CHALLENGES IN

MOBILE VIDEO PRODUCTION

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Thesis summary

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Subject
Challenges in mobile video production

Summary

The purpose of this study was to find out what kind of guiding producers and film-makers need from mobile phone manufacturers in order to create technically more functional mobile videos. Currently, the technical quality of mobile videos is not generally regarded as very high while they appear pixilated and jerky on the small display.

The study consists of three parts. The first two parts feature a theoretical research followed by the last part, which is empirical by nature. In the first part, both the mobile video as such and its usage are reviewed. The theoretical part also focuses on the audience of the mobile video, and on its production. The research of the production of mobile videos is mainly focused on the postproduction phase, and on the compression of mobile videos.

The empirical research was done by creating a thematic interview. Six informants were selected from persons who have participated at least in one mobile video production as the producer or film-maker. The thematic interview was divided into three categories: the background of the informant, the current status and future of the mobile video in general, and the production phase of the mobile video. The third part of the study includes an analysis of the empirical research combined with and compared to the theoretical information presented in previous parts of the thesis. In this sense the third part is a summary of theoretic and empiric research, and it was gathered mostly to serve mobile phone manufacturers in their work developing mobile media. The purpose of the summary of this thesis is to present the producers' and film-makers' expectations and proposals concerning the development of mobile video production.

The study shows that challenges are introduced into the production of a mobile video when artistic and technical professionals meet and have to find a common tongue. A solution could be the co-operation of the producer and mobile phone manufacturer. Co-operation could also provide the possibility to create a model of mobile video production. Producers like to have more feedback from their productions from both mobile phone manufacturers and consumers.

OULUN YLIOPISTO

Humanistinen tiedekunta   Tiivistelmä opinnäytetyöstä

Laitos			
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Tiivistelmä

Tutkimuksen tarkoituksena on selvittää, millaista ohjeistusta tuottajat ja elokuvantekijät kaipaavat matkapuhelinvalmistajilta, jotta he voisivat toteuttaa teknisesti entistä toimivampia mobiilivideoita. Tällä hetkellä useiden mobiilivideoiden tekninen taso ei ole riittävän laadukas ja videot näyttävät pienellä matkapuhelimen ruudulla pikselöityneiltä ja nykiviltä.

Tutkimus jakautuu kolmeen osaan, joista kaksi ensimmäistä osaa pohjautuvat teoreettiseen ja viimeinen osa pohjautuu empiiriseen tutkimukseen, joka toteutettiin teemahaastatteluna. Ensimmäisessä osassa tarkastellaan teoreettisesta näkökulmasta mobiilivideota ja sen käyttöä. Toisessa osassa esitellään mobiilivideon tuotantoprosessi. Tuotantoprosessi-osiossa painotus on jälkituotannon ja mobiilivideon kompressoinnin esittelyssä. Tutkimuksen kolmannessa osassa käydään läpi mitä mobiilivideo, sen teko ja käyttö on nykyisin käytännössä ja miten sitä voitaisiin mahdollisesti tulevaisuudessa kehittää. Kolmatta osaa varten on haastateltu kuutta sisältö- ja elokuvatuotantoalan ammattilaista, jotka ovat jokainen osallistuneet yhteen tai useampaan mobiilivideotuotantoon joko tuottajan tai elokuvantekijän roolissa. Tutkimuksen loppuyhteenvedon tarkoituksena on esittää erityisesti matkapuhelinvalmistajille tietoa siitä, mikä mobiilivideoiden teossa on olennaista 1) alan selvitysten ja tutkimuksen sekä 2) sisällöntuottajien ja elokuvantekijöiden näkökulmasta: millä tavoin olisi mahdollista tehdä mahdollisimman laadukkaita mobiilivideoita?

Tutkimus osoittaa, että mobiilivideotuotannoista tekee haastavia se, että niissä kohtaa eri alojen ammattilaisia, joilta puuttuu yhteinen kieli. Yhtenä ratkaisuna toimisi tuottajien ja matkapuhelinvalmistajien tiivis yhteistyö. Yhteistyö saattaisi myös mahdollistaa mallin luomisen mobiilivideotuotannoille. Lisäksi tuottajat kaipaavat enemmän palautetta tuotannoista niin matkapuhelinvalmistajilta kuin kuluttajiltakin.

Muita tietoja
Asiasanat: mobiilivideo, tuotanto, tuottaminen, sisältötuotanto, kompressointi

ABBREVIATIONS

3G   *Third Generation mobile communication*

CD-ROM   *Compact Disc Read Only Memory*

CODEC   *Coder Decoder*

CPU   *Central Processing Unit*

DRM   *Digital Rights Management*

DV   *Digital Video*

HTTP   *Hypertext Transfer Protocol*

IR   *Infrared Radiation*

JPEG   *Joint Photographic Experts Group*

M-JPEG   *Motion Joint Photographic Experts Group*

MMS   *Multimedia Messaging Service*

MPEG   *Moving Picture Experts Group*

OTA   *Over-The-Air technology*

PDA   *Personal Digital Assistant*

SMS   *Short Message Service*

TCP   *Transmission Control Protocol*

UDP   *User Datagram Protocol*

WAP   *Wireless Application Protocol*

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1. INTRODUCTION

1.1 Background for the study

Mobile technology has indirectly changed people's way of life and usage of time (Räsänen & Järvinen 2004: 52). New technology enables possibilities to communicate almost everywhere and people can continually communicate with each other. People can share emotions and events in real time with other people (See Räsänen & Järvinen 2004: 49). E-mails can be read with the mobile phone, and communication via text messaging services enable communication in situations where interaction would have normally been impossible – such as during a meeting or in the library. Mobile technology enables effective and informative communication, but at the same time it offers a possibility to entertain consumers, for example, with audio and video related applications. This study concentrates on finding ways to develop profitable entertainment and content-creation productions for mobile devices. The focus is in studying mobile video and the challenges the content producers, producers and film makers meet in today's mobile video productions.

The introduction of new mobile technologies has opened various new opportunities for content creation. While mobile phone manufacturers are designing new mobile phone models, it is expected that consumers need a new kind of content for mobile purposes. For example, basic ringing tones and games are not enough for today's consumers, but high-level content with modern audio and graphic elements have demand. Content can be infotainment[1], edutainment[2] or entertainment, for example. Entertainment-related features, such as music and video, are expected to succeed in the mobile environment. Music business is breaking through in mobile phones at the moment, but according to Pekka Räsänen and Heidi Järvinen[3], audiovisual material can be seen as the next step in mobile technology (Räsänen & Järvinen 2004: 49).

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[1] The term Infotainment comes from the words information and entertainment. It is a combination of news and entertainment programs or an entertainment program in a news format. (Wikipedia 2005.)

[2] Edutainment is also known as educational entertainment or entertainment-education. It is a form of entertainment that is designed to educate as well as to amuse. (Wikipedia 2005.)

[3] Both Pekka Räsänen and Heidi Järvinen are working at the Department of Sociology in the University of Turku. Räsänen works as a Senior Researcher and Järvinen as a Researcher.

An essential aspect in the use of mobile technology is that people adapt to new devices and applications as a part of their daily life. In Räsänen's and Järvinen's opinion, the mobile phone is a perfect example of a mobile device in which the meaning of the moving image is increasing via new technical applications and services (Räsänen & Järvinen 2004: 50). The mobile way of life offers people new possibilities to enjoy audiovisual material in the form of mobile videos, for example. Mobile videos can be viewed anywhere, but at the same time mobile phones set technical limits to viewing, and restrict usability. Viewing the mobile video from a small screen may not provide a pleasant user experience or the memory of the mobile phone may not be adequate for streaming without interruptions.

Ulf Lindqvist, Timo Siivonen and Helene Juhola[4] remind that the content is the most important element in media technology. Sometimes the most important issues are being overlooked – new services require that both content creation and technology are in interaction with each other. New services have to meet the consumers' needs. Accurate content, distribution channels and platforms should be even more carefully selected for each new service (Lindqvist, Siivonen & Juhola 2005: 45).

The first steps of the mobile video can be compared to the first steps of videos played on PC. Media players did have their performance problems. Large-scaled videos did not play smoothly and standard feature-length films did not even fit to a single CD-ROM (Manovich 2001: 311). The solution to this problem was found in video compression. Visual appearance had to be degraded so that the file size could fit to a smaller space, and small file size enables videos to be run smoothly. The mobile video has to be compressed, too, to as small file size as possible, but at the same time it has to appear visually pleasant on a small display. Low-resolution video must be made in high quality.

In *The Language of New Media* (2001), Lev Manovich compares the introduction of the QuickTime media player in 1991 to the introduction of the 19th century pro-cinematic

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[4] Lindqvist, Siivonen and Juhola are working in VTT, in Technical Research Centre of Finland. Lindqvist works as a Research Professor, Siivonen as a Senior Research Scientist and Juhola as a Group Manager.

device called Kinetoscope[5] in 1893: "Both were used to present short loops, both featured images approximately two by three inches in size, both called for private viewing rather than collective exhibition." (Manovich 2001: 313.) At the moment, mobile video can be compared to these two technologies. All of them appear to play a similar cultural role. Manovich continues: "We may expect that when digital videos appear on small displays in our cellular phones, - - they will once again be arranged in short loops because of bandwidth, storage, or CPU limitations." (Manovich 2001: 317.)

The looping technique is used in some cases in mobile phones. Mobile phones can, for example, include content like animated screen savers that are played in loops. Users can film and edit their own short video clips with their mobile phones, and in the future, it will probably be possible to use them as looping screen savers. According to the media and film researcher, Erkki Huhtamo, every single person can basically create short mobile videos with their own mobile phone and send[6] them to friends. (See Pekonen 2003.) Evolving techniques of data transfer are enabling users to create video calls and send real time live video to each other.

In addition to self-made video clips, there are nowadays professionally produced mobile videos available. Defining the professional mobile video can be difficult. On one hand, it can be understood as a kind of short film played on the mobile phone's display, but on the other hand, the mobile video can be compared to a multimedia message or an animated screen saver. The mobile video can even be an interactive mobile video game. Moreover, some people may understand it as a full-length feature film, but in this study mobile video is understood as a short film.

1.2 Description of the study, scope and methods

While mobile moving image is a new kind of filmmaking, it faces several aesthetic and technical problems before it can visually appear – and do so in an appealing manner –

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[5] Kinetoscope was invented in 1891 by the American Thomas Alva Edison. It was the first cinematic machine to employ film and it was based on loops.

[6] Short video clips can be sent via MMS, IR or Bluetooth technology.

on the mobile phone's screen. The medium's small screen size, small file sizes, low resolution and quality of compression set restrictions to mobile video production (Åberg 2005: 12). If restrictions are not paid attention to in the production phase, the final mobile video is not usually suitable for mobile phone use. In addition to low quality content, unacceptable technical quality in mobile videos is also annoying for their viewer. Grainy and pixilated moving images do not interest the paying customer.

This study pays special attention to current technical restrictions of mobile videos. Technical quality of the mobile videos is not always satisfying. The aim of this study is to find out what causes the problems in mobile video productions. It can be assumed that film-makers and producers do not have enough detailed information about the technical area of mobile video productions and about the restrictions that the mobile phone sets. Because of the technical problems, it can also be assumed that mobile phone manufacturers should create a technical specification for mobile video production, so that technically functional videos could be designed and produced for several different mobile phone models.

The purpose of this thesis is to find out whether producers and film-makers have enough knowledge of the technical challenges and restrictions of mobile video productions, and to fathom what kind of expectations and proposals they have for the reception of technical guidelines from mobile phone manufacturers. Mobile phone manufacturers do not have knowledge of what specific information they should deliver. Therefore, there has to be a research of what kind of information is needed for such technical guidelines.

This study includes both theoretical information and empirical research. Because mobile video productions are yet a very uncharted branch, there is not much information currently available about mobile video productions. This information comes mainly from the Internet and it can occasionally be insufficient. Hence, it is necessary to adopt existing theoretical information and also to include an interview in this study.

The informants[7] of the interview research were selected from Finnish producers and film-makers, who have dealt with mobile video productions. I used a thematic interview for collecting the interview material. It was produced by individual interviews made via e-mail. As mentioned earlier, the object of my study is not quite well known or established. This is why I think that by interviewing producers and film-makers, and interpreting, analyzing and comparing the answers to existing theoretical information, the other informants' answers and my own experiences and knowledge of mobile phone business and technology, we can get fresh and relevant information about the field and its challenges.

The themes of this study can be divided into three segments:

DEFINITION OF MOBILE VIDEO AND USAGE ISSUES
CONCERNING MOBILE VIDEO

In this segment the mobile video and its usage are being viewed from a theoretical point of view.

OUTLINING OF THE MOBILE VIDEO PRODUCTION PROCESS

Mobile video production has many similarities to traditional film production, but there are also some differences. This study introduces mobile video production phases briefly and concentrates on phases that differ the most from traditional film-making – the mobile video's postproduction phase that includes the compression and distribution phases.

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[7] Detailed information about the informants and thematic interview can be found from Section *4. Producers' thoughts on mobile video production,* that includes the analysis of this study.

<u>CONTENT PRODUCERS' CONCEPTIONS OF MOBILE VIDEOS,</u>
<u>THEIR USAGE AND THEIR PRODUCTION PROCESS</u>

The third segment of this study concentrates on the content producers' empirical point of view. What do film-makers and producers consider as a mobile video, and do their statements differ from existing notions? What kind of technical challenges have content producers met during mobile video productions? Do they need more technical specifications in order to create even more functional videos for mobile phones?

1.3 Structure

The introductory chapter includes an overview of the topic, description of the study, scope and methods of my study.

Chapter two consists of the definition of a mobile video, and it also concentrates on the usage of the mobile video and its potential audience.

Chapter three consists of a brief introduction to the mobile video production process and its challenges. The main focus is in the postproduction phase, which contains the mobile video compression and distribution phases.

Chapter four contains the results of the interview. This chapter analyzes whether producers and film-makers agree with what can be considered as a mobile video and its audience.

The last chapter contains the conclusions and summary of the study, and includes expectations and proposals gathered from the analysis of the interview for mobile phone manufacturers.

2. MOBILE VIDEO AND ITS USAGE

2.1 The term 'mobile video'

Mobile moving image has several different names. It is called at least the 'micromovie', 'mobile movie', 'mobile video' and 'mobie'. The moving image on the mobile phone's small screen is yet such a new and quickly developing business that the descriptive term has not been permanently established yet. All of the previous terms mean roughly the same, but have a little difference in nuance. According to Lassi Tasajärvi, the Project Manager of Pixoff[8] a 'micromovie' means a video that is mainly distributed to mobile phones and, in addition, to PDAs or the Internet. Instead the term 'mobie' refers to content that is mostly distributed to mobile phones. (Tasajärvi 2004.) Terms 'mobile movie' and 'mobile video' both refer to moving image that is displayed in a mobile device.

Tasajärvi himself prefers using the term 'mobie'. The word 'movie' is derived from the words 'moving' and 'image' and, similarly, the word 'mobie' is derived from the words 'mobile' and 'image'. Tasajärvi states:

> *"The new term refers not only to the moving image, but to the moving screen and viewer as well. It also illustrates the fact that the images are transferred to the viewer through the net with the help of different technologies."* (Cite Vesanummi 2004.)

Mobie is currently an unfamiliar term, but its predecessor micromovie is more well-known. Finnish people became familiar with the term 'micromovie' a couple of years ago when the Micromovies competition and seminar were held at the Tampere Film Festival. The Micromovies Competition defines the micromovie as a short film that is compatible to mobile devices. Restrictions were not set in techniques or genres. The only existing limit was the time limit – films were not allowed to exceed 3 minutes and 14 seconds. (Tampere Film Festival 2003.)

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[8] Pixoff is a net community and distribution channel for Finnish short films and animation. For more details, see Section *3.5 Distribution phase and technology* and http://www.pixoff.net.

Erkki Huhtamo characterizes a micromovie as a very simple and small moving image. According to Huhtamo, the micromovie takes advantage of the small display and the short duration of the video. (See Pekonen 2003.)

In Kati Åberg's[9] opinion, the term 'micromovie' is unsuccessful at least from the mobile phone point of view. Micromovie harks back to the medium's small size and it refers to content that is narrative and like a film (Åberg 2005: 12).

The term used in this thesis is 'mobile video', because it is currently hard to predict whether the terms 'mobie' or 'micromovie' are going to be adopted in everyday use. A new term that means the same thing may even become the standard in the future. Thus, 'mobile video' suits best this thesis, because the word 'mobile' refers to the mobile devices, and this study concentrates on videos that are especially produced and viewed on the mobile phone screen.

This study mainly approaches the mobile video as a short mobile moving image. The term 'mobile video' is also more telling than 'mobile movie', because 'mobile movie' can easily be understood as referring to a feature-length film that is displayed on the small mobile phone display. The terms 'mobie', 'micromovie' and 'mobile movie' are not appropriate terms from the point of view of this study. The term 'mobile video' can also be understood in the future despite the prospect of a new term getting established.

From this point onward, the terms 'mobie', 'micromovie' and 'mobile movie' are replaced with the term 'mobile video', because using several different terms would be too confusing for the reader.

2.2 The medium and its mobility

New communication and media devices become more common if they can replace existing devices or offer new features. Mobile phones succeeded in replacing line

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[9] Kati Åberg has directed videos for mobile phone use. She holds an MA in New media studies at the Medialab of the University of Art and Design in Helsinki and she also has a degree in Production for Performing Arts at the Theatre Academy.

telephones, because they could offer wireless communication (Räsänen & Järvinen 2004: 51). The postmodern society and the people living in it adapted mobile phones as a necessity, because they offered the possibility of communicating everywhere (given that there is a network available). Mobile phone manufacturers currently face new challenges. Mobile phones are trying to break through as personal media devices, capable of, for example, showing mobile videos. The mobile video has to offer its viewers additional value, because the mobile phone cannot compete as a film platform with media that have larger displays.

When the mobile phone is experienced as a media device, it meets competition with several different media. The mobile phone can, for example, include a camera with the possibility to film and edit short video clips, a Web browser, a radio and mobile TV. People may still want to carry separate mobile phones, digital cameras and music players with them, regardless of existing multifunctional mobile phones. The small display size of mobile phone does not necessarily offer a user-friendly experience when browsing the Internet, watching mobile TV or streaming mobile videos. For example, browsing Web pages containing lots of images on the computer is more comfortable than scrolling a Web page on the mobile phone screen. Watching videos on TV is more comfortable than watching them on a small display. The fact is that the mobile phone cannot compete with its display size. It has to offer some additional value that other media with larger displays cannot. The mobile phone's uncontested advantages are its personal character and mobility.

Mobility means a method of communication that allows the users to share information in real time while they are moving from one location to another. The mobile phone is usually carried everywhere and it can serve its user as a portable and personal media device. It is part of both the working and spare time of people. We have got accustomed to using our mobile phones during breaks. Tasajärvi states that the purpose of the mobile videos is to fill in people's waiting time. (See Pekonen 2003.) Furthermore, he states that the mobile phone offers the possibility of watching mobile videos anywhere, anytime and in any circumstance unlike other available media. (See Vesanummi 2004.)

The mobile phone is a personal kind of medium that is especially designed for social interaction. It can be experienced as a personal device that expresses something about

its bearer. For example, the viewing context differs from viewing videos from the PC screen. The image on the mobile phone screen is viewed much closer than on a large display. The user's own hands form a border to the mobile phone screen, and that makes the video more concrete and subjective than watching it from a computer screen (Åberg 2005: 12–13).

2.3 Mobile video's current challenges and profitability

New services are adopted if they are experienced to be more beneficial than current media. A service, such as the mobile video, has to be useful and easy to use in order to be adopted. For example, WAP services were experienced uncomfortable to use and the service charge too high. Therefore, WAP services are seen as an unpractical and unnecessary mobile phone feature (See Räsänen & Järvinen 2004: 53–54).

New innovations, such as WAP services, are not always a success, especially not when needed criteria are not met. There are five different criteria that affect the innovation's utility value. These are the innovations:

1. Necessity,
2. Appropriateness,
3. Complexity,
4. Reliability and
5. Visibility (See Räsänen & Järvinen 2004: 51).

2.3.1 Necessity

Necessity is the most essential characteristic that affects the adoption of the innovation. The product or service receives its utility value when its purpose of use is found (Räsänen & Järvinen 2004: 51). The challenges of new media are currently in focus, and mobile technology is getting ready for content creation. From a technical point of view, there is a need for new innovations that use new highly developed technology. Without

a need for the technology to evolve into better applications, there would even be no innovation such as the mobile video available. However, content should not be created only because there is a technology available. Instead, technology should be developed on the content's terms.

Producers and film-makers need to have personal ambitions in order to create new innovations such as mobile videos that have not found their necessity yet. Content producers can see mobile videos as a possibility to create art in a new way. In order to create content such as mobile videos, there is a need to have a certain technical knowledge. The purpose of this study is to find out that is there enough technical knowledge for this among content producers, and if not, how this knowledge could be improved. Receiving technical knowledge makes it possible to create new innovations for mobile purposes. If content producers succeed with productions, not only can the necessity of mobile videos be found, but also a demand for the markets is introduced.

There should be further studies concerning the necessity of mobile videos. This study is focused mainly on the technical challenges of mobile videos, but there are other problematic issues related to them. It should be studied what kind of mobile videos can have necessity and utility value so that they can reach the consumers and be profitable for their producers. The commercial possibilities and consuming of mobile videos should also be studied from a critical point of view.

2.3.2 Appropriateness

Mobile videos are appropriate, for example, in filling in people's waiting time, but their use can be, in some cases, very complex. Mobile video viewing is probably not interesting, if there is a TV set or a computer available. People occasionally have to kill waiting time outside the home. Mobile videos are appropriate in the situations when there is waiting time to spend and exploit. Unfortunately, it is not enough that an appropriate 3G phone for mobile video viewing is available; operator-specific connection settings are needed to be able to stream or download videos from the

network. Moreover, the streaming or downloading service has to be used somewhere where a suitable network is available.

Currently one of the biggest attractions in mobile content creation is music and its wireless form. Anssi Vanjoki, the head of Nokia Multimedia, says that music is going to be the next big trend in multimedia. The research institute Strategy Analytics estimate that in the year 2009 there are going to be 839 million pieces of music downloaded by 67 million mobile phone users. Main target group is going to be, by a rough estimation, people of 16 to 24 years. The research institute believes that music and media markets are going to beat the size of game markets already by the year 2006. (Viitasaari 2005.)

There is also going to be an opportunity for mobile videos when music becomes an everyday commodity in mobile phones. The mobile phone is going to be adopted as a personal media device and new user experiences are going to be researched. Perhaps, on the long run, sound is not enough. The image and visual aspect are going to be wanted on mobile phones, too.

The demand for mobile videos can be found if they can, for example, give some additional value to the feature film. Trailers, deleted scenes and interviews of actors may interest film fanatics, if videos are produced especially for the small display size. Mobile videos make entertainment possible whenever entertainment is needed. Nordlund[10] states:

> *"The functional benefit of personal media devices is the possibility to consume entertainment anywhere and anytime. Compared to TV broadcasts, personal media devices deliver better functional value by allowing the user to control the content, choose the content irrespective of programme schedules, and access the content regardless of the place."*
> (Nordlund 2004: 15.)

However, the situation for mobile videos is very challenging. For example, mobile videos cannot be consumed as much as music. Mobile videos have to renew themselves

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[10] Mikko Nordlund has graduated from Helsinki University of Technology and he has done his thesis on the subject *"Impact of Personal Media Devices on Video Distribution Value Nets"* (2004).

in order to get the interest of the audience to last. According to a market research, a lot more money is consumed on filmed content than on video games or music. In portable use, the focus of the user has to be on the mobile video, whereas music can be played in the background while the user is engaged in other activities. Nordlund states:

> *"Thus there is considerably more time than can be used to consuming music than video. - - Both music and gaming devices have one clear advantage over video: music and games can be consumed several times, whereas the appeal of a video title wears off faster – majority of filmed content is consumed only once. The personal media device users have a constant need for new content."* (Nordlund 2004: 66.)

2.3.3 Complexity and reliability

The reliability of the mobile video is strongly related to its complexity. Mobile content does not only require that communication is fast – it also has to be comfortable and reliable. It is not enough that new mobile phone models are developed – the new technology necessitates that also networks evolve. Both 3G phones and networks are needed in order to enable facile communication.

The streaming of a mobile video is frustrating if the network connection is suddenly lost. It is also possible that viewing a downloaded mobile video fails. The video may appear jerky if its file size is too big, or the mobile phone does not have enough memory. The quality of the mobile video can also be poor, if the video is, for example, designed and produced to a different kind of mobile device.

2.3.4 Visibility

Currently, mobile videos do not have much visibility, but it can be predicted that mobile phone manufacturers and content creation portals are going to market mobile videos when there is more supply available in the markets. In the future, mobile videos can be

downloaded or streamed[11] via network or they can probably be ordered via SMS. They can be received as OTA video, in the same manner as OTA ringing tones or OTA operator logos. However, there has to be much wider supply available in the markets before mobile videos can be profitably distributed via specialized portals.

To get more new content available there has to be film-makers, who are interested in making mobile videos. Profitability has to be found in mobile videos in order to also get the professional film-makers and producers to design and create them. Professional film-makers' interest may be hard to achieve, if mobile videos are compared to short films. Film director Saara Cantell states that short film is the most undervalued film format. Most short films are made in colleges, and short films seem to be a mere stepping stone for a film career (Cantell 2004: 10). Because of the lack of esteem, there is a possibility that professional film-makers are not willing to work with mobile videos either. Why would anyone want to produce an undervalued mobile video? Is there any profitability or utility value in mobile videos? Can financing be organized for mobile video productions?

According to art graduate Alli Haapasalo, short film productions are not profitable. Financing is insignificant and both visibility and sales are non-existent. One way to get professional film-makers enthusiastic about short films would be a better appreciation of the film form. Nonetheless, this is still not enough because productions also need more financing (Haapasalo 2004: 25).

According to Tasajärvi, there are currently no film-makers, who work full-time with mobile videos. Mobile videos are produced mostly by short-film makers and mobile designers. Yet, mobile video producing is as hard as traditional filmmaking. Financing can be applied from the same foundations than to traditional filmmaking, for example, from AVEK[12] or SES[13] in Finland. (See Pekonen 2003.)

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[11] More details from distribution technologies in Section *3.5 Distribution phase and technology*.

[12] AVEK is Audiovisuaalisen kulttuurin edistämismiskeskus (The Promotion Center for Audiovisual Culture). See more details from http://www.kopiosto.fi/avek.

[13] SES is Suomen Elokuvasäätiö (Finnish Film Foundation). See more details from http://www.ses.fi.

Haapasalo supposes that short films could be more profitable, if they were made more by professionals. Professionals would have more alternatives to offer and maybe even succeed with short films. The audience for short films would be found, if there were short film exhibitions (Haapasalo 2004: 25).

Åberg states that mobile phone manufacturers tend to promote the mobile phone as a medium in which content can be created. Artists and art students are being encouraged to produce content for the small screen (Åberg 2005: 12). Mobile phone manufacturers could encourage film-makers even more for mobile video making and give them supportive feedback from mobile video productions.

2.4 Potential audience of the mobile video

Breakthrough of new technologies is not always as fast as was expected. It is not enough that a technology is available and it is functional. Mobile video producers and also mobile phone manufacturers have to discover an audience for the content, as well as the audience's current and forthcoming needs (Lindqvist, Siivonen & Juhola 2005: 45).

Defining the audience is necessary, because mobile videos have to be designed to a certain target group. It is essential that producers and manufacturers are aware of whether the target group is willing to view videos from the small mobile phone screen, and whether they are even willing to pay for that service. The definition of the target group is also important in order to categorize the content of the mobile video. If there is an audience for mobile videos, it is essential to chart what kind of mobile videos are in demand, and in what kind of situations[14] mobile videos are being watched. However, this study does not concentrate to those aspects.

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[14] Tasajärvi states that mobile videos can be watched anywhere: in a moving vehicle or varying circumstances, as a whole or in parts, by yourself or in company. (See Vesanummi 2004.) Mobile videos are usually watched when there is useless waiting time. Traveling is maybe the most common situation when mobile videos are watched.

The term 'audience' can be defined using several different methods. For example, the audience can come from different social classes and cultures[15]. The audience can contain people from different age segments, or it can be determined by gender[16]. The potential use of mobile videos is going to be affected by social and cultural backgrounds.

Reliability cannot be achieved in consumer research of mobile videos while mobile videos have not yet become common. However, the consuming habits of Internet-based video delivery can be used as a reference in a mobile video consumer survey. The user group of Internet-based video delivery can give some indication of the mobile video consumer age distribution. The age distribution of paying film downloaders in United States during the first half of 2004 was the following:

- 25 % of users were 18-24 years old
- 27 % were 25-34 years old
- 30 % were 35-44 years old
- 13 % were 45-54 years old
- 4 % were 55-64 years old
- 1 % was over 64 years old (See Nordlund 2004: 44).

However, age distribution can differ in mobile video downloading and streaming. Downloading films via internet is usually paid by credit card, and that does not make minors to be able to download films. Operators can allow minors to be able to use mobile video downloading and streaming services if services are charged in telephone bill.

Minors are probably going to be one of the biggest mobile video consumer groups, if they are allowed to use mobile video services. According to empirical research, mobile technology affects especially the social activity and consuming habits of the young

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[15] In western culture men are usually more interested in technology and mobile services than women, but in the east the main target group of mobile services is young women. (Rautio 2003.)

[16] Research results tell that in Internet based video delivery 81 % of paying film downloaders in United States were male during the first half of 2004. Women's share is only 19 % (Nordlund 2004: 44).

generation (See Räsänen & Järvinen 2004: 52). The young generation, who have adopted the Internet and mobile phones as a child, are going to adopt an extensive number of phone features easier. Many young people use CD players and MP3 players. The mobile phone is going to compete with these portable music players when its sound reproduction system becomes more developed. It is possible that young people are going to replace their portable music players with multifunctional mobile phones. It can also be assumed that young people would like to experience mobile video viewing.

The analysis[17] by Andersen & al. assumes that users between 15 and 30 years are used to manipulating mobile phones and computers to consult information, but the consumers' overall familiarity with such technology is low:

> *"If it is assumed that 100% of the current mobile users between 15 and 30 years and 100% of the fixed Internet users are used to manipulating devices (handsets or PCs) to consult information. This amounts today to approximately 110 million users in Europe. This number only represents 36% of the total population above 15 years old (310 million). Although it is clear that there will be mobile users above 30 years old that do not use the fixed-line Internet and will nonetheless be able to use data devices, the current lack of end-user familiarity with technology could be a barrier to the development of the market."* (Andersen & al. 2002: 105.)

Andersen & al. remind that this is only a static view of the situation. They predict that in the future, most of the increase in mobile penetration will be in the age segments above 45 years. The rest in this age segment who do not currently have a mobile phone are unlikely to be very familiar with technology. At the same time, consumers become familiar with the Internet potentially increasing the age variation of the consumers, and an increased number of users will become accustomed to using mobile technology. Overall, technology adoption will remain a slow process (Andersen & al. 2002: 105).

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[17] The European Commission Directorate-General Information Society asked in 2001 Andersen to perform a study related to mobile services. The study was subscribed to because mobility is being seen an attractive branch and it has potential commercial possibilities. Andersen Project Team made 'Digital Content for Global Mobile Services' final report as a result of the study and it was published in 2002 (Andersen & al. 2002: 10).

3. PRODUCTION PROCESS

In mobile video production there are many similarities to a traditional film production. For example, the production processes of the mobile video and that of the film converge many times. Because currently there is no particular mobile video process available, the model for productions has to be applied from existing production models. Traditional film production is the closest model that can be used in mobile video making. This chapter introduces briefly those production phases that can be adopted from film production. The chapter concentrates on those aspects that differ the most between mobile video and traditional film productions.

In *Film art: an introduction* (1990), Bordwell and Thompson divide a film production into three general phases: 1) preparation, 2) shooting and 3) assembly. The idea and script are developed in the preparation phase. Moreover, the funding for the film is acquired, the publication is made and the distribution of the film begins. In the next phase, the film is being shot and in the third phase the images and sounds are put together to create the final film (Bordwell & Thompson 1990: 8). These phases are also known as preproduction, production and postproduction, but the phases can also be divided in more detail into 1) concept and idea development, 2) script development, 3) production and 4) postproduction. In this study, the concept, idea and script development phases are separated from the preproduction phase in order to clarify the structure of mobile video production.

Mobile video production differs the most from traditional film production in the preproduction and postproduction phases. The small display, low resolution, and compression that is not always efficient enough, are the reality of today in mobile productions (Åberg 2005: 13). Mobile videos should not be made in the same manner as traditional films even if the production phases are quite similar. According to Tasajärvi prominent mobile videos are designed from the very beginning for mobile devices. (See Pekonen 2003.)

In the concept, idea and script development phase, it should be considered that the same film elements that work in the film theatre may not be functional on the small display of the mobile phone. The size of the terminal equipment must be borne in mind already in

the idea development phase. The mobile video postproduction phase also has its specialties. It differs from the postproduction of a traditional film in that it contains a compression phase that has to be done in order to decrease the file size for the mobile video. This study is above all focused on mobile video compression and distribution phases, because they differ the most from traditional filmmaking and cause a lot of challenges in mobile video productions.

3.1 Concept, idea and script development phase

The development of the concept and idea start even before the actual preproduction phase is started. The concept has to be charted in order to comprehend the context of use of the mobile video, as well as its special characteristics. It is essential to consider what kind of a story suits a mobile video the best. A short mobile video requires functional film elements. Insignificant pictures or sounds cannot be afforded in a few-minute's film – not even on a single frame[18]. The best solution for the problem is to concentrate on a well-defined problem-solution structure. It is best to unveil the main character of the story in the first frame of the film. There is no time for introductions or profound character analyzes in a short-spanned story (Cantell 2004: 10).

In film production, everything is based on the script. The writer is responsible for both the development and preparation of the script. An independent producer or a production company can hire a writer to produce the script, but sometimes the writer is working on her own. Writing a script for a mobile video differs from traditional script writing. In the idea development phase, the writer and producer have to pay attention to the display size of the medium as well as to the short duration of the video. All other production phases can go wrong if the technical restrictions are not considered in the script development phase.

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[18] Frame is the basic source of a film. One frame represents one image.

The script usually goes through several stages, and rewriting is common. "These stages include a treatment[19], a synopsis[20] summarizing the basic action; one or more full-length scripts; and a final version, the shooting script[21]." (Bordwell & Thompson 1990: 10.) The director may want to make some corrections to the script and shape it in each stage, until the final version is satisfying and can be approved.

Here are some useful tips and hints that make a mobile video functional:

THE LENGTH OF THE VIDEO

The guidance is that mobile videos should last less than three minutes. If there is a need to make a series of mobile videos, every sequel of the story has to work also alone. A sequel of the series cannot be dependent upon the other sequels of the video. It has to work as a single, individual video, because the viewer can also watch only one sequel at a time instead of watching all of them. (Pixoff 2003.)

RECOMMENDATIONS FOR SHOOTING

In the creation of the storyboard, it should also be observed that the mobile video prefers close-ups and still images, and there is no sense in using long shots while ignoring small details. The camera should prefer staying in one position than moving quickly from one object to another. Otherwise fast movement is displayed as choppy pictures. (Wishnow 2004.)

Tilting, panning and dolling should rather be avoided when shooting a mobile video. If there is need to move the camera, it should be done peacefully and steadily, and this has to be taken under consideration already in the making of shooting plan and the storyboard. (Pixoff 2003.)

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[19] Treatment is an intermediate form of synopsis and script that contains large abstract of the film's or video's structure and plot.

[20] Synopsis is a brief, approximately one or two pages long descriptions of a story or plot.

[21] Shooting script is the final script that includes, for example, the scene numbers, camera angles and inserts.

Fast horizontal, vertical or diagonal panning and fast zooming do not work in mobile videos. The essential characters, objects and development of the plot should be shot as close-ups, and the camera should stay much longer in those aspects than in traditional films.

USE OF ANIMATION

Animation is more optimal material for the mobile video than a heavy video clip. Compared to traditional video, animation is simpler with its own special characteristics. Animation is often deliberate, and it includes still images that often overstay on the display. Expressions are illustrated with close-ups, and the design of pictures is quite simple. Stop-motion animation helps technology to follow the content. (Tasajärvi 2004.)

AVOID TOO MUCH AUDIO

Storytelling in mobile videos has to be focused on visual appearance, because mobile videos are often watched in noisy situations, such as while traveling on a bus. Pixoff advises that the mobile video should not concentrate on audio features, because it might be that the viewer does not even play the video with tones on, and misses the dialog, background music and effects. It is also possible that the mobile phone's sound reproduction system is not advanced enough to produce the wanted sound atmosphere. (Pixoff 2003.)

CONSIDER USING TEXTS CAREFULLY

Texts should be used carefully in mobile videos. Texts are most probably going to be hazy if the mobile video is going to be viewed while streaming. If there is a need to use texts, the font should be very simple and texts must be able to be cut up for several frames. If texts are allowed to stay on the screen longer than usually, they can be read clearly. (Pixoff 2003.)

TEST MOBILE VIDEO IN TERMINAL EQUIPMENT

It is not enough to edit and view mobile video material on the computer screen only, because it is most probably going to look different on the mobile phone screen. Same images that seem to work well on the computer may not work well on the mobile phone screen. The functionality of the mobile video cannot be found out if the video is not tested beforehand on the mobile phone screen. The viewing experience differs from watching the video on a computer screen to watching the video on a mobile phone screen (Åberg 2005: 13).

3.2 Preproduction and production phase

The director's role is the most important role in the production phase. However, the roles of the producer and writer are very important in the preparation of a mobile video. The producer's role is mainly organizational and financial, but the producer can also be an artistic producer, who in some cases likes to say her opinion about the artistic side of the production, too. The producer is responsible for developing the project from the very beginning to the very end. It is recommended that the producer, writer and director are not the same person, because it is too difficult for one person to handle the whole complexity of a film.

The producer can work independently and unearth ideas that are gathered into a mobile video. In this case, the producer has to sell the idea to a production company or financers. In some cases producer works for a production company and discovers new ideas for films. The production company may also hire a producer to construct the whole package (Bordwell & Thompson 1990: 10).

When the writer is finishing her job and script is about to reach its final version, it is the producer's time to start planning the finances, schedule, actual production phase, crew and shooting locations. When all plans are ready, it is time to start the shooting phase.

"The shooting phase is usually called production (even though "production" is also the term for the entire process of making a film)." (Bordwell & Thompson 1990: 12.) In the production phase, there are several different kinds of workers to enable the creation of the film. The director's role is the most important, because she is primarily responsible for overseeing the shooting and assembly phases (Bordwell & Thompson 1990: 12). In mobile video productions, the director has to be very aware of restrictions that the small display sets.

3.3 Postproduction phase

The editor's role is significant in the postproduction phase. She is responsible of cataloguing and assembling the takes produced during shooting (Bordwell & Thompson 1990: 16). Traditionally, the editor has to wait for the footage to be processed in the laboratory, but mobile videos are most probably shot with a digital camera, and editing can basically begin right after shootings.

According to Peter Hoddie[22] problems occur in mobile video production, because mobile videos are made with tools that are originally designed for other purposes. (See Järvinen 2002.) Video editors that are designed for traditional film editing may not be suitable for mobile video editing. New editors are developed alongside with technology, and they are going to be more suitable for mobile video editing than current editors.

The editor's aim is to build the final cut with the director's consultation. When the final cut is about to be ready, it is time to begin sound editing. First, the sound effects are added, and when the sound editor begins her job, the composer begins her own, if there is one. When all sounds are ready they are synchronized with the picture (Bordwell & Thompson 1990: 16–17).

In traditional film production, the picture and sound would be ready to be printed and distributed at this phase. In mobile video production, this phase means the beginning of

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[22] Peter Hoddie is founder and President of Generic Media. The company is specialized in moving image as well as to Internet-based distribution.

compression. Compression is necessary, because the availability and viewing of mobile videos have to be fast and comfortable. (Rautio 2003.)

3.4 Compression phase

A mandatory, and the most demanding, part of mobile video production is compression. Compression means that the redundant and perceptually irrelevant parts of video sequences[23] are reduced (Forum Nokia 2004: 7). Big production companies hire a compressionist to compress their mobile videos. In smaller productions, there is no specialized person in charge of compression. Compression can, for example, be done by the editor or any other worker, who has enough technical knowledge.

Efficient compression sets its own challenges to the production, because the video quality should not suffer from the compression. Problems occur, because there are several different mobile phone models available that differ from each other. Mobile phones can have different display sizes, their amount of memory differs and the mobile phone manufacturers can use different kinds of media players in their products.

Hoddie explains that in addition to mobile videos' small physical size, their file size should be equally small. Only essential visual and audible information should be used in video compression. Because of the limitations of compression, algorithm pictures often get pixilated after compression. For example, hair, grass and fast movement are displayed as squares and rectangles. (See Järvinen 2002.)

The digital video signal is usually compressed with codecs in order to make technically easier the sending, recording or saving of video signals (Keränen, Lamberg, Penttinen 2003: 102). A codec is a combination of an encoder and a decoder. It makes possible the encoding of audio or music to a specific format, and the decoding of media encoded in this specific format. Encoding means the processing of a raw, uncompressed file to a compressed file and to an encoded form while maintaining the quality. Moreover,

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[23] A series of still images form a video sequence.

decoding means that viewable image is being converted to an original file (DivX 2000-2005).

There are two ways of compressing a digital image: the lossless and lossy compression. Lossy compression is better suited for moving image compression. Compression methods differ between images that can or cannot use temporal redundancy reduction. These methods are called the intra-frame and inter-frame compression.

3.4.1 Lossless compression

After compressing and decompressing the video, it may contain the same data as the original video. This is called lossless compression (Keränen, Lamberg, Penttinen 2003: 229). Lossless compression can be compared to, for example, Win ZIP[24]. No data is lost no matter how many times the file is compressed. Each individual frame in the video can be compressed.

The lossless method does not excel at moving image compression, because the image in the video changes all the time. Moreover, lossy compression algorithms save more space than lossless algorithms. The lossless method is better suited for graphics and still images than for the moving image (Keränen, Lamberg, Penttinen 2003: 229).

3.4.2 Lossy compression

Lossy compression is used in most video codecs. When the video is compressed and then decompressed, it loses data and unlike the original video. How much the compressed video loses in terms of the original data is dependent on the amount of compression. The lossy method is used for compressing video and photographs (Keränen, Lamberg, Penttinen 2003: 230).

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[24] ZIP file is a compressed file in which the file has been compressed without changing its information content.

Lossy compression filters less important information. The picture area usually contains pixels that have very small color or luminosity differences compared to surrounding pixels (Keränen, Lamberg, Penttinen 2003: 230). For example, the number of shades of gray that pixels have is reduced.

Famous lossy codecs include MPEG1, MPEG2, MPEG4, DV, Windows Media Video, RealVideo, Sorenson, Indeo and Cinepak. For example, the Nokia S90 widescreen smart phone model 7710 uses H.263, MPEG-4, and RealVideo8 codecs[25]. (Nokia 2005.) Actual video compression can be made with the intra-frame or inter-frame compression methods.

3.4.3 Intra-frame compression

Intra-frame or I-frame compression relies on a single and specific frame compression. This means that each separate frame needs to be encoded. The intra-frame method is used in JPEG and M-JPEG formats. The intra-frame method is often used in a modern editing method, non-linear editing, which means that it enables accessing any frame in a video with the same ease as any other. While there is no possibility of taking advantage of the information in previous and forthcoming frames, there is an ability to recreate each frame without the need for the others (Keränen, Lamberg, Penttinen 2000: 230).

3.4.4 Inter-frame compression

Inter-frame or P-frame compression relies on information in the preceding, and occasionally, following frames to compress an image. If the image consists of a several static frames, new frames can take advantage of the previous frame. Inter-frame compression is based on saving the keyframes. A keyframe is a complete, but heavily compressed, frame and it contains information of the whole image area. The keyframe

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[25] More details from named codecs can be found, for example, from Forum Nokia:
http://www.forum.nokia.com

is followed by delta frames, which include only the changes to the keyframe. Compression is more effective if there are fewer changes in frames (Keränen, Lamberg, Penttinen 2000: 230–231).
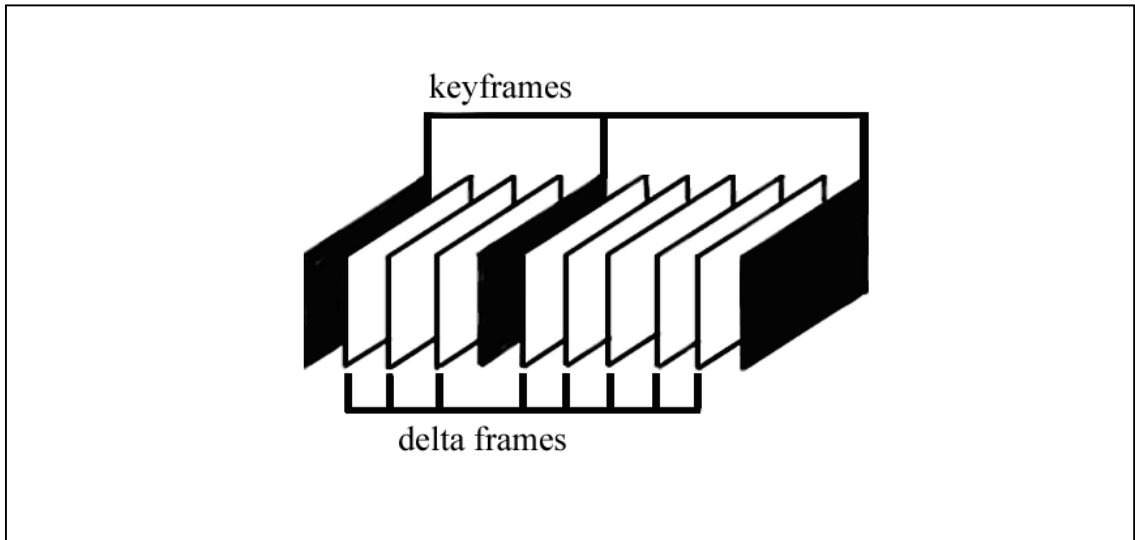
Figure I: Inter-frame compression (adapted from Keränen, Lamberg and Penttinen)

High quality for an image can be achieved with inter-frame compression, even if the compression ratio is high. For example, DV and MPEG formats use inter-frame compression.

3.4.5 Video coding

In compression, the redundant and perceptually irrelevant parts of video sequences are reduced. Compression is based on generating motion-compensation data, which describes the motion between the current and the previous image. The current image is predicted from the previous one (Forum Nokia 2004: 7).

Video redundancy can be categorized into three redundancies: spatial, temporal, and spectral redundancies.

> "*Spatial redundancy refers to the correlation between neighboring pixels. Temporal redundancy means that the same objects appearing in the*

previous image are likely to appear in the current image as well. Spectral redundancy addresses the correlation between the different color components of the same image.” (Forum Nokia 2004: 7.)

The redundancy of the video sequence has to be reduced in order to reach an efficient compression. Thus, some non-redundant information must be discarded. During this, the video encoders take into account the properties of the human visual system, and the discarded information is mainly least important for the subjective quality of the image (Forum Nokia 2004: 7).

3.4.6 Audio coding

Sounds are amplitude waveforms as a function of time. They can be digitized when samples of the corresponding waveform are taken frequently enough.

> *“For arbitrary sounds and music, a 44.1 kHz sampling frequency is considered to provide high quality. For speech, an 8 kHz sampling frequency is adequate for most applications. Typically, 16 bits is enough to represent one sample.”* (Forum Nokia 2004: 9.)

There are several ways to compress digitized audio material. “- - advanced audio coding methods take advantage of the human psychoacoustics model.” Barely audible audio signals can be discarded or compressed. There are two different audio coding methods available: generic audio coding and speech coding techniques. “Generic audio coding algorithms are targeted for music and sound as well as human voices, whereas speech coding algorithms are aimed at speech only, and perform relatively poorly when music is coded.” (Forum Nokia 2004: 9.)
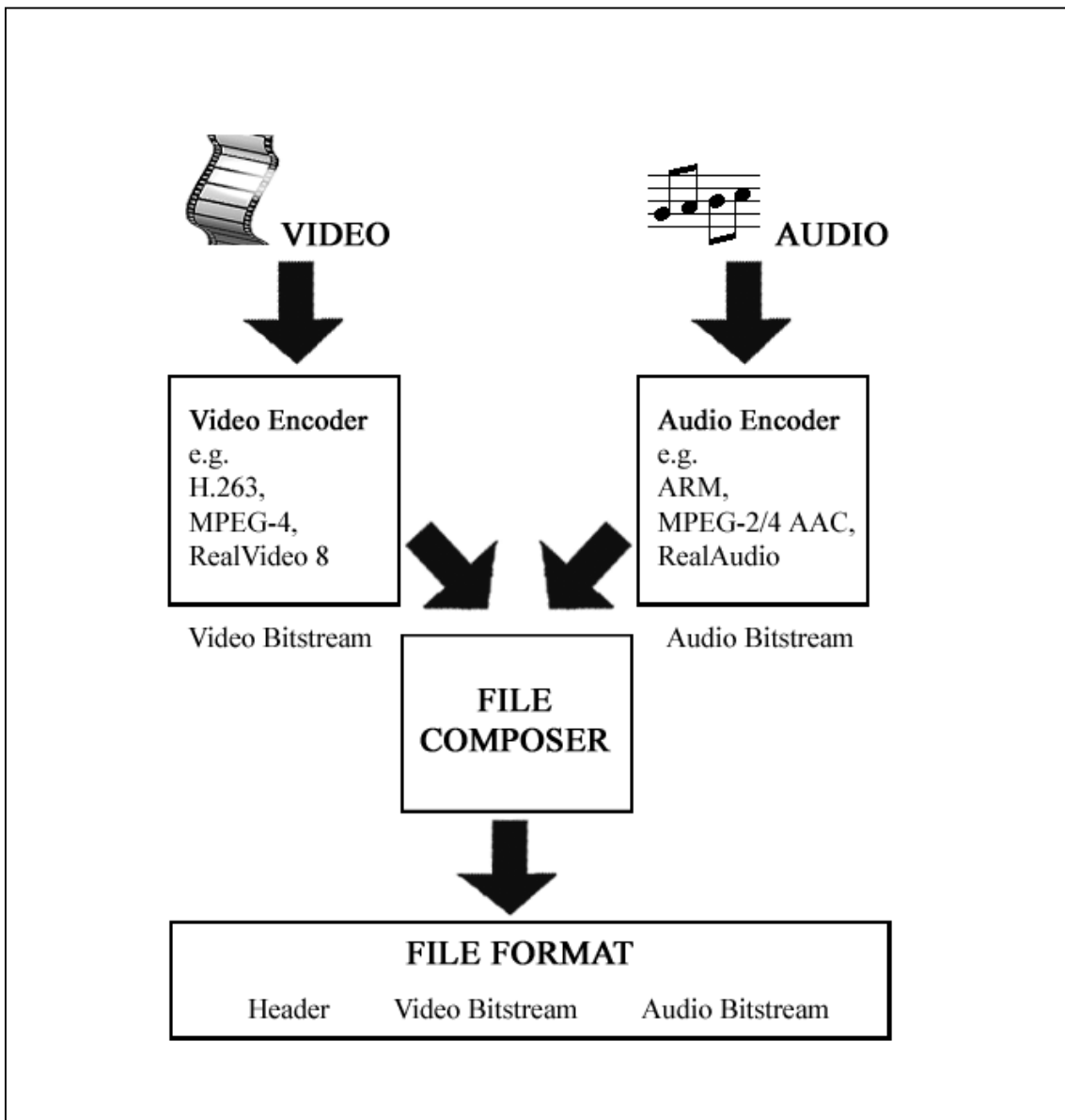
Figure II: The compression of mobile video (adapted from Forum Nokia)

3.5 Distribution phase and technology

A traditional film generally receives a theatrical exhibition after production. An exhibition can also be non-theatrical, which means screening in the viewers' homes, classrooms, hospitals, etc. (Bordwell & Thompson 1990: 21). In some cases mobile videos are displayed in theaters, but usually only at film festivals and competitions. For mobile videos, the distribution channel is mostly non-theatrical.

The distribution channels for mobile videos are not yet established, but operators and mobile phone manufacturers are interested in real-time streaming, and the possibilities it provides (Elorae 2004: 14). Currently, it seems to be topical to study the distribution technologies. Once a technology is mature enough for distribution, it is time to concentrate on the distribution channels, such as mobile portals. Mobile portals offer, for vendors and consumers, the possibility to find each other. Media technology and mobile videos, for example, can be seen as pioneers in e-business. However, the needs of vendors and consumers have to be discovered before mobile portals are to be outlined (Lindqvist, Siivonen & Juhola 2005: 47). Pixoff.net[26] is an example of the mobile portals of future. Pixoff is currently focused on Internet-based short films and animation, but its format could also work well as a mobile portal.

Advancing mobile technology makes live video and audio possible in the mobile phone environment. With the help of streaming technology mobile videos can be distributed to mobile phones. Streaming does not require a large memory space on the mobile phone.

There are several streaming service providers available. Numerous news channels and programs have their own real-time streaming services, but mobile videos have not yet found their way to the streaming providers. Markets are dependent on indirect network effects, and this is why mobile phones have to be compatible. Customers must be able to access several video services of different providers, and phones from different manufacturers have to access the same content services. Nordlund specifies:

> *"This kind of compatibility requires either standardization or an emergence of a de facto standard. Key compatibility issues arise from software (video and audio encoding technology, file format, and DRM[27] technology). If a standard does not emerge, the network effect does not work due to incompatibility."* (Nordlund 2004: 72)

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[26] "Pixoff.net is the online destination dedicated to showcasing the variety of Finnish short films and animation to an audience around the world. By encoding, hosting and streaming the work, Pixoff.net provides the film-makers exposure, distribution opportunities and an active community for feedback and networking. Pixoff.net brings together both young underground artists and professional film-makers." (Pixoff 2005.)

[27] Digital Rights Management ensure that e.g. mobile video can only be downloaded or played when the relevant conditions that are determined by the copyright owner are met. Conditions may include payment or the system can prevent the copying and distributing the video to a third party.

Streaming is possible in GSM networks, but bit rates[28] or speeds are quite low. Thus, the quality of a mobile video is not excellent – the quality of the image is not very high, and audio quality is low. 3G networks enable a better streaming quality by raising bit rates. However, only a raise in the bit rate does not guarantee a pleasant viewing experience. The quality of streaming depends also on codecs. In addition, bit rates and codecs are not the only components that affect the quality of streaming. Network congestion or other possible problems might lower the transferring speed (Elorae 2004: 14).

3.5.1 Local playback

In local playback, the mobile video is stored locally before it can be used. In other words, the whole mobile video has to be downloaded from the network to the mobile phone before it can be watched even partially (See Elorae 2004: 16). Local playback offers a better quality and reliability than HTTP streaming, because when the whole video is downloaded to the phone before playback, there cannot be network-related problems during playback. The consumer does not need to worry if the network is suddenly lost and streaming is interrupted when viewing mobile video, for example, on the train.

However, the use of local playback also has challenges, because there is usually not much free memory available in mobile phones. It may not be possible to download several mobile videos to the mobile phone without deleting the old ones. One way to deal with the memory issue is to save videos to a memory card, but memory cards are currently still quite expensive. The consumer is not willing to spend money for several memory cards in order to be able to save many mobile videos.

Nordlund predicts that download services are likely to become more popular than streaming. He argues that the personal media devices are often used in an interruption-prone environment and the content that is already downloaded is easier and faster to access (Nordlund 2004: 61).

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[28] In streaming technology, bit rate means the number of binary digits transferred per second.

3.5.2 HTTP streaming

The idea in progressive downloading, also called HTTP streaming, is that the mobile phone starts downloading the mobile video, and the playback starts when enough data has been downloaded. The playback program counts the average time that it takes to download a part of the mobile video and then estimates when it could download the rest of the video during the playback. This is performed so that the playback does not need to be interrupted in order to wait for more data to arrive. However, the HTTP is transferred on top of the TCP, or transmission control protocol, and it can still generate pauses during playback because of congested networks. Furthermore, the whole mobile video is stored locally in the end, using up the memory in mobile phone. When the file is downloading, the user cannot jump forward to parts that are not yet downloaded (See Elorae 2004: 17).

3.5.3 Streaming

Streaming means that content can be accessed directly from the network without transferring it to the consumer's mobile phone prior to playback. Only the downloaded part is played after which it is discarded. Thus, streaming of large media files, even larger than the available memory of the mobile phone, is enabled (See Elorae 2004: 17).

Streaming requires a dedicated streaming server and an uninterrupted connection between the server and the mobile phone. "Stream bandwidth must not exceed the available end-to-end network bandwidth – otherwise the playback becomes jerky. Streaming requires only little memory for buffering in the end user device." (Nordlund 2004: 5)

Streaming uses connectionless UDP, or user datagram protocol, packets for data transmission.

> *"UDP does not use retransmissions like TCP. While this may degrade the quality of the playback, it is more robust to network congestion and*

similar problems that cause HTTP streaming to pause the playback. - - Real streaming can also start showing the content almost immediately after initiating the connection. Additionally, the user can go forward or rewind the stream while watching it. To make this all possible, real streaming uses its own protocol and media codecs." (See Elorae 2004: 17.)

Real-time streaming can be used, for example, in on-demand video and live broadcasts. On-demand video is a video clip that is stored in the streaming server and can be streamed from the server by anyone who is connected to the server. The video clip can be accessed at any time as long as the connection is available. In live video, the server has live video feed from some source and it can be accessed by the client through streaming (Elorae 2004: 17–18).

4. PRODUCERS' THOUGHTS ON MOBILE VIDEO PRODUCTION

This chapter contains an analysis of the interview research. The inclusion of the interview research to this study was necessary in order to examine the possible new aspects of the mobile video and its audience, but also challenges and problems in production from the content producer's point of view. Interviews of people who are familiar with mobile videos and the production make it possible to find out topical information about the current situation of mobile videos, and also to get more information about mobile video productions.

The six persons, who were selected as respondents for this research, have participated at least one mobile video production as a producer or a film-maker. Three of the informants have been working within media while engaged with their studies. Two of them have recently graduated either from an art and media school or a media program. One informant has been working in media scene about five years, and the rest of the informants have approximately 20 years of experience in the field of media production. Four of the informants were titled as Producers (working either as an independent producer or in a production company); one was working as a Development manager and one as a Project designer during the research.

When I started looking for informants in the beginning of my study, I assumed I would receive a higher number of interview responds than I finally did. I thought there would be more people, who are somehow engaged in mobile video productions. It was hard to reach producers and film-makers who have been dealing with mobile videos. Some potential informants refused because they did not see themselves as specialists of mobile videos. Despite the fact that there were not many informants available for this study, I think the answers received from the six people are very important and relevant. The rareness of the professionals in the field makes the answers even more important.

Currently there are no film-makers in Finland who are mainly focused on mobile videos. Mobile video productions did not receive any funding from AVEK (The Promotion Center for Audiovisual Culture) in autumn 2004 (AVEK 2005: 48–51). This indicates that currently there are not many mobile video productions ongoing in Finland. If there are any, then they are quite small productions and probably done by

film and media students and dilettantes. From this perspective, finding six content producers, who have experience in mobile video production, is a satisfactory sample.

All interviews were done via e-mail. The questionnaire was divided into three topics:

    1) background of the informant

    2) current and future situation of the mobile video and

    3) production phase of the mobile video. (See Appendix.)

The questions for the interview were created together with people studying and working with the media branch, and with a large mobile phone manufacturer. The aim was to make the questions such that the answers would bring some topical information about the current situation of mobile videos, and also about mobile video productions and their challenges.

The analysis is done by combining and comparing the existing theory and interview results. I have also included my own know-how and experiences in media and mobile technology into the analysis. I have studied media production in a Master's Program at the University of Oulu, and I have years of experience working with mobile technology.

4.1 Mobile video and its audience

This chapter includes a collation of what is considered as a mobile video and its audience in producers and film-makers point of view. Interviewee were inquired how the term 'mobile video' is defined, to whom mobile videos are targeted and in what kind of devices consumers are considered to be viewing mobile videos.

4.1.1 Definition of mobile video

According to the producers and other professionals interviewed for this study, an ideal, well-produced mobile video is unanimously a short story, about one minute long, which

has been especially designed to be viewed on a small mobile phone display. Its visual storytelling is very well-defined and it takes advantage of the special characteristics of the mobile device. One of the producer informants said that a good mobile video is "Short, contains one or two turns and is simplified with its visual and auditive expression." Moreover, the informants also agreed that a mobile video has to be produced so that the mobile phone's technical restrictions have been taken into account. The mobile video has to be able to be downloaded and watched anytime and anywhere. Another producer informant stated: "In a good mobile video, attention has been paid to terminal equipment restrictions, and advantage taken of special characteristics that the devices offer."

According to the results of this research, mobile video can be defined unambiguously a short film. Both the empirical and theoretical researches agree with the fact that a mobile video is watched mainly from mobile phone screens, and that the short length video is best suited for portable devices. While mobile phones are mainly used during breaks, it can be assumed that consumers prefer watching a short story to a full-length feature film on the mobile phone screen. The informants brought up the fact that has been mentioned many times in previous research made on mobile video or entertainment: The every-day use of the mobile video takes place in situations such as waiting for a bus. It is essential to remember that the main purpose of a mobile video is to fill people's waiting time usually outside the home.

4.1.2 Audience

The interview made in this study proves that categorization of the mobile video consumers gets mostly done by age, which is the most common way to categorize consumers in the western culture in general. Most of the respondents of the interview agreed with the fact that the main target group of mobile video services is young adults, who are less than thirty years old. Only one single mobile video project of the informants was focusing on both children and their parents.

Both the interview and theoretical research results agreed with the statement that mobile videos can be seen as the next step in mobile content after music business. As it was discovered earlier in this study, the mobile music business estimates that the main target group of music downloaders will be teenagers and young adults. It can be predicted that the main target group of mobile videos is also going to be teenagers and young adults, who have adopted mobile technology as an every-day commodity.

Nevertheless, age should not be the only way to categorize the audience of mobile videos. Contrary to the western culture, young women are the main target group for mobile services in the east. Young people and people working with technology are not the only people who have technical knowledge nowadays. It is misguided to assume that only the young generation is willing to use mobile services. The skills and interests of adults and senior people should not be underestimated. Mobile videos can have demand among adults and even among pensioners, if the content is carefully designed to a certain target group. Adults, who have regular earnings, have more purchasing power to use for new innovations. Pensioners, who are willing to use mobile services, usually have more time than the younger generation, but the offered content cannot be the same that is offered for young adults.

The interview result gives rise to the thought that mobile videos are going to entertain only a small target group on the long run. There was a statement by an informant that all mobile phone users are going to watch mobile videos once or twice, but the active consumer group still stays quite concise. Most mobile phone users may be hard to reach so that they would watch a mobile video even once. From this point onwards, the meaning of conception becomes very important. In order to make both the production and marketing of mobile videos profitable, mobile videos should attract an established target audience. Production companies should chart what kind of content could reach a large demand and serve a large group of paying customers.

Free mobile videos that are already installed to new mobile phone models could be one way of getting mobile phone users to become accustomed to using mobile videos. Operators could also promote the use of mobile videos by offering free mobile video downloading or streaming trials for their customers. Unfortunately free possibilities to view mobile videos may not be enough to convince customers of the necessity and

utility value of mobile videos. Free trials can offer to customers an experience of mobile video viewing and they would be aware of the existence of mobile videos.

Further studies regarding mobile video consumer research should be done. In order to find a meaning for content creation, the target group of mobile videos would be essential to chart. Defining the target group is very important when a service is being designed and created. The target group defines what kind of content is appropriate and what kind of data transfer method should be used for sending and receiving that content. Consumer research should also concentrate on what kind of content is needed and what kind of groups of users could be further categorized. It is not insignificant what kind of message is included to content that is aimed at a certain audience.

4.2 Special characteristics of mobile video production

This chapter includes a collation of the kind of special characteristics mobile video productions have. The informants were asked what kind of problems they have faced during mobile video productions, and whether compression causes difficulties. The amount of available information concerning the restrictions, which mobile device set, was also queried. Moreover, they were asked if there is enough information offered about these restrictions, and if there is any need for a technical specification, given that mobile phone manufacturers could create and deliver a technical guideline on how to produce mobile videos with better technical quality.

According to interviews it became clear that the knowledge that is derived from traditional film production is not enough in mobile video production. In addition to familiar technical terms there also has to be technical competence in order to create a suitable content for the mobile environment. Technical requirements that the mobile video production sets can be learnt by empirical work, because there are still many issues in which there is not yet practice available.

The special characteristics of mobile video production that were emphasized in this study are technical specialties like compression and restrictions that terminal equipment

sets, co-operation between producers and mobile phone manufacturer, and feedback. According to this study, the technical knowledge is not enough in mobile video productions while the branch is still quite young. Producers need co-operation with their colleagues and also with mobile phone manufacturers in order to share ideas, and also to develop mobile video productions. Feedback is also very essential in order to improve productions.

4.2.1 Technical specialty

Designing the script and style that suits the small mobile phone display should be easy, because there are many tips and hints available, for example, on the Internet. Problems rise in the technical part of the production. In mobile video productions, the role of technology is emphasized, because such videos cannot be produced in the traditional way to mobile devices. The technical quality of mobile videos has not always been as good as was expected. Therefore technical knowledge and skills have to be developed in order to create a functional entity that satisfies also the paying customer.

Mobile video productions are especially challenging when the video is being produced for different devices. The viewing experience differs from watching a video on the computer screen to a watching video on the mobile phone screen. When watching mobile videos with different phone models, the viewing experience can also be different.

According to the both theoretical and empirical researches, mobile videos are mostly produced for mobile phones, but also for PDAs. Some informant stated that in the project, in which the informant was involved, the video was designed for smart phones like Nokia Series 60 and SonyEricsson P900 and also PDAs. All informants are unanimous about the fact that mobile videos are mostly viewed with mobile phones.

It was discovered in the theoretical part of this study that devices usually have different display resolutions, their amount of memory can differ and dissimilar file formats can be supported. Some informant listed that problems are caused by different features of

terminal equipment like display size, memory, media player, etc. A smoothly playing, compressed video that is specially designed for one device may be too large to be played in other devices. What works well in some mobile phone manufacturer's models may not work at all in a competitor's models. It is not even guaranteed that video works as expected in all phone models of a given manufacturer.

Without mobile video standards it is impossible to create mobile videos that are technically functional in all devices. The lack of mobile video standards leads into a situation, where the existence of a technical guideline that suits every mobile phone manufacturers' all models is not possible.

The result of the interview disagrees about whether there is enough knowledge about compression available. Some respondents believed that valid information can be received from mobile phone manufacturers. One informant said that even if there is information available, it is never enough, because technology is developing fast and valid information becomes obsolete. However, it is believed that valid information can be obtained by sharing the know-how and experience in order to further develop mobile video productions. According to another informant the skills can only be improved by experience, and mobile video branch can only be developed if information is shared.

According to the research, it is obvious that all informants do not even know what kind of information is needed as far as compression is concerned. There is not enough knowledge on compression making it arduous to propose the guidelines that could be helpful when compressing videos. One informant stated that "All kind of information is needed". It can be interpreted that there is not much technical knowledge available if it cannot be specified what kind of information is needed.

However, it is not enough that there are technical guidelines available for compression. The model for mobile video production should be created by sharing the experience and knowledge about what is currently technically possible and what kind of possibilities technology can offer in the future. Furthermore, testing-related issues should not be forgotten.

Testing issues are strongly related to mobile video production. It is not enough that the mobile video has been compressed and tested in a compression editor. Even if it seems to play smoothly in the compression editor, it is essential that the final product is also tested on terminal equipment, because this is the only way to verify that the compression has indeed succeeded.

Testing is seen as a big challenge in mobile video productions. It is a new phase in film production and it causes problems, because videos should be tested in several different phone models. For smaller production companies, testing can also be a big investment, because the latest models from different mobile phone manufacturers should be available and purchased in order to verify that the mobile video is functional in all models that are available on the market.

Producers do not have to solve testing-related issues alone while they can network to testing platforms that are, for example, available in Oulu. Here there are two different testing platforms called the 'Octupus'[29] and 'Rotuaari'[30]. A testing platform makes it possible to test mobile content in the real environment and, for example, the Octupus Network arranges training and business related support for its customers. (Mobile Forum 2005.) There are also new possibilities to find potential customers and co-operators by networking to other projects.

A new kind of production also requires that the team is trained for new kind of production processes. Some informant stated that the members of working group have to be trained because mobile video production requirements differ from traditional film production. The working group must consist of at least one person, who is technically talented, but it is also recommended that other working group members have at least some kind of consensus on what is compression and how does mobile video production differ from traditional filmmaking. There is no use for technical specifications if the team members are not technically qualified to implement them.

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[29] For more details, see http://www.mobileforum.org

[30] For more details, see http://www.rotuaari.net

4.2.2 Co-operation

In mobile video productions, there is a need for different kinds of people doing their own tasks in co-operation with their colleagues. Producers probably need to communicate with distributors, such as the operator, and with mobile phone manufacturers. When people and ideas of different areas meet, it is obvious that there are going to be misunderstandings. People have their own special terminology, and they may use acronyms. For example, a representative of a mobile phone manufacturer may not have a comprehensive knowledge of the mobile video production process. Specialized terminology of one area may not be familiar to people working in different businesses. Sometimes even people working in the same area speak about the same elements with different names, and this may be confusing to others working in the same project.

Nowadays it is not enough that people have specialized, for example, in technical, artistic or financial skills. People with multiple skills, who have both the creativity and technical talent, are required when working with mobile video projects. Skilful people have to speak the same language with other people in different branches, and they have to understand each other. A common tongue can be difficult to find without sharing experience and knowledge with others. Co-operation is essential in order to create mutual parlance.

The meaning of co-operation is significant because artistic, financial and technical areas meet in mobile video productions. There is knowledge about mobile video productions available, but this knowledge is divided to different branches. Film-makers and producers have the ability to design mobile videos, but they need to be informed on what kind of possibilities and restrictions mobile devices set. Engineers have, for example, the knowledge concerning what kind of file sizes suits the devices and what kind of display resolution the team has to pay attention to while creating the video. Film-makers and producers seem to lack technical information, but the reason can be obliviousness. It is difficult to ask the right questions if there is not enough knowledge about the subject. Information needs to be shared, but the problem may be getting the co-operation started.

One producer informant stated that mobile video makers have a large amount of information to be shared with mobile phone manufacturers. One way of sharing knowledge could be a workshop where film-makers, producers and mobile phone manufacturers could share ideas and discuss what kind of possibilities productions of today have. Nowadays, networking and relationships are emphasized and mutual meetings, which are organized even a couple times a year, could open new possibilities that would be beneficial for both sides.

According to an informant, there are many phone models available in markets with features that do not have even usage yet. The informant thinks that ideas could be shared in order to find the purpose of use for those features. Mobile videos could also be designed and created by research and development done together by the production company and mobile phone manufacturer. It would be rational to develop the content and technology at the same time. Mobile phone manufacturer could invite film-makers and producers to participate in a 'Call for Ideas' conference. Both parties could share their point of view of common interest, there could be a workshop, and the co-operation related to research and development issues could be developed.

Workshops should be concentrated on the relevant issues concerning mobile video production. The main issue could be seeking a mutual understanding among people working in different branches. Workshops could provide the possibility to create a model of mobile video production, and even a production guide in co-operation with producers and mobile phone manufacturer. Technology and content could also be developed simultaneously and this would be the best way of sharing ideas and experience among people working in different areas.

4.2.3 Feedback

In addition, an essential thing to co-operation is feedback. Workshopping would also be a good way for producers to get feedback from their mobile videos from the mobile phone manufacturers. All film-makers and producers are not encouraged enough for the creation of mobile videos. They need consolable feedback from mobile phone

manufacturers and, of course, mostly from the audience. Some of the producers I interviewed have not got any feedback from manufacturers. The feedback comes mainly from the audience. Given feedback has been encouraging, but feedback from mobile phone manufacturers would also be appreciated. An informant conjectured that there has not been much feedback either from mobile phone manufacturers or audience, because there are no proper distribution channels for mobile videos available.

Mobile video producers and film-makers need encouragement by feedback especially in today's situation, where there are many issues to be solved. Producers and manufacturers could discuss how to make mobile videos a profitable business and what kind of possibilities there are to apply for financing. There are also other challenges, such as how can correct distribution channels be found in the limitless and unbound mobile world.

4.3 Mobile video's and its production's future

The interviewed producers and film-makers were asked what they see as the situation of the mobile video in five years. Respondents were unanimous in that technology has to be developed further in order for the production of mobile content to be reasonable. If technology does not give more extensive opportunities for content creation, there cannot be a wide choice of mobile services and mobile videos available.

Both the development of technology and mobile content could be faster, more economical and more rational, if the research and development work of both areas would be done in the same project at the same time. A common project would strengthen the knowledge on mobile video production, and it could open up new possibilities of arranging distribution channels for content and achieving new customers.

Informants were optimistic in that the situation of mobile videos is going to improve in the next five years. According to this study, it can be forecast that the mobile video branch could be developed so that it could be profitable to produce mobile videos. An

informant stated that film-makers will find a new way to produce and show short films in the form of mobile videos. The informant continues that mobile videos can also be made by mobile phone users, who can send and receive videos to each other. However, technology has to be developed further in order to reach a state, where mobile videos could be common. For example, data transfer rates and compression technologies have to be improved.

If the model of mobile video production could be created, it is more comfortable for film-makers to start searching for the possibilities that mobile videos could offer. However, one informant stated that it must be considered carefully if it even makes sense to create videos for mobile purposes. According to the informant, there has to be tenacious arguments why someone should produce content for mobile phones if there is a possibility to produce content, for example, for TV or theater distribution.

5. CONCLUSIONS

Because the mobile video branch is still not quite well known, the interview result did not give much new information. The results of the interview mostly support the information that has been previously introduced by other researchers. Both theoretical and empirical researches agree with the challenges that the mobile video currently face. However, an unexpected result was that there is more need for interaction between producers and mobile phone manufacturers than for technical guidelines.

The production of mobile videos has several challenges that have to be solved between producers, film-makers, mobile phone manufacturers and operators. All parties have specific information about mobile videos that should be shared to others. There is no sense in working alone and developing own projects – networking and co-operation should be created in order to develop mobile video projects along with the technology. In addition, it has to be remembered that technology has to be developed on content's term, not vice versa.

The necessity for mobile videos has to be discovered in order to get profitability and visibility for mobile videos. Profitability and visibility are necessary so that there would be professional film-makers and producers, who are interested in mobile video making, and the audience would find mobile videos as an every-day commodity. Applying for financing would be more comfortable, if mobile videos should have demand.

Mobile phone manufacturers have to concentrate on the usability of mobile video viewing. Getting started cannot be too complex, and the consumer should be able to get the required operator settings into the phone easily. Moreover, the actual viewing of the mobile video should be comfortable and reliable. Film-makers and producers should, for their part, create mobile videos that are specially produced for a small display, and attention has to be paid to the customers' needs.

The key to a successful mobile video production is in the co-operation between the producers, film-makers and mobile phone manufacturers. Information and experience has to be shared among the people working in different areas. It would be rational to do

the research and development work together so that content and technology could be in harmony with each others.

Here are the expectations and proposals gathered from the analysis of the interview for mobile phone manufacturers:

GUIDELINE

First of all, there should be a standard for mobile videos. Without a standard there cannot be valid technical specifications for mobile video production – at least for every mobile phone manufacturer's phone models. Without a standard guideline, there is going to be plenty of technical problems in mobile videos, such as the compressed mobile video not having high quality in all phone models.

The basic model of mobile video-making should be created in co-operation with producers and mobile phone manufacturers. In order to chart what kind of information the guidelines should include, both producers' and mobile phone manufacturers' experience should be shared. At the moment it seems that no-one alone has enough experience of mobile video making so that they could even propose issues to be handled in an advantageous guideline. All kind of information seems to be needed in addition to compression, file sizes and display resolutions. Producers and film-makers should be instructed in what kind of technical opportunities mobile video productions currently have, and what kind of video can be functional on the small mobile phone screen.

CO-OPERATION

People working in different branches meet in mobile video production. There can be, for example, artistic, financial and technical specialists, who use their own terminologies. It is usual that even the technical people speak from use different names to describe the same elements. Thus, it is

very challenging for people working in different areas to find a collective terminology.

Co-operation between producers, film-makers and mobile phone manufacturers is one way of finding the same terminology. There are also other benefits in co-operation in addition to finding the same terminology. Both content producers and mobile phone manufacturers can continually have the latest information from mobile video making and technical development via co-operation and information sharing. Currently there is some information available, but is becomes obsolete very fast. Technology is developed expeditiously, and all information should be regularly updated, and also continuously delivered to those who need it.

Co-operation could be a reasonable way to create the model of mobile video productions. The mobile video production guidelines could also be created in co-operation with producers, film-makers and mobile phone manufacturers.

FEEDBACK

Producers and film-makers need encouraging feedback from both the consumers and mobile phone manufacturers. This is because mobile videos are not currently profitable and there is not much experience of making them. Mobile phone manufacturers should explain how mobile videos should be done technically, and producers could examine in co-operation with manufacturers what kind of distribution opportunities and channels there are available.

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Producer 1	male	15.12.2004
Producer 2	female	22.12.2004
Producer 3	female	22.12.2004
Producer 4	male	30.12.2004
Project Designer	male	01.12.2004

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APPENDIX

Original interview questions in Finnish

I TAUSTATIEDOT

1. Yrityksesi nimi ja toimenkuvasi? Kuinka kauan olet toiminut alalla?
2. Monessako mobiilielokuvatuotannossa olet ollut mukana?
3. Miltä osin tuotannoissa onnistuttiin ja missä epäonnistuttiin?
4. Mihin mobiileihin päätelaitteisiin suunnittelitte elokuvat?
5. Mille kohderyhmälle suuntaatte mobiilielokuvat?
6. Mistä laitteesta oletat kuluttajan katsovan mobiilielokuvianne?

II MOBIILIELOKUVA NYT JA TULEVAISUUDESSA

1. Miten määrittelisit lyhyesti termin "mobiilielokuva"?
2. Millaisille mobiilielokuville uskot olevan tarvetta/kysyntää?
3. Millainen on hyvä mobiilielokuva?
4. Mikä on mielestäsi mobiilielokuvan tilanne viiden vuoden kuluttua?

III TUOTANTOVAIHE

1. Missä mobiilielokuvan tuotantovaiheessa ilmenee ongelmia perinteisestä lyhytelokuvatuotannosta eroten ja millaisia ongelmat ovat?
2. Kuka hoitaa mobiilielokuvan pakkaamisen ja aiheuttaako pakkaaminen ongelmia?
3. Onko ohjaajalla ja leikkaajalla tarpeeksi tietämystä mobiilielokuvan pakkaamisesta?
4. Mitä ohjelmia ja codeceja käytätte elokuvan pakkaamisessa?
5. Oletko saanut tarpeeksi tietoa, mitä teknisiä rajoituksia mobiilipäätelaite asettaa mobiilielokuvatuotannolle?
6. Mihin kaipaisitte ohjeistusta matkapuhelinvalmistajalta?
7. Testaatteko valmiita mobiilielokuvia mobiilissa päätelaitteessa? Jos testaatte, niin käytättekö useita eri valmistajien puhelimia?

8. Minkälaista palautetta saatte valmiista tuotannosta laitevalmistajilta ja kuluttajilta?

Interview questions in English

<u>I BACKGROUND INFORMATION</u>

1. The name of your company and your job description? How long have you been operating in the branch?
2. In how many mobile movie productions have you participated?
3. Which parts of productions have succeeded, and were there any failures?
4. For what kind of terminal equipment were the movies designed?
5. What is the target group of your mobile videos?
6. What kind of devices do you expect that the consumers are using for watching your movies?

<u>II MOBILE MOVIE'S CURRENT AND FUTURE SITUATION</u>

1. How would you define the term "mobile movie"?
2. What kind of mobile movies do you believe have demand?
3. What are the characteristics of a successful mobile movie?
4. How do you see the situation of the mobile movie in five years?

<u>III PRODUCTION PHASE</u>

1. In which part of the mobile movie production process do problems appear, and how do they differ from traditional short film production? What kinds of problems are there?
2. Who arranges the compression of movies, and does it cause problems?
3. Do the director and editor have enough knowledge about the compression of the mobile movie?
4. What programs and codecs are used in your productions?
5. Have you acquired enough information concerning the technical restrictions that mobile terminals set for mobile movie production?
6. Where do you require guidelines from manufacturers?
7. Do you test your movies in terminal equipment? If you do, then do you use models from different manufacturers?

8. What kind of feedback do you receive from manufacturers and consumers?