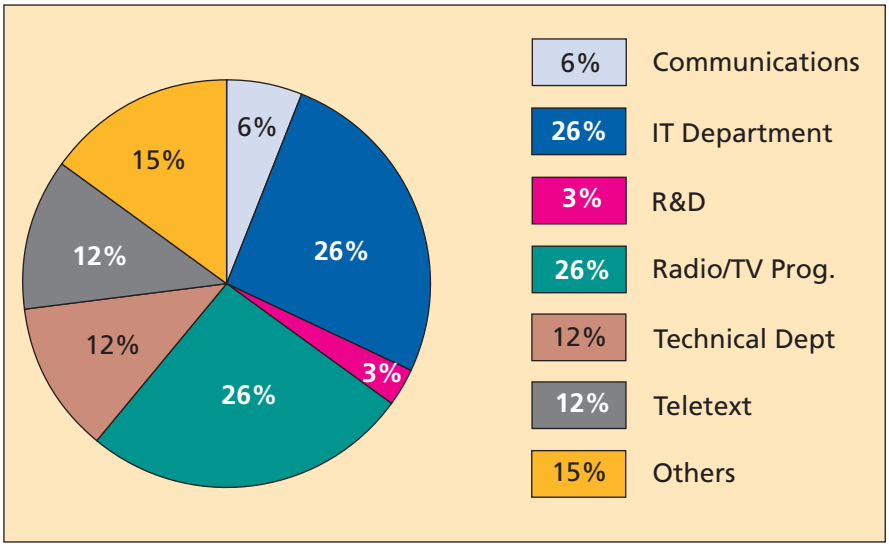
7.1. Location of web production

The results for this question are shown on the chart below *(top of next page)*.

In can be seen that about one third of Members have established a stand-alone Internet/webcasting division. The integration of webcasting into a common multimedia (MM) production department has been considered



by only 14% of Members. More than half of EBU Members (54%) have accommodated their webcasting operations in one of the existing departments of their organization, as shown on the chart below.



It is interesting to note that, in most cases, webcasting became part of the IT department or a radio/TV programme department. Integration with teletext is perhaps lower than was expected.

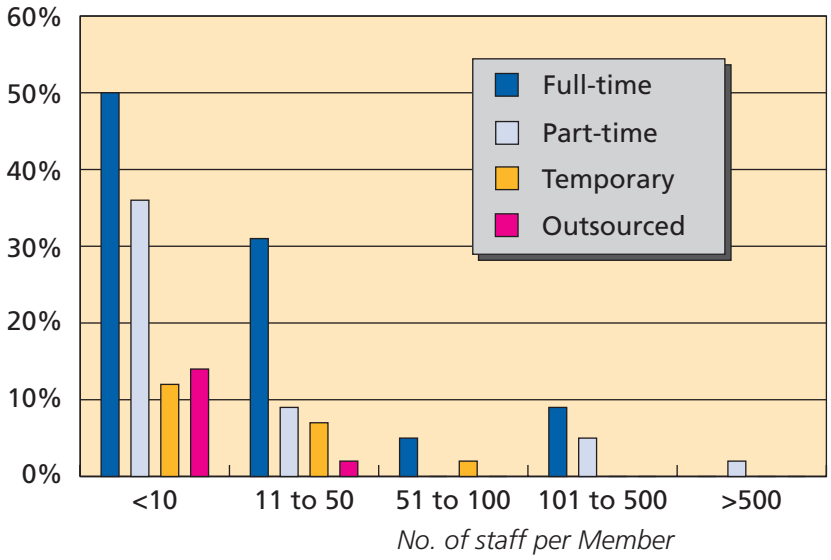
7.2. How many staff

About half of Members have set up very small Internet/webcasting units, consisting of 10 people or less. Some 30% of Members have between 11 and 50 persons working in this area. The BBC can be singled out as an organization with more than 500 staff working in the Internet/webcasting area.

7.3. Costs involved in webcasting operations

The survey posed questions about the different cost categories (given in euros), including:

- the approximate annual investments in technical equipment;
- the cost of the staff (per month);

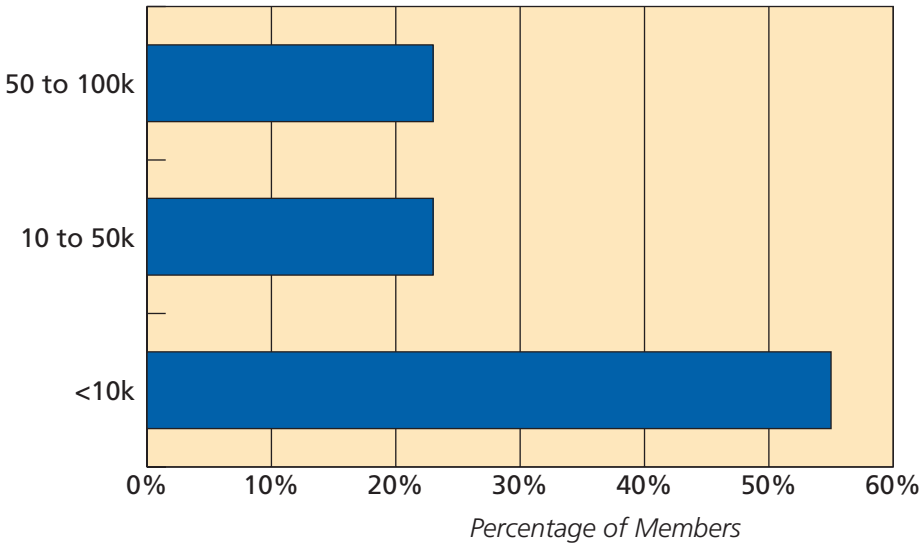


- the production costs (per month);
- the maintenance costs (per month);
- the streaming costs (per month);
- the transmission costs (per month).

The responses received are summarized in the following sections.

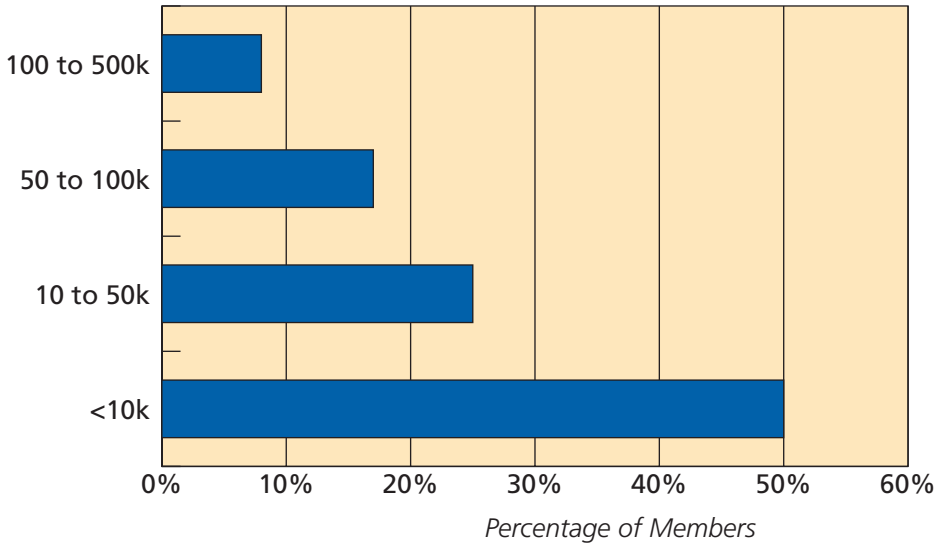
7.3.1. Staff costs per month

The chart below shows that about half of EBU Members spend less that €10'000 a month on their webcasting/ Internet staff. The other half spend between €10k and €100k per month. It is fair to assume that monthly expenditure on the staff is related to their number and qualifications. This expenditure includes the salaries, pension contributions, travel expenses, etc. of all the staff categories involved – including staff on temporary contracts and outsourced staff.



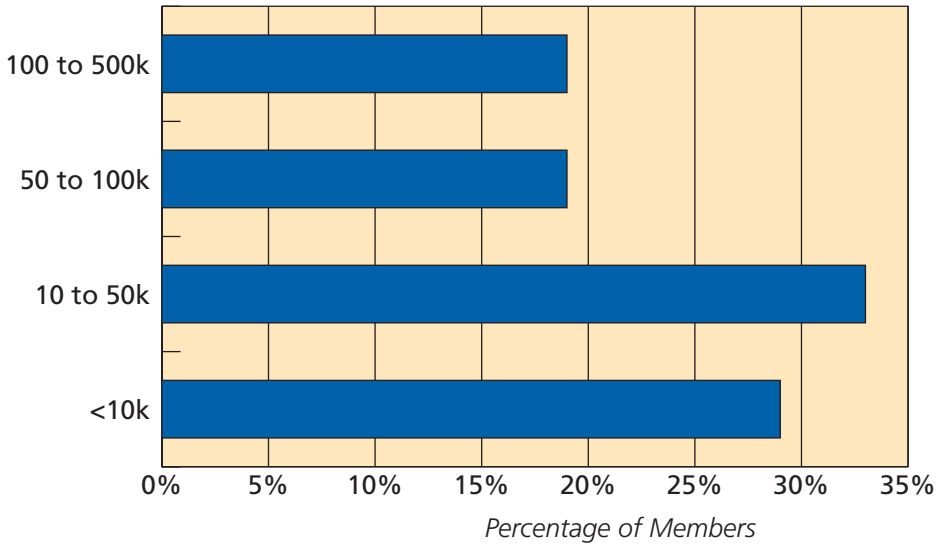
7.3.2. Production costs per month

Again, the production costs needed to produce and publish Members' websites is below €10k for about 50% of Members but it may be higher than €100k for very large operations *(see the chart below)*.



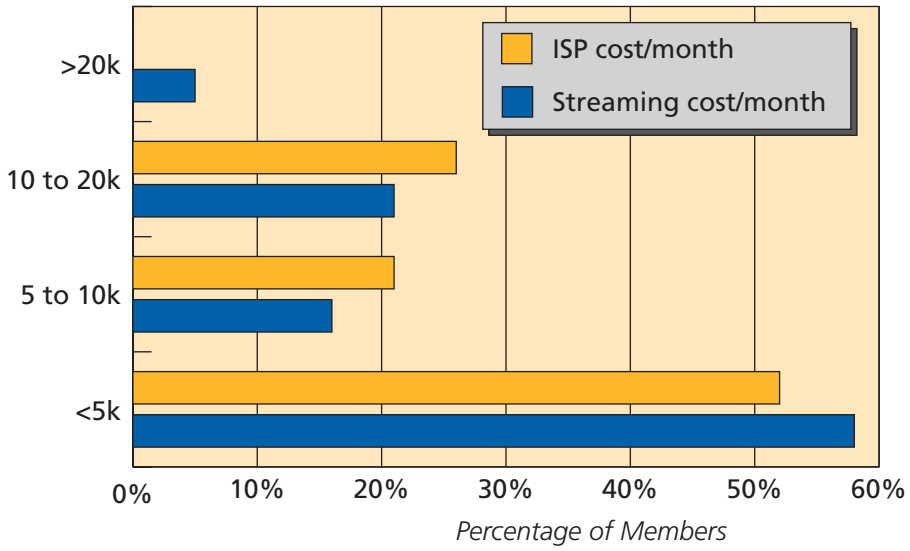
7.3.3. Investment costs

The investment costs cover the purchase of equipment and software. It is interesting to note in the chart below that the annual investment costs may range from less than €10k up to €500k.



7.3.4. ISP/streaming costs

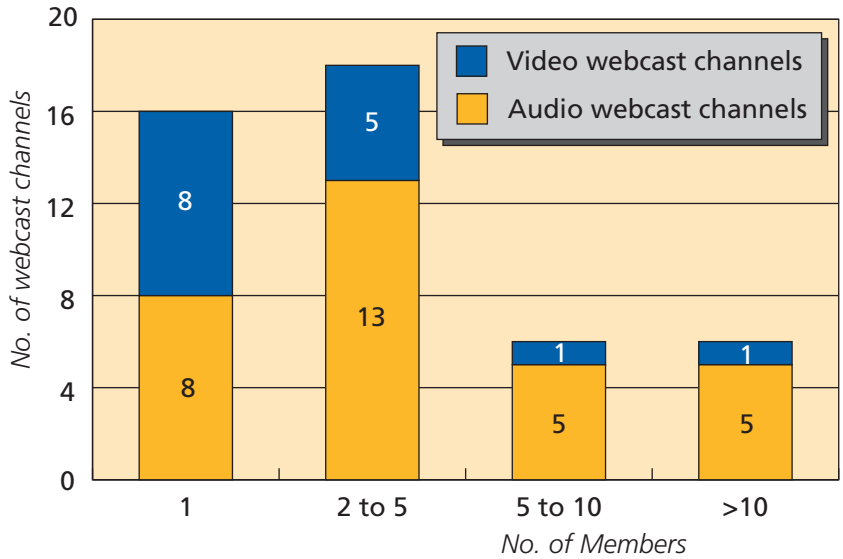
The ISP/streaming costs are summarized in the chart below *(top of next page)*. The yellow bars represent the monies paid monthly to ISPs for streaming services, while the blue bars represent the monthly costs directly incurred by Members who provide their own streaming facilities. The ISP costs vary with the number of streams distributed and their average bandwidth. The more users who receive the Members' streams, the more that Members need to pay to the ISP. It can be seen that more than half of EBU Members pay less than €5k per month to the ISP. However, this data does not say how many people have been reached within one month, nor how long each person stayed connected.



8. Webcast statistics

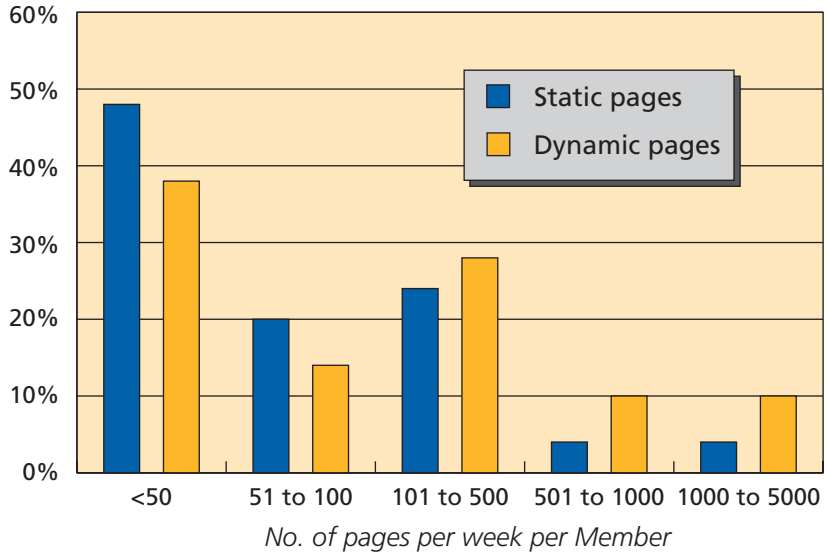
8.1. How many media streams per website

The chart below shows that among the 31 respondents who answered this question, eight broadcasters produce only one continuous audio stream per website, 13 broadcasters produce 2 to 5 audio streams, five broadcasters produce between 5 and 10 audio streams and five broadcasters produce even more than 10 audio streams. As regards video webcasting, it is evident that most EBU broadcasters provide five or less concurrent video streams on their websites.



8.2. Amount of static or dynamic web pages produced

The chart below depicts the percentage of static and dynamic pages produced per week. As the dynamic pages are produced “on the fly”, broadcasters need a repository of templates on the web server, and a database. The chart shows that larger organizations, producing a greater number of pages, make use of connected databases and they distribute more dynamic than static pages.



8.3. Audience monitoring

About 89% of Members perform audience monitoring. Half of those who perform it use their own tools to evaluate the web traffic and track the users. A quarter of Members outsource this activity to external specialized agencies.

8.4. Which parameters do EBU Members monitor

Parameter	Percentage of Members
Number of visits per day	88%
Average number of pages viewed	83%
Average duration of visits	46%
Bandwidth (average and peak)	39%
Number of refused connections	15%
Country of origin	41%

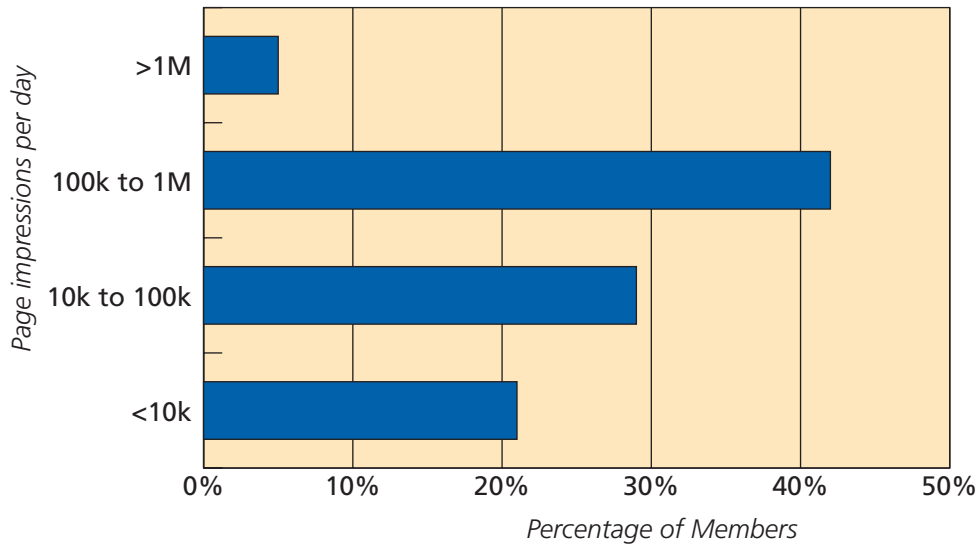
8.5. Estimated average traffic in September 2001

8.5.1. Different number of page impressions per day

The chart below shows the number of different page impressions [2] recorded per day. For example, 20% of Members' websites exhibit less than 10'000 page impressions a day (on average). It is slightly surprising that 40% of Members reported a range between 100k and 1 million page impressions a day. These figures are quite impressive and show how hugely popular our websites really are.

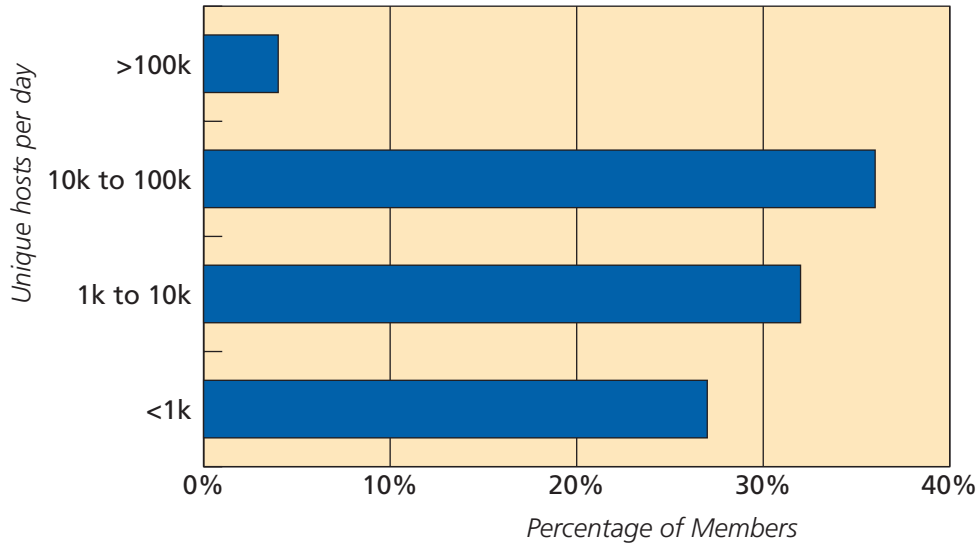
In particular, the maximum daily page-impression rate was reported by the BBC: a staggering 7'055'053!

2. Here, a "page impression" is defined as a user request to call up a page, not including page requests made to a search engine or web directory.



8.5.2. Unique users per day

The chart below shows the number of unique users (hosts) accessing the EBU Member sites each day. These numbers are impressive too. The highest number was reported by the BBC: 500'000.



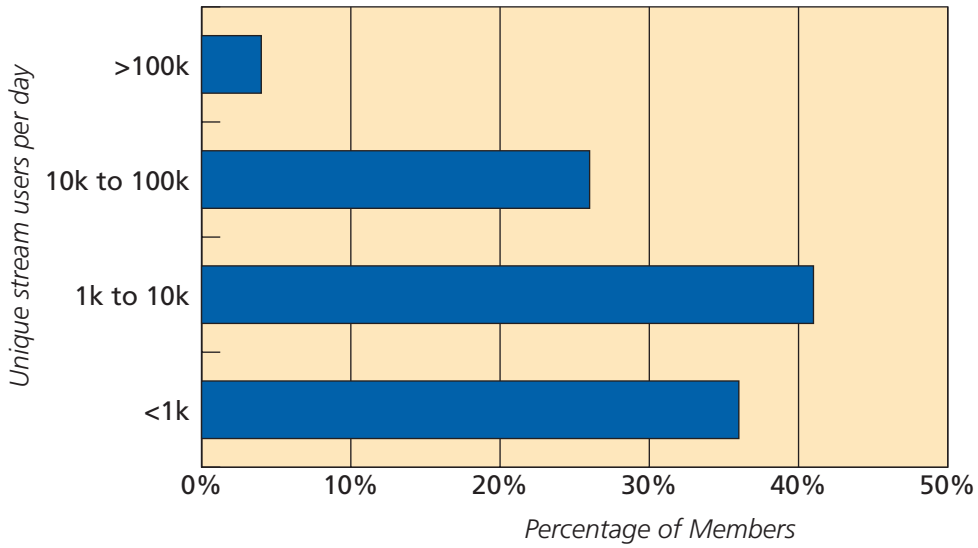
8.5.3. Unique stream users per day

The graph below *(top of next page)* shows the average number of unique stream users per day [3]. It can be seen that about 80% of EBU Member sites reported less than 10'000 unique stream users a day. The record was again set by the BBC: 100'000.

8.6. The make-up of the online audience

The table below *(next page)* gives estimates about the gender make-up of online audiences. It is interesting to note that, in Norway, the NRK site is more often visited by women, whereas it is the reverse for the TV2 site

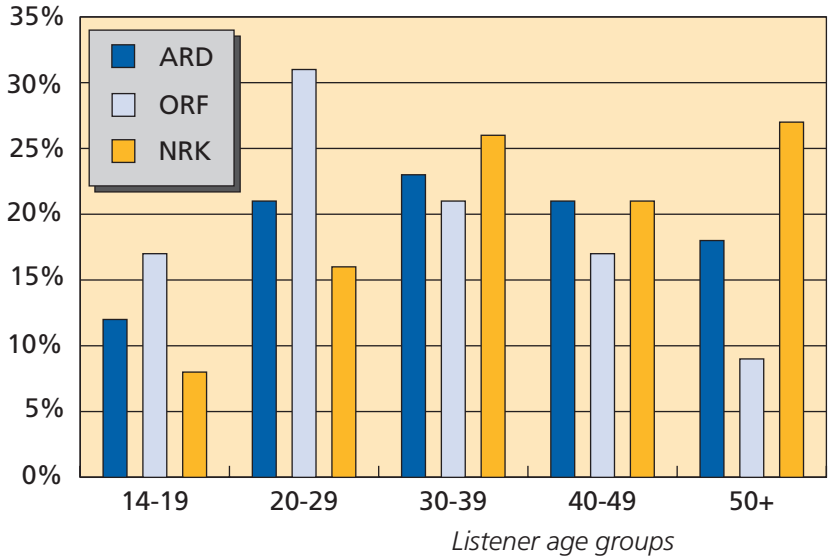
3. A "unique stream user" is an individual who accesses an audio or video stream.



(also in Norway). The respondent from Turkey indicated that all visitors to their site were men but this, of course, needs to be verified.

	ARD	FTV	ORF	DRS	RTE	DK	NRK	NO-TV2	RU-ORT	TRT
Male	59	56	61	60	52	63	40	62	60	Male
Female	41	44	39	40	48	37	60	38	40	

The chart below shows the age distribution of the online audience for three EBU Members. At ORF in Austria, the peak audience is in the 20 to 29 age group. At ARD in Germany, the audience peaks in the 30 to 39 age group while, in Norway, NRK receives most of its visits from people who are older than 50.



8.7. Estimate of the largest audience

The survey invited participants to indicate the events that had received the biggest online audience. Generally, the largest numbers of online visitors usually come when sudden and important events occur. An example was

the terrorist attack in New York on 11 September 2001, when the BBC reported 7 million page impressions a day and TV2 from Norway had 1.1 million page impressions.

Here are some other interesting statistics that arose from this section of the questionnaire:

- ARD logged about 30m page viewings of its "ARDtour" programme;
- UK Channel 4 recorded 20m page viewings of its "Big Brother 2" programme:
- In May 2001, French Television used more than 1 terabyte (1000 gigabyte) of streaming video for a "Loft Story" TV programme which it served over a two-week period.
- The Flemish broadcaster VRT reported that, on the occasion of the communal elections, 80'000 people visited their website.
- The Hungarian TV broadcaster MTV had 480'000 page viewings during the 2000 Summer Olympic Games.
- The Croatian radio/television broadcaster organized a national contest for the Eurovision Song Contest, "Dora 2001". More than 500 concurrent video/audio streams were available from their website.

9. Conclusions

This article provides a summary of the first systematic and detailed survey to be carried out on the webcasting activities of EBU Members. Webcasting is a relatively new form of "broadcasting" (i.e. reaching people with textual, audio and video information) and requires specialized technical knowledge. The survey showed that the technical facilities and tools are evolving extremely rapidly and, consequently, there is a large variety of commercial products used by EBU Members. These products vary in their power, features, cost and user-friendliness. There has been little or no sharing of intelligence about the relative value of the web production and publishing tools used by EBU Members. This task is to be undertaken now by EBU Project Group BMW (Broadcasting of Multimedia on the Web).

The Members' sites range from light websites, characterised by a basic web presence, to large web farms using a cluster of servers. The light websites use simple and non-expensive production and distribution tools, and small webcasting teams; they provide mainly static pages (perhaps with some scriptable functionality) and are hosted by an external ISP. The large web organizations, such as the BBC and ZDF, require large technical, editorial and management teams, powerful technical facilities (such as connected databases to enable the creation of dynamic web pages), they are maintenance-intensive and costly to operate. However, these larger website are highly professional, flexible, dynamic and can be reached reliably by many concurrent users. As the complexity and size of websites increase, the external hosting option becomes more expensive than the internal option. For large-scale operations, the survey showed that it is most economic to buy all the production and hosting equipment. However, external hosting reduces the internal staffing and administration.

Franc Kozamernik graduated in 1972 from the Faculty of Electrotechnical Engineering, University of Ljubljana, Slovenia. Since 1985 he has been with the European Broadcasting Union (EBU). As a Senior Engineer, he has been involved in a variety of engineering activities, ranging from digital audio broadcasting and audio source coding to the RF aspects of the various audio and video broadcasting system developments. In particular, he contributed to the development and standardization of the DAB and DVB systems.

Currently Mr Kozamernik is the co-ordinator of several EBU research and development Project Groups including B/AIM (Audio in Multimedia) and B/BMW (Broadcasting of Multimedia on the Web). He is also involved in several IST collaborative projects, such as SAMBITS (Advanced Services Market Survey / Deployment Strategies and Requirement / Specification of Integrated Broadcast and Internet Multimedia Services), Hypermedia and S3M.

Franc Kozamernik was instrumental in establishing the EuroDAB Forum in 1994 to promote and roll out DAB, and acted as the Project Director of the WorldDAB Forum until the end of 1999. He represents the EBU in Module A of the WorldDAB Forum. He is also a member of the World Wide Web Consortium (W3C) Advisory Committee.

The survey showed that webcasting can complement traditional radio and television broadcasting. Many predict, however, that webcasting will soon evolve into an independent medium with its own profile and characteristics, and it own market. For example, there are already many new WWW radio services – run by conventional broadcasters – that are only available on the Internet. The number of such station is steadily growing, in spite of the fact that they are facing some legal (copyright) and regulatory problems, especially in the USA.

The Internet is gradually becoming a convenient medium for content distribution, not only for the distribution of finished products to the consumers but, increasingly, during the content-creation process itself. As broadcasters are renowned for possessing extensive archives, many are concentrating more and more on content creation and production, using Internet technologies to efficiently minimize their IT costs and reduce the production times. The global Internet can be used not only to deliver static images but also to edit and deliver full-length films; the content – audio or video – can be created at one location, edited at another location and distributed from yet another location. This network solution for content production and distribution, together with massive storage resources, is likely to prevail.

There is no doubt that webcasting is gaining momentum and it will be interesting to observe the evolution of EBU Member's activities in this area. The EBU's Strategic Information Service plans to poll EBU Members at regular intervals, in order to study the trends and dynamics of EBU Internet activities over a longer span of time. While many important questions were addressed in the survey described here, some important aspects (e.g. access and security, search functions, storage considerations, etc.) were either omitted or not sufficiently dealt with. These should be included in any future surveys.

10. Bibliography

[1] **EBU Webcasting Handbook – Webcasting, the third pillar of broadcasting**
EBU BPN 035, November 2001 – prepared by EBU Project group B/BMW (Webcasting of Multimedia on the Web). Editor: Franc Kozamernik (EBU). E-mail: kozamernik@ebu.ch

[2] MP3 – Fraunhofer Institute: http://www.iis.fhg.de/amm/techinf/layer3/.

[3] Ogg Vorbis: http://www.vorbis.com/.

[4] MPEG-4 Industry Forum: http://www.m4if.org/

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