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Abstract

After years of stagnation in the Internet following the burst of the New Economy, a new phenomenon ignites the fantasies of the Internet community. Web 2.0 seems to redefine the economical foundations of the Internet economy. Services such as MySpace, YouTube and Second Life have demonstrated the power of the alleged new online community services. User-generated content and social networks are the artefacts of the new movement. The mobile service industry has picked up the trend, and developed cutting-edge mobile services based on user-generated content. In the paper the emerging mobile extensions of existing online Web 2.0 applications and pure mobile Web 2.0 services are analysed and compared and the potentials for a profitable positioning of mobile operators in the value chain are extracted.

Keywords: Web 2.0, Mobile Services, Business Models, Telecommunication industry

1 Introduction and Motivation

The development of new wireless communication technologies will bring fundamental change to the telecommunication industry (Siau and Shen 2003). Moreover, there is a common consensus amongst researchers that mobile data and multimedia services are the key to the success of 3G and 4G communication technologies (Sigurdson and Ericsson 2003; Forge 2004; Picard 2005; Gressgard and Stensaker 2006). Since the broad introduction of 3G networks, mobile operators are striving to extend their business with new mobile data services (Amberg, Hirschmeier et al. 2004). Wohltorf (2004) states "*that new sources of revenue must be identified and exploited, which are highly relevant to the end-user and utilize the improved technology*". However, the solution to refinance the investments in 3G and 4G networks has not been found as yet. In contrast, at the same time in the closely related Internet domain, new successful services based on user generated content are emerging known under the term Web 2.0.

Examples of successful Web 2.0 platforms are YouTube, MySpace, or Sevenload. They show that there are certain advantages of user-generated content (see also

Hoegg (2006)): The **simple value chain is** one particular advantage of some Web 2.0 applications. Business models based on user-generated content are in the simplest version based on two players, the platforms provider and the users. The user generated content is furthermore **relevant** to the target group, since the content provider belongs to the very same target group. Finally, the **costs** for offering the content are comparably low. Since, the user provides the content for free without any restrictions; the community provider has neither acquiring costs nor related costs for content protection.

After the impressive quick uptake of Web 2.0 applications the question has been raised, how the mobile telecommunication industry can benefit from this development (Morath et al. 2006): Will the mobile industry be only a bitpipe provider for mobile extensions of Web 2.0 sites or are there options for a leading role in the value chain? The mobile telecommunication industry has recently showed the interest in investing in this area by announcing co-operations with Web 2.0 players (Cingular with YouTube, and Vodafone announced a co-operation with Bertelsmann to launch Bloomstreet). This strategic move can be interpreted as a turning point for the "closed garden" strategy of mobile network operators, which focuses on the distribution of commercial content.

Despite of the increasing interest of the mobile network operators (MNO) in mobile Web 2.0 applications, there is little knowledge available about the main characteristics of emerging mobile Web 2.0 application. This paper provides a contribution in this field by focusing on the following research questions:

- What are the main characteristics of both business models and applications of emerging Mobile Web 2.0 services?
- In which form can user-generated content be successful in the mobile environment?
- How can MNOs position themselves in the market of Mobile Web 2.0 services?

The contribution of the paper is based on a market overview and explorative and descriptive case studies of emerging mobile user generated video applications and business models. Firstly, a selection of online Web 2.0 applications is observed in terms of their mobile strategy, to develop an understanding of the current mobile enhancements of existing Web 2.0 platforms[1]. Then in the second step, four cases are identified and analysed that represent pure Mobile Web 2.0 application.

The content of the paper is structured as follows: In section two the main terms are defined and the research approach is described. Section 3 comprises an analysis of mobile extensions of existing online Web 2.0 sites. In section 4 an in-depth case study of a stand-alone mobile user generated content application is presented and several case studies are analysed. Section 5 contains a cross-analysis and summary of the results. Section 6 concludes the paper with a summary and outlook.

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[1] The list of Web 2.0 services is in appendix B.

2 Research Approach

In this section first the most important terms are defined in order to clearly delimit the research object. Then the specific research approach is described.

2.1 Basic Definitions

The main terms that need to be defined in order to delimit the research object are: mobile services, Web 2.0 and Mobile Web 2.0 services.

Mobile services: There are an unlimited number of Mobile Services (Varshney and Vetter 2001). Consequently, there are different perceptions and definitions about Mobile Services (Jorstad, Dustdar et al. 2005). Haaker et al. (2006) described Mobile Services in a broad sense as "*innovative services that combine technologies and concepts from the domains of telecommunication, information technology and consumer electronics*". However, Mobile Services in the context of this paper are referred to as data services in wireless networks. Based on the type of data involved, pure data services and multimedia services can be distinguished. Mobile multimedia services comprise of videos or pictures, and will be in the focus of this paper.

Web 2.0: Web 2.0 is a term that is still polarizing in research and practice and currently there is no widely accepted scientific definition of Web 2.0. One of the first and extensively cited definitions is the one proposed by Tim O'Reilly. Tim O'Reilly, who has popularized Web 2.0, explained the term in the year 2005 as follows: "*Web 2.0 is the network as platform, spanning all collected devices; Web 2.0 applications are those that make the most of the intrinsic advantages of that platform: delivering software as a continually-updated service that gets better the more people use it, consuming and remixing data from multiple-sources, including individual users, while providing their own data and services in a form that allows remixing by others, creating network effects through an architecture of participation, and going beyond the page metaphor of Web 1.0 to deliver rich user experiences.*" (O'Reilly 2005). O'Reilly's definition describes Web 2.0 from the platform perspective. Another approach to define Web 2.0 would be based on the main features describing the phenomenon from user and business perspectives. Starting from O'Reilly's definition and based on the analysis of the features of several Web 2.0 platforms, Hoegg et al (2006) concluded that common features of Web 2.0 services are:

- The main focus lies on user-generated content and respective services for collaborative creating, management, updating and sharing of content by users.
- Another component of Web 2.0 platforms are automatic update procedures that evaluate each user's input and create always a new common state of knowledge and content, or as some authors explain it, mechanisms for creating after each input the newest stage of collective knowledge.
- Trust building services as ratings, voting and similar, which are also the foundation for the collective intelligence services.

Based on the findings, Hoegg et al. (2006) defined Web 2.0 as "*the philosophy of mutually maximizing collective knowledge and added value for each participant*

by formalized and dynamic sharing and creation of user generated content". In accordance with this definition mobile Web 2.0 services are defined below.

Mobile Web 2.0 services: Mobile Web 2.0 services are in general mobile services based on user generated content of different kind. These services can be created in two ways:
- By mobile extension of existing online Web 2.0 application, which will be called **Mobile enabled Web 2.0 application,** and
- By creating pure mobile Web 2.0 services that are specifically dedicated to mobile networks and are based on user generated content. They will be called **Stand-alone Mobile Web 2.0** services in the paper.

In this paper both types of mobile services will be analysed and compared.

2.2 Research Approach

The research was carried out in three steps:

- **Step 1 - Analysis of Mobile enabled Web 2.0 applications:** In the first step the analysis focused on mobile enabled existing Web 2.0 applications.

- **Step 2: Analysis of Stand-alone Mobile Web 2.0 Services:** In the second step several descriptive case studies of pure Mobile Web 2.0 Services were conducted.

- **Step 3: Comparison and analysis of results:** In the last step the different approaches were compared and their potential for positioning of mobile operators was assessed.

The analysis of the existing mobile Web 2.0 application was in both cases based on short descriptive case studies (Yin 1994). The analysis in all case studies was structured based on the MCM-Business model research framework. The MCM-Business Model Framework is described in more detail in the next section below.

2.3 The MCM-Business Model Framework

The MCM-Business Model Framework was developed at the Institute for Media and Communications (MCM) of the University of St. Gallen and provides a generic overview of components of business models. It has been used successfully for structuring the analysis of business models of mobile services (Hoegg and Stanoevska-Slabeva 2005).

The starting point for the development of the framework was the widely cited definition proposed by (Timmers 1998). According to Timmers, a business model is "… *an architecture for the products, services and information flows, including a description of various business actors and their roles, a description of the potential benefits for the various business actors, and a description of the sources of revenues."* (Timmers 1998). The components denoted by Timmer's definition were extracted and enhanced with further aspects affecting business models (for example "Social Environment"). Further components of business models have been synthesized based on an in-depth analysis of the body of literature about

business models (Rappa 2005), (Afuha & Tucci 2001), (Osterwalder 2004), (Staehli 2002), (Faber et al. 2003). The resulting MCM-Business model framework is presented in figure 1:
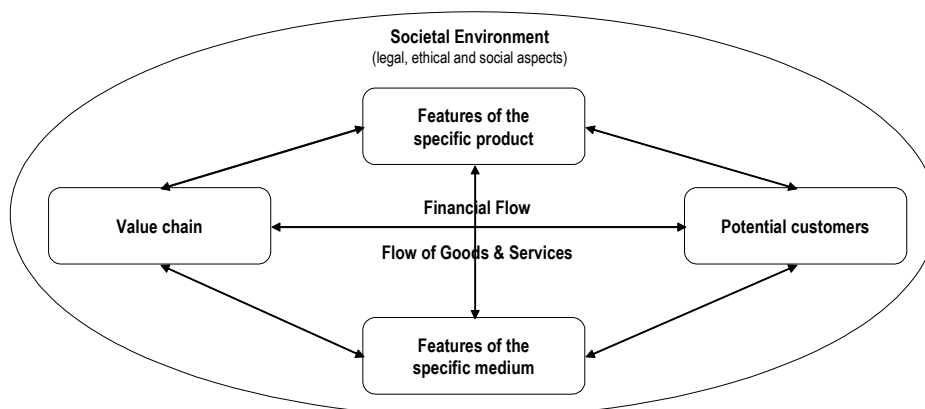

Figure 1: MCM-Business model Framework

The elements of the framework are explained in more detail below:

- The **social environment** component of a business model reflects all outside influences on the business models, such as the legal and ethical aspects as well as the competitive situation in the market. It refers to the social and regulatory context in which a business model is developed and implemented.
- The component **features of the medium** expresses the possibilities for transaction and interaction over a specific medium. For example different applications are possible online and on the mobile medium.
- The component of **potential customer** covers all aspects of target group and customers as well as the expected added value. The different business models certainly address different target groups, and do address different needs of the customer.
- The component **value chain** reflects the directly involved players necessary for the production and delivery of the offered product or service and their interrelationships. A typical portal value chain consists for example of a content owner, content aggregator, content provider, portal owner and of course the user.
- The component specific **features of the product** express the exact design and the way the service is experienced by its customers. It also explains what the specific benefits are, and how the customer might be contributing.
- The component **financial flow** explains the earning logic of the business model and makes it clear which elements of the value chain contribute from a financial perspective.
- The component **flow of good and services** identifies all the processes within the company and the value chain necessary for the creation of the product or service.

Based on the identified generic components of business models, the Mobile Web 2.0 services have been analyzed using the same structure. The focus of the analysis will be on the following components of the MCM-framework: features of the medium, potential customers, value chain, and specific features of the product as well as the financial and service flow. This approach enabled high compatibility of the achieved results.

3 Analysis of Mobile Enabled Web 2.0 Application

The analysis of mobile enabled Web 2.0 services draw from results of previous research. Hoegg et al (2006) selected and analysed 41 Web 2.0 platforms and analysed their business models. The list of considered platforms is given in annex 1. The same 41 Web 2.0 platforms where now analysed from a different perspective: First, for each site it was evaluated, if it has a mobile extension. The identification of the mobile extension was bases on the following approaches:

1. Accessing the standard web site with a mobile phone user agent (Nokia 6210, Sony-Ericsson K600i)
2. Accessing the pages with a mobile phone
3. Using Google Mobile to find the pages
4. Testing related URLs (mobile.*, m.*, wap.*, and */mobile)
5. Using search engines (Google, Live search) to find relevant information.

Out of the 41 observed sites, eight sites offer a mobile extension to their offering. Service providers that have only announced the launch of mobile services at the time of the investigation have not been considered. For each of the seven sites further detailed analysis was performed. Thereby data has been collected from various sources:

- Official press releases of the launching company,
- Analysis of the data available online,
- Observation of the application through a mobile emulator.

In the next sub-section, the service "Handy Clipfish" is comprehensively described based on the previously introduced components. Then the other identified mobile services are investigated.

3.1 The Case of "Handy Clipfish"

"Handy Clipfish is a mobile extension in form of a stand-alone mobile portal of the German video-sharing platform Clipfish (www.clipfish.com). Clipfish has been launched by the German broadcaster RTL in August 2006. Since the end of 2006 Clipfish offers also a mobile extension (c.f. 2)
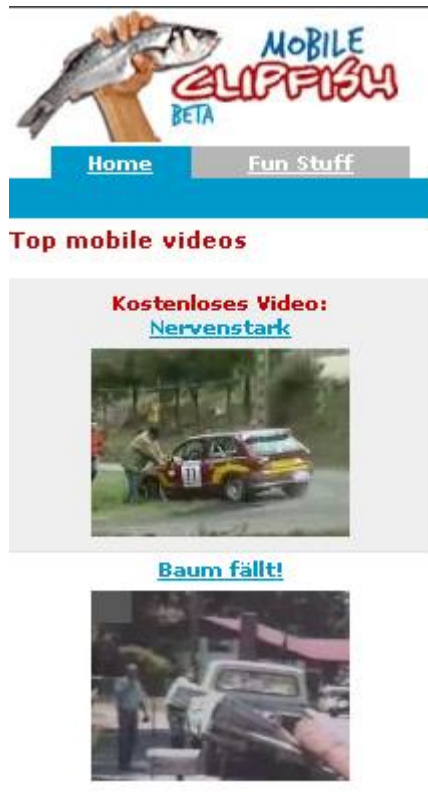
Figure 2: Handy Clipfish screenshot

The main features of the Handy Clipfish business model can be summarized as follows:

Features of the product: Handy Clipfish is a mobile extension of the online video sharing platforms. Currently only a selection of 20 videos is offered for the mobile phone. The videos are converted to the 3GP format by the company Dynetics. The online videos are furthermore listed on a new mobile portal, which has a new separate URL (www.handyclipfish.com). The interested user can consume the video by downloading the 3GP files. Each video available for the mobile phone costs 0.99 Euro.

Features of the medium: The videos are offered through a mobile portal (see figure 2) that has the typical look and feel for mobile portals and is less user-friendly when visited through an online browser.

Customers: The mobile service is open to any interested German speaking customer.

Financial flow: "Handy Clipfish" charges 0.99 Euro for the mobile download of a video. The payments are processed with the Ericsson IPX Payment solution, which is suitable for micro payments. The revenue is distributed among Clipfish and the remaining partners of the value chain contributing to the solution (Dynetics and Ericsson). The author of the content is not involved in the financial flow.

Value chain: The content for the mobile portal is taken from the online platform. Given this the main partners in the value chain are the platform owner and the

users providing content. While the upload of videos is still possible only online, the download of videos is possible over the mobile as well. A new intermediary in the value chain is the company Dynetics, providing specific services necessary to convert the online content to suitable mobile formats. In summary Clipfish offers a mobile extension only for the download of videos.

"Handy Clipfish" is only one example of a mobile enabled Web 2.0 site, which tries to create a new revenue stream through the mobile extension. The results of the analysis of the remaining seven sites offering mobile extensions is summarised in the next chapter.

3.2   Summary of Features of Mobile Enabled Web 2.0 Sites

The findings of the analysis can be summarized as follows (see also table 1):

Service	Mobile Access	Description
Bloglines	User Agent	User-Agent based redirection of a mobile version of the web site
Bubbleshare	MMS	Mobile upload of picture using the mobile phone camera and the built-in mobile email function. Creation of a special mobile album.
Google Maps	User Agent	Mobile Applications - Yellow Pages with maps and routing functions
MusicStrands	User Agent	Mobile Application for Windows Mobile and Symbian 60 and a mobile Site
MySpace	Specific	Special co-operation with Helio (handset vendor) and Cingular (MNO)
Technorati	URL	Special web site adapted to mobile devices, m.technorati.com
YouTube	MMS	Mobile Uploading of content based on the MMS technology after creating a mobile profile on the Internet site. In addition, YouTube offers a mobile web page, which was empty.

Table 1: Overview of Web 2.0 offerings with mobile extension

Features of the product: The mobile extension was in most of the cases a translation of the Internet appearance to the mobile environment. Accessing the mobile site from a mobile hand-set was in most cases based on the main URL and the interpretation of the user agent (UA). Based on the UA, the server hosting the application identifies the Internet browser and certain system details. If the visiting UA is identified to be associated to a mobile device (such as mobile phone or PDA), advanced services offer automatic redirections to the mobile version of the platform. Technorati, similar to Handy Clipfish, was the only service with a specific mobile URL.

Some sites provide a mobile extension for only part of the value chain. For example YouTube and Bubbleshare used the mobile channel only for uploading content. Based on the MMS technology users are able to upload pictures or videos to the site. On the contrary, Clipfish offers a mobile extension only for the

download of specially adopted videos to the mobile device. Based on co operations with handset vendors, MySpace integrated the service functionalities directly into the mobile device in order to provide an optimal consumer experience.

Features of the medium: Even though the mobile extensions basically copy the functionality of the online version a conversion to the mobile video formats is required. For example online the prevailing format is Flash, while in the mobile area 3GP. In addition not all videos available online are suitable for a mobile device. For example long videos might be considered not interesting and too costly.

Customers: The mobile extensions are basically open for any interested user. However, some platforms have announced cooperation with mobile network providers. In case of cooperation with a mobile operator, the application is provided in a special way for the customers of the operators and is already pre-configured on the handsets of the customers.

Financial flow: At present most of the mobile extensions of the existing Web 2.0 platforms do not provide additional financial income for the platform owners. From a commercial point of view, none of the mobile versions of the Web 2.0 communities are integrated into the earning logic of the online business model. The observed online Web 2.0 services are mainly based on advertisements revenues. These advertisements are not shown in the mobile versions, due to the limited capabilities (especially screen-size) of the mobile hand-sets. In fact, the mobile extensions are cost and profit neutral. However, first examples (i.e. Clipfish) show that the mobile extension can be a paid distribution channel. One example represents Handy Clipfish. Other possibilities in the future are revenue sharing models with mobile operators or by offering the mobile extension as a premium service. Bubbleshare, for instance uses the mobile environment for generating additional revenues and profits. The site supports the upload of pictures using MMS. Since the MMS offers integrated premium charge functionality, it would be possible that Bubbleshare receives from the MNO a share of the users' charge.

4   Analysis of Stand-Alone Mobile Web 2.0 Services

In the second phase of the research emerging stand-alone Mobile Web 2.0 Services were analyzed. The focus was on video-sharing platforms. An Internet research was conducted to identify Mobile Web 2.0 service in the area of Mobile Videos. The result of this research was the following list of services:

- SeeMeTV, a commercial offering by Hutchison 3G UK Ltd, which was analyzed in more detail
- TinyTube, a mobile portal offering free access to videos of different Internet video-sharing platforms as YouTube, MySpace and similar. The mobile portal is built as a mashup, and draws user generated content from existing Web 2.0 sites, converts the content into formats suitable for mobile devices and offers it through the mobile portal. Mashups are well known from the Internet space (O'Brien and Fitzgerald 2006; Wilde 2006).

> Mashups are the term to describe services, which combine information from different sources to a new service (Goodman and Moed 2006).

- 3GPforfree, a stand-alone mobile portal offering a collection of videos for the mobile phone.

In the next chapter, first the stand-alone application SeeMeTV will be described in more detail and then the characteristics of all observed stand-alone mobile application will be summarized.

4.1 Case study "See Me TV"

SeeMeTV was launched by the mobile network operator Hutchison 3G UK Ltd (3UK) October, 18th 2005. SeeMeTV is a platform for sharing video clips. The users can upload their video clips by MMS (Multimedia Messaging System). Other user can then download the video by browsing through a WAP portal. For each download of the video the contributor of a video receives a 10 % share of the selling price. The credits are received by PayPal, if they reach a threshold of 10 GBP. If this limit is not reached the user does not receive any money. Uploading is very simple, since the user only needs to send a MMS to a certain short-code.

In March 2006, 3UK claimed that they had received more than 30.000 uploads. In September 2006, one year after the launch, 3UK stated to have reached 12 million downloads and 100.000 uploads. It generated more than 250.000 GBP for the contributors of the service.
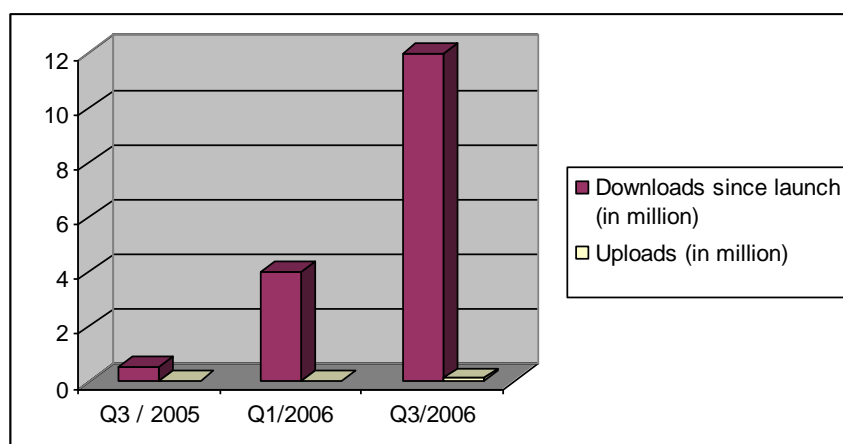

Figure 3 Development of See Me TV[2]

In terms of the components of the MCM-Business model framework the service can be described as follows:

Features of the product - The service is based on the idea of sharing content with other users. The user can upload a video clip (limited to 30 seconds) recorded by the built-in camera. Other sources are explicitly excluded. After uploading the clip, the video clip is reviewed by moderators and then included in the "SeeMeTV"-Gallery. Other users can download the clip, and send their

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[2] The figure is based on 3's press releases from October, 18th, 2005 ("3 launches See Me TV - the ultimate reality mobile TV channel"), March, 8th, 2006 ("People's channel 'SeeMeTV' tops 4 million downloads"), September, 28th, 2006 ("3 customers driving boom in mobile user-generated content")

comments. Since the provider of the clips receives a monetary reward for each download the provider of the clip is certainly interested to promote the service, and specifically the own clip.

The **Features of the Medium** is determined by standard technologies - MMS and WAP. The MMS technology is used to upload the content to the platform of 3UK. WAP is used to allow the user browsing the content. The user is identified by the MSISDN and a user-specific account is created.

The number of **Potential Customers** of the service is congruent to the customer base of 3UK. All handsets offered by 3UK support the required technologies, and therefore there is no limitation for any customer of 3UK to use the service. In addition, the service is pre-configured correctly upon the delivery of the handset to customers of 3UK.

The **value chain** is completely controlled by 3UK 3. There are no other players except the participating users involved. The role of the content provider is shifted to the user, what also eliminates copyright issues, digital rights management, revenue sharing, and co-determination of the service.

The **financial flows** are taking place between the user and 3. The user needs to pay for each upload of a video clip (50 p). For each download the provider of the video receives 1 % of the sales price. If the account of the user has reached 10 GBP, the money is transferred using a PayPal transfer. Thus, PayPal becomes a new additional player in the value chain.

Flow of goods and services: 3UK offers a platform for users. Contributors are sending the video clips by MMS to a short-code. The video clips are checked by moderators, and then included in the SeeMeTV gallery. There are different categories offered, to enhance the browsing experience of the user.

The service provider respects the claims of the **social environment** to offer an acceptable service. The term and conditions of SeeMeTV clearly regulate the content of the video clip.

The main differences of SeeMeTV to other mobile services are:

(1) **Complete coverage of the user base** of 3UK. The service can be used by all 3UK customers without subscription. In addition, there are no special technical requirements as the service is preconfigured on end devices of the 3UK customers.

(2) A **direct monetary reward** for participating.

(3) **Modification of the roles** along the value chain. The consumer becomes a producer of content. This has several advantages. Firstly, the complexity of the value chain and the strategic motivations are reduced. Secondly, the implementation of such a service is less complex, since certain issues do not need to be considered (licences management). And thirdly, the power and influence of the contributors compared to traditional content providers is negligible. Thus, the

stand-alone mobile Web 2.0 application is based on a simplified value chain, compared to the usually complex mobile value chains (Barnes 2002).

(4)The **costs** for acquiring content are significantly lower, compared to costs for acquiring content from commercial content providers.

4.2 Summary of Features of Stand-alone Mobile Web 2.0 Application

The remaining cases of stand-alone mobile Web 2.0 application have been also analyzed according to the MCM-Business model framework. The results can be found in the following table.

	SeeMeTV	TinyTube	3gpforfree
Features of the medium	Upload per MMS, Download and Streaming	3GP download and streaming in different quality levels	Combination of fixed and mobile internet
Features of the product	Video clip platform with additional commercial content	Mobile Extension to different video platforms, such as YouTube, Google Video, etc.	Internet Portal for 3GP Video clips
Value chain	Platform operated by 3UK	TinyTube is only the mobile extension to existing service.	User generated content
Financial Flows	User is paying for uploading (99p) and downloading, revenue share	Advertisements	None
Flow of good and services	MMS Upload from the user, monitoring by platform operators, download by user	Only downloading and streaming of video clips	Downloading video clips with the computer and transfer to mobile device

Table 2 Comparison of selected Web 2.0 services

Based on the above observations the **features of the medium** can be summarized as mainly consisting of services for the transport of video files over different bearer technologies, such as MMS and UMTS. A future development will be the broadcast of the video. In addition, supporting function such as evaluation and recommendation are implemented using WAP and SMS technologies.

The **features of the product** are centred on providing video clips. To the plain video services additional features are added, such as evaluation of videos, annotations to videos, etc. The services basically differ in the presentation of the videos, the data base and the pricing.

The positioning of the service provider along the **value chain** varies. SeeMeTV is an example of a MNO centric approach, while the other services are just utilizing

the MNO infrastructure (transport and billing) without having a formal agreement with the MNO.

The **financial flow** covers several aspects. There are the revenues on the network layer for data traffic, and on top on the application service, for using premium services. On the application layer, the upload and/or the download of content can be charged. Even gratification of uploads dependent on the number of respective downloads can be paid out.

Finally, the **flow of good and services** is determined by the wireless communication technology standards. For uploading content the observed services utilized the MMS. The access of the contents is realized by TCP/IP and XHTML respectively WAP.

The commercial relevance of these offerings can be evaluated based on the number of downloads, uploads, and the size of the offering (see table 3):

	Size of the offering	Downloads	Earning logic	Date
SeeMeTV	120.000	12.000.000	yes	09/06
TinyTube	n.a.	n.a.	yes	21/02/07
3GPforfree	165	87.056	no	21/02/07

Table 3 Commercial comparison of the selected services

5 Analysis of the Results - Potential of Mobile Web 2.0 for Mobile Operators

The above case studies confirmed that there are two main approaches for creating mobile Web 2.0 sites: Either by enabling a mobile extension of the whole flow of the service or part of it for existing online Web 2.0 sites, or by creating stand-alone mobile web 2.0 applications.

Depending on which approach is taken, there are different opportunities for the mobile network operator to generate additional revenues, depending on the level of his involvement. Three roles of the mobile network operator can be identified:

- The mobile network operator (MNO) as bitpipe provider
- The MNO as equal partner co-designing the solution
- The MNO as main initiator and designer of the solution and leader of the value chain.

The MNO as bit pipe provider
The weakest role of the mobile operator is given in case of a mobile extension of existing Web 2.0 sites or in case of stand-alone mobile portals that do not explicitly involve the mobile operator. These types of solutions are open globally for any interested customer having a suitable handset independent of the mobile operator he is subscribed to. Most of the offerings are free or employ a payment

solution independent of the billing facilities of the mobile operator. In such solutions, the mobile operator has no influence on the design of the service and his role is the role of a bit pipe provider. The MNO profits from the increased mobile traffic due to upload and download of videos, but has no opportunities to add value to the solution and for further revenue creation.

The MNO as equal partner co-designing the solution
The MNO is in a better position, when he is directly involved in the solution as a partner to the content creating Web 2.0 site. This is the case when there is an agreement among the content creating Web 2.0 site and the MNO, and the mobile Web 2.0 solution is offered through the MNO to his customers. The added value that the MNO can offer is a pre-configured service on the handset of his customers and exclusive access of the content creating site to the customer base of the MNO. In addition, the MNO might provide support for the conversion of online content into formats suitable for the mobile device and assure a good quality of the service for his customers. The MNO furthermore provides a transport and billing channel. Leveraging the Multimedia Messaging Service (MMS), the Web 2.0 service provider can directly charge for the uploading of contents, whilst the process of uploading content from a user perspective is eased. Co-operating with a successful Web 2.0 service provider, can be the source of significant revenues for a mobile network operator. The direct involvement of the MNO offers him the potential for revenue-sharing not only for communication of the content, but also for the application itself. In addition, he might profit from higher customer satisfaction and a lock-in effect for his customers.

As can be seen from the example of MySpace, potential competitors for this role of the MNO in the value chain are handset providers. Instead of ensuring quality for the customer through the mobile operator, this can also be achieved through cooperation with handset providers. Handset providers as for example Nokia have a broad, global customer base and a pre-configuration of the service on their handsets assures access to a broad customer base. Many handset providers have announced specific solution for access to Web 2.0 application and co-operations with Web 2.0 sites.

The MNO is main initiator of the value chain
The best position for the MNO is, when the MNO initiates a stand-alone Web 2.0 application and creates his own content creating community out of his customer base. A successful example of this solution is SeeMeTV of Hatchinson 3G described above. It offers a starting point for an exclusive participation in the revenue stream, providing a high quality service for the own customers, and strong lock-in effects for customers. In addition, a successful service provides a good foundation for co operations with other existing Web 2.0 sites and commercial content providers. The critical success factor here is to be able to achieve critical mass of interested customers and content out of the own customer base. Hatchinson 3G has succeeded in that, by offering revenue sharing for users generating content from the beginning.

The above analysis provides many arguments in favour of the positioning of the mobile operator as initiator of Web 2.0 solutions in a way similar to the Hatchinson 3G case. However, the window of opportunity for this option might

not be open for a long time. The more Web 2.0 sites offer independent mobile extensions or start to cooperate with other players as handset providers, the smaller the window of opportunity for the MNOs gets. Each new independent application and cooperation creates lock-in effects that will make a late start of MNOs more difficult.

6   Conclusion and Further Research

In this paper Mobile Web 2.0 services have been defined and classified. In addition based on a selection of descriptive case studies of different kind of Mobile Video Web 2.0 solutions the specific features of such solutions have been extracted and generalised. One potential limitation of the research presented in this paper, is the selection of observed Web 2.0 sites. The field of Web 2.0 is very dynamic and new solutions emerge fast and also already existing ones are diminished. A further limitation of the study was the focus on video-sharing services. Other types of social software, as for example social networks or online collaboration platforms, might enable and even require a different role of the MNO. Given this, the presented case studies provide a current snapshot and have been sufficient to provide a first illustration of current approaches to create mobile Web 2.0 application. In addition, it was possible to analyse the potential implication on and opportunities of MNOs to position themselves.

Three different roles of MNOs have been identified: the MNO as bit pipe provider, the MNO as equal partner co-designing the solution and the MNO as main initiator and leader of the value chain of stand-alone Mobile Web 2.0 application. The window of opportunity for a strong role of the MNOs in Mobile Web 2.0 application might be short and MNOs need to react fast.

To get a clearer picture of the relationships of the involved players in the value chain of Mobile Web 2.0 applications and their options for positioning in the value chain, in a next step the relationships will be modelled and simulated. In addition, further observation of the market is necessary in order to include other type of Web 2.0 application and to be able to identify potential new approaches.

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Appendix A: Examined pages

Name	URL
3gpforfree	http://3gpforfree.net
Bloglines	http://www.bloglines.com
Bubbleshare.	http://www.bubbleshare.com
Clipfish	http://www.clipfish.de
Google	http://www.google.de
Google Maps	http://maps.google.com
Google Mobile	http://mobile.google.de
Handy Clipfish	http://handy.clipfish.de
Live Search	http://search.msn.de
MusicStrands	http://www.MusicStrands.com
MySpace	http://www.MySpace.com
Technorati	http://www.Technorati.com
TinyTube	http://tinytube.net
YouTube	http://www.YouTube.com
YouTube Mobil	http://m.youtube.com
Second Life	

Appendix B: 40 selected Web 2.0 sites

	Name	*Description*	*URL*
1	*43things*	*Sharing resolutions*	*http://www.43things.com/*
2	*Bloglines*	*Blog Guide*	*http://bloglines.com/*
3	*Blogniscient*	*Blog Guide*	*http://blogniscient.com/*
4	*Blummy*	*Bookmarking Tool*	*http://blummy.com/*
5	*Brainreactions*	*Idea Generation Platform*	*http://brainreactions.net/*
6	*BubbleShare*	*Photo Stories*	*http://www.bubbleshare.com/*
7	*Clipfish*	*Video sharing*	*http:/www.clipfish.com*
8	*Consumating*	*Community*	*http://consumating.com/*
9	*Dailymotion*	*Videos*	*http://dailymotion.com/*
10	*Digg*	*News Site*	*http://digg.com/*
11	*Facebook*	*Community*	*http://facebook.com/*
12	*Frappr*	*Community Mapping*	*http://frappr.com/*
13	*Furl*	*Bookmarking*	*http://furl.net/*
14	*Gabbr*	*News Site*	*http://gabbr.com/*
15	*GiveMeaning*	*Charity Platform*	*http://givemeaning.com/*
16	*Google Maps*	*Maps*	*http://maps.google.com/*

17	*HousingMaps*	*Property Mapping*	*http://housingmaps.com/*
18	*iRows*	*Spreadsheet Application*	*http://irows.com/*
19	*Last.fm*	*Music Platform*	*http://last.fm/*
20	*Lazybase*	*Database*	*http://lazybase.com/*
21	*Loomia*	*Podcasting*	*http://loomia.com/*
22	*Metacafe*	*Videos*	*http://metacafe.com/*
23	*MusicStrands*	*Music Platform*	*http://musicstrands.com/*
24	*MySpace*	*Community*	*http://myspace.com/*
25	*Newsvine*	*News Site*	*http://newsvine.com/*
26	*Odeo*	*Podcasting*	*http://odeo.com/*
27	*Pageflakes*	*Personal startpage*	*http://www.pageflakes.com/*
28	*Podomatic*	*Podcasting*	*http://podomatic.com/*
29	*Riya*	*Face Recognition*	*http://www.riya.com/*
30	*Rollyo*	*Individual Search*	*http://rollyo.com/*
31	*Seconds11*	*Podcast-Teasers*	*http://www.seconds11.com/*
32	*Skobee*	*Calendar*	*http://skobee.com/*
33	*Spurl*	*Bookmarking*	*http://spurl.net/*
34	*Swicki*	*Search Results Wiki*	*http://swicki.com/*
35	*Technorati*	*Blog Guide*	*http://technorati.com/*
36	*Truveo*	*Video Search Engine*	*http://truveo.com/*
37	*UpTo11*	*Music Platform*	*http://upto11.net/*
38	*Voo2do*	*Todo-List*	*http://voo2do.com/*
39	*Wayfaring*	*Community Mapping*	*http://wayfaring.com/*
40	*Wetpaint*	*Wiki Platform*	*http://wetpaint.com/*
41	*YouTube*	*Videos*	*http://youtube.com/*