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Mobile Web 2.0. The new mobile communication industry

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Abstract
The convergence of technical and consumption aspects today allows hybridisation between mobile devices and the Web 2.0, leading to a new symbolic space called Mobile Web 2.0*. This research outlines an original theoretical and technical panorama that offers the reader an introduction to the* Mobile Web 2.0 *phenomenon. To do so, emphasis is placed on the central aspects of the evolution of mobile telephones towards collaborative internet-based applications. It also analyses the difficulties and limitations of the industry, the seven principles of the Web 2.0 adapted to mobile devices and the product and content aspects of an incipient yet fully-evolving market.*

Key words
Web 2.0, mobile Web 2.0, mobile devices, third generation (3G), mobile communication, user-generated content, multimedia convergence, culture industry

Resum
La convergència d'aspectes tècnics i de consum permeten avui la hibridació entre mobile devices *i web 2.0, i generen un nou espai simbòlic denominat* Mobile Web 2.0*. Aquesta investigació traça un original panorama teòric i tècnic que permeti introduir al lector en el fenomen del* Mobile Web 2.0*. Per fer-ho, es posa èmfasi en els aspectes centrals de l'evolució dels telèfons mòbils cap a aplicacions col·laboratives via internet. A més, s'analitzen les dificultats i limitacions de la indústria, els set principis del Web 2.0 adaptats als* mobile devices*, i els aspectes de productes, continguts d'un mercat incipient però en franca evolució.*

Paraules clau
Web 2.0, *Mobile Web 2.0*, dispositius mòbils, tercera generació (3G), comunicació mòbil, continguts generats per l'usuari, convergència multimèdia, indústria cultural.

1. Introduction: from the mobile internet to the mobile Web 2.0

The mobile network society (Castells *et al* 2006) is in movement through wireless communication technology. The drive by terminal manufacturers and telephone operators towards third-generation mobiles (3G)[1] has created the appropriate infrastructure for promoting physical mobility plus connectivity, and with it an attractive and incipient market. The mobile internet defines the use of the internet on mobile devices.[2] Meanwhile, the convergence of technical and consumption aspects today allows hybridisation between mobile devices and Web 2.0 (O'Reilly 2005; Cobo Romaní and Pardo Kuklinski 2007), and generates a new symbolic space called mobile Web 2.0, driven by an empowered web consumer (Wilson 2006), always online, with whom manufacturers, telephone operators, start-ups and media try to connect. It is precisely the mobile Web 2.0 that is the subject of our study in this article.

Mobile devices allow content to be captured from the point of inspiration (Jaokar and Fish 2006) and Web 2.0 adds to it the principle of collective intelligence through a taxonomy created by users, which promotes a new mobile data industry.

The appearance of 3G technology gave meaning to this transformation. Whereas the first and second generation of mobiles were designed and optimised based on voice communication, the differential of the third generation is its efficient connection with TCP/IP networks – the internet communication protocol – offering complementary uses that take advantage of this technical capacity.

However, to attain market maturity and achieve the leap from traditional mobile telephony to mobile internet and then to mobile Web 2.0, those involved in the business need to modify and adapt historical strategies described later in this article. For their part users, with their consumption attitudes, will have to perceive the appeal of these devices in terms of convergence, ubiquity and productivity. With increasingly more pow-

erful equipment in terms of processing capacity and multimedia implementations, a growing bandwidth on mobile internet, greater volume of Wi-Fi networks, more flexible and efficient web browsers, hybrid uses and massive online communities, convergence appears to be simply a matter of time.

This study outlines a theoretical and technical panorama that provides the reader with an introduction to the mobile Web 2.0 phenomenon. To do so, emphasis is placed on the central aspects of the evolution of mobile telephones towards collaborative internet-based applications. It also analyses the difficulties and limitations of the industry and the product, content and graphic interface aspects of an incipient yet fully-evolving market. This work is part of the theoretical framework of more extensive research called "Campus Móvil. Mobile devices and Web 2.0 applications. Towards a prototype design with teaching innovating university purposes", the final aim of which is the design of the prototype Web 2.0 application for devices based on Spanish higher education uses.[3]

2. Limitations of the mobile telephony industry

The penetration figures of mobiles worldwide are spectacular. According to Castells (2006), in 2004 there were 1,198 million landline telephones in the world and 1,748 million mobiles, when scarcely a decade earlier landline telephones numbered 643 million compared with just 56 million mobiles. The figures rise year on year. The ITU (2007) states that there are 2,600 million mobile telephony users worldwide.[4] This inversion in the figures between landline and mobile telephones, in the favour of the latter, occurred in 2002, which showed a trend in which landline telephony was on the road to disappearing. However, there are historical factors that result in current technical limitations and hinder the shift from traditional mobile telephony to the mobile internet and subsequently to the mobile Web 2.0. Mobile telephony devices have been designed from both the physical and the conceptual aspect in the image of wired telephony terminals. Manufacturers have focused on offering a user experience that is as close as possible to traditional telephony. As there is no initial standardisation of manufacturing, or of software (especially of operating systems), or of user experience, consumers have been locked into incompatible proprietary technologies that offer a market in which the user is punished on the basis of using more and more incompatible technologies on different supports. Besides this, the industry's finances have been based on operator-manufacturer power relationships whereby network administrators incorporate proprietary services of the manufacturer that are totally dependent on their network, without permitting the access of third-party developers. This way, the operators create an increase in the value of the use of the network in line with the improvements added to the software or to the equipment itself. This commercial logic creates de facto monopolies where the subscriber is deprived of options and which has, to date, prevented the creation of an ecosystem of applications and services that result in the increase in value of mobile devices as multimedia terminals. It is because of this that, despite growing technological capacity, mobile devices are underused as multimedia tools. The operator-manufacturer society is based on mechanisms that prevent both users and third-party developers from installing additional software, generally through the non-publication of API, libraries or the internal description of the workings of the operating system.[5]

Consumers select the devices and technologies that best meet their needs, but they also do so as a mass user who has to adapt to business models existing prior to their needs. One of the mistakes of the IT and electronics industry is in thinking that the first type of adaptation is resolved by the consumer selecting terminals independently, when in reality the most natural act is for the consumer to choose the independent features of each telephone of use to them. The telecommunications industry has made attempts to recognise these behaviour patterns and has created compatible open protocols and technologies, such as Bluetooth and Wi-Fi. However, to date there is no standardisation or opening-up of the internal technologies of mobile devices, both in terms of equipment or software.

A new difficulty appears in the above context: that of software designers. Users face a market of technologies fragmented into different manufacturers. This fragmentation means that designers have to increase their development costs because of two key aspects: a) adapting applications to devices with very diverse equipment and software features; b) the complementary production costs relating to access to the operating system libraries or to the programming and cross-compiling[6] environments in the different devices.

Beyond the intentional division of the industry (and the logic of planned obsolescence), software designers also face limitations regarding the computational capacity of mobile devices. Generally speaking, these devices use low energy consumption and small physical space technologies, determined by portability needs. They also usually use embedded technologies or unrelated and inferior versions of the most popular operating systems, which are often completely different systems from their commercial versions (especially those belonging to Microsoft and Apple), even though they retain the names of desktop computer systems for commercial reasons.

The increase in viewing surface on new devices and the standardisation of the browser in terminals works as a window on the use of technologies housed in different zones of the network by mobile telephony users. Software manufacturers and service providers can focus on creating value and content for terminals by different manufacturers solely, economically and openly, and use the existing front-end web technologies of almost any development.

It is to be expected, as occurred in personal computing systems, that manufacturers focus on creating semi-proprietary extensions in browsers (open API, closed back-end or blocked by patents) for the captive creation of differentiating applica-

tions in their terminal models. On the other hand, it is also foreseeable that the evolution of technologies and software will foster the adoption of completely open web browsing applications for mobile devices.

In the area of browsers as a platform, a parallel technology seems to be developing to implement the web in terminals that were not originally designed for web display or interaction. Proxy browsers[7] distribute the computational load of the download and rendering of the page equally between the terminal and a server situated on the internet (generally belonging to the company), which acts as a proxy in the connection. The intermediary server traps the requests, captures them, recalculates them and converts them into a format more in line with the computational needs of the device and the connection (compression of graphics, simplification of the HTML and/or conversion to XHTML) and sends them to the terminal. This trend in using a proxy browser as a platform and intermediary[8] means access can be provided to services that require an intensive computing process for normal terminals and may lead to an interesting trend with a view to the adaptation of developments designed for large systems and the compatibility of traditional computational systems.

3. Adapting the consumer market

As has been mentioned, the limitation of mobile terminals lies more in market impositions and their modes of use than in the actual technology. Beyond the traditional use of telephony systems (calls, interaction with voice mail), the most successful recent uses have been those that have increased the communication possibilities of the terminal at very low or nil cost per unit of use. In Europe, the use of SMS for short communications (user to user and business to user), the use of pings or SMS with "confirmation of receipt" indicating the receipt of arrival and the use of calls that are not picked up by the sender and that are usually used to communicate binary information between users aimed at the communication of an unequivocal message with temporary importance are well known. These uses of communication have characteristics that are missing from many computing developments aimed at mobiles. In other words, they are standard, born on the terminal, they have a simple and unequivocal interface and are universal to all telephones. And they have, therefore, begun to be used by agents and/or incorporated as a means of interaction between users and the traditional computing or interactive systems on the web.

With such a complex scenario, we will have to wait and see how the consumer market will react to 3G technology. The most optimistic (Levinson 2004; Thompson 2005; Steinbock 2003, 2005) foresee an unstoppable evolution. Steinbock (2005) points to the transition of the voice business to the looking business and it is here where the hybridisation of mobiles towards applications with built-in Web 2.0 consumption makes sense. According to an analysis by Levinson (2004) of the benchmark environment of the USA, this trend indicates that the mobility culture will swallow the internet, i.e. users will consume the net much more from their mobiles than from their computers. This is a possible scenario in the USA and Asia, with mobile internet at no additional cost or consumption volume limit (e.g. in the AT&T/Apple alliance for the iPhone), and the ease of access to Wi-Fi networks in urban environments. However, it is a scenario with certain limitations in the European and Latin American context, given the peculiarities of operators' commercial strategies.

While the mobile was originally designed for business and professional consumption, the evolution of the market veered towards employment and interpersonal communication. Later, teenagers and young adults became the driving forces of the market. This is the same sector that leads the consumption of Web 2.0 and that offers more early adopters in the trial and error strategies of both Web 2.0 businesses and mobile device manufacturers and operators. The similarities of the two consumer markets - mobiles and Web 2.0 – further reinforce the possibilities of the convergence analysed in this study.

In 2000, European telephone operators made a large capital investment with the aim of being awarded a licence to use the frequencies aimed at 3G telephony for European Union states.[9] Despite this, after eight years they have still not been able to capitalise this investment (Wilson 2006). At that time, it was supposed that 3G technology would offer an enormous range of multimedia services for which the user would be willing to pay. This has not been the case, while the pressure to capitalise these investments quickly becomes even greater in an environment of planned technological obsolescence geared towards the development of the fourth generation of mobiles.

Beyond the above evolutional limitations of the mobile telephony industry, another of the reasons that has, to date, slowed down the modification of consumption towards the mobile internet and the mobile Web 2.0 has been the scant innovation policies of the operators, fearful and incapable of facing the outcome of social networks via mobile Data Industry through the fear of losing their traditional market of charges based on voice communication and SMS.

Other reasons that affect the implementation of web consumption via mobiles are the extremely high connection costs, slow browsing speeds, barely usable interfaces for browsing and the lack of a culture of use. Today, computers are more efficient and economical for internet browsing and using Web 2.0 applications. Despite this, the experiences of text messaging and ringtones indicate that, with pre-existing advantageous conditions for the user, there is a consumer market looking for new forms of technological uses.

Another significant problem is that of standards. Graphic interfaces vary according to the device and not all mobiles support the same software since the service provider restricts the functions of the tool and limits the usage capacities according to its commercial interest. As was the case in the virgin market

of web browsers in the early 1990s, the W3C[10] is fostering a web applications standard for mobiles that promotes undifferentiated browsing integration between computers and mobiles. However, this will not only be difficult to control but it could also entail a limitation for a specific type of application that seeks to obtain greater specificity.

4. Central features of the mobile Web 2.0

Jaokar and Fish (2006) propose seven features of the mobile Web 2.0 that highlight significant aspects of the convergence analysed in this article.

1. Content created on mobile devices and integrated in Web 2.0 could alter the balance of power in the media industry. The ubiquity of mobiles allows the user's point of inspiration to be captured and takes it from being a primary information consumption tool to being a content production tool (e.g. news) by the user, all within a context where consumption becomes highly personal and differential.

2. The user is not a number but a label. Labels could provide a way of mapping the multiple numbers of our lives more naturally and intuitively and free the user from the restrictions of network operators. All users store personal data of contacts on their devices, but changing these (because of theft, ageing or loss of the terminal), the problems of transferring these data from one terminal to another and the ever greater use of independent fixed connection pointers of the operator (e-mail, instant messaging, VoIP addresses) force users to keep copies of these data as a back-up on address servers (Web-based or on protocols such as LDAP) housed on the internet. The opening-up of these data using standard social network, contact and personal information description protocols (such as FOAF[11]) may – in contrast to the traditional telephone book – promote the creation of a decentralised taxonomy that awards meaning to the snippets of personal information distributed in a user network. Together with the information gathered from the mobile and other communication devices, this folksonomy will allow the creation of geoposition-based recommendation services or new, more personal forms of remote social contact similar to existing Web 2.0 applications.

3. Global nodes and multi-language. Location is a complex exercise of traditional mobile networks. The mobile Web 2.0 is destined to be a web-based worldwide mobile network with multi-language access. This is a desirable scenario without roaming, international calls, download by file weight or monopolistic or duopolistic market abuses and with the competition of VoIP telephony to reduce the cost of traditional calls and increase the possibility of locating users, irrespective of the network and country they are in.

4. The mobile Web 2.0 allows synergies between applications to be enhanced through mashups. New functions created on the basis of joining products, at all times emphasising efficient uses associated with mobility. An example of this is the widespread use of mashups of Google Maps on mobile devices (especially in the USA). Besides this, virtual presence or remote interaction technologies (software that permits the use of one terminal from another through a network connection) will enable the administration of a large volume of data that "live" in other systems (desktop computers, laptops, servers, web or remote services) ubiquitously over terminals. Classic interaction technologies such as Webex/Cisco are giving way to much more closed and multiplatform systems of interaction[12] that permit the administration, consumption and alteration of information housed in remote terminals and both person to group and group to group collaboration.

5. *Ajax* as a basic system of interaction both with a view to the user (greater flexibility for interaction) and with a view to optimising network resources (the load of transferring a complete HTML or XHTML document versus the load of transferring a snippet of information formatted with XML or JSON). *Ajax* can be used in conjunction with the interaction facilities of the browser (telephone services mapping) to enable the interaction of the application using the terminal keyboard, as occurs with the shortcut keys of *Ajax*-based services aimed at domestic computers (Gmail and Yahoo! E-mail use combinations of keys to access different services and menus). This will allow the creation of applications sensitive to the context of the terminal and to the usual forms of interaction known to the user.

6. The mobile Web 2.0 will drive location-based services as this is the essential differential of mobiles with which other tools cannot compete. Mobility contributes to data administration from different geographical spaces. In addition, the architecture of participation may offer truly significant data based on contextual need and propose organic use in contrast with the present limited offer by operators.

7. The mobile Web 2.0 proposes mobile searches differently from the search procedures used from computers, emphasising the context of time, event and place. There is also a low capacity of serendipity and less user patience. With these differences, greater efficiency in the results is required given the specific consumption needs and the obligation of presenting scant information sequentially. Still in its emergent phase,[13] the development of effective research tools in Web 2.0 applications via mobiles and the trail of use and research that a user generates may contribute to the development of the semantic web.

5. Trends in content and graphic interfaces

One of the fundamental questions in tackling convergence between mobile devices and Web 2.0 applications is what type of content will users want to consume under mobile platforms. The key question is: how can mobility add value to content? While the role of editor is passed on to the consumer in Web 2.0, in the consumption of social networks via mobile devices, the offer of content by operators is secondary. It may be that the key is not to provide content of great relevance or to recy-

cle what is offered in the traditional media but to generate connectivity, user visibility and participation platforms designed for mobile leisure or for professional life. This is where there is more similarity with Web 2.0 architecture, wherein providers supply a platform for an active end user turned into a publisher.

Although there are multiple possibilities of use, three consumer needs can be stressed regarding mobile Web 2.0 applications with which attractive business models can be constructed: a) manage mobile data from the point of inspiration; b) generate snippets to be recovered and reused in other environments. One of the possible applications that would fulfil these connectivity variables would be a platform devoted to transferring these snippets of information from a mobile to a server and from there to a web application for their possible revision and extension, such as an agenda or knowledge management system (Brandt, Weiss and Klemmer, 2007); c) make the most of time without computational availability or network access (means of transport, public places without access to computational power, short waiting times) to continue online, have access to multimedia content and interact on the network.

As regards graphic interfaces, the challenge facing mobile devices is well known due to the lack of space on the screen. Whereas Web 2.0 applications were originally designed to be browsed from a computer with a standard resolution of 1024x768 pixels, mouse, keyboard and drag and drop, the main question regarding this item is what the most suitable way is to adapt Web 2.0 applications to these interfaces (with 240 pixels width or less) that do not have many of the screen visibility features that a standard computer has. The emergence of touch screen technology – which allows sites to be visited in their normal version and without format changes – may result in a new design paradigm for all manufacturers.

However, beyond this recent innovation, the main distinctive patterns of portability continue to be light weight, sequential presentation, prioritisation and user understanding (Lindholm, Keinonen and Kiljander 2003). But not just that. Simplicity is the essential aim because, unlike the use of larger interfaces such as desktop computers, where all the attention is focused on the screen, interaction on mobile devices takes place within a different context where the physical environment is the interface and where users are carrying out their primary activity while using the mobile.

According to Lindholm, Keinonen and Kiljander (2003), the present aim of designers of this type of interface is miniaturisation and the expansion of applications and functions. These two apparently contradictory issues share a common obstacle: the restrictions of the user interface. Many more things can be done on smaller tools, but how do you design all this new information on the screen? Also, as an additional difficulty, the transition of changes in interfaces is difficult. If one of the constitutive principles of Web 2.0 are light programming models and the search for simplicity, it is evident that over-specification has no place.

Notes

1 Analogue telephones are considered to be the first generation of mobile telephony (1G); digital cell phones the second generation (2G), and high-speed broadband digital devices are the third generation (3G) (Castells *et al*, 2006: 24). Besides affording better quality internet connections, these promote a more sophisticated use of the equipment towards convergence with multimedia applications. 3G describes a telephone protocol range that transmits and receives information at greater speed and allows internet connections at a similar speed to that of standard connection broadband.

2 Some time ago, manufacturers in the industry ceased calling their products "mobile telephones", with the most widespread term being mobile devices. Mobile devices include mobile telephones, PDAs (Personal Digital Assistants), MP3 players and portable video consoles. Laptop computers are not included. The applications that a third-generation mobile device features include: telephone, photo and video camera, audio and video player, broadband internet connection by Wi-Fi or the network of the partner operator of the equipment, web browser, e-mail, agenda, video games console and, in some cases, other personal computer functions. It should be stressed that although new applications are constantly being added, there is a broad range of products and not all of them have the above features.

3 More on Campus Móvil at <http://hci.stanford.edu/jbrandt/hugo/campusmovil>.

4 ITU (International Telecommunication Union) data for September 2007. Taken from <http://afp.google.com/article/ALeqM5iqxtfxK0op09jqpbJht2Ahp5Vgyw>. As an example of one of the markets that most affects us, Spain is one of the countries with the greatest density of mobiles per inhabitant. In July 2007, there were 48 million users and a level of penetration of 107.46 lines for every one hundred inhabitants (data taken from <http://sociedaddelainformacion.telefonica.es/jsp/articulos/detalle.jsp?elem=5107>).

5 The strategic positioning of operators resembles the attempt by old internet and e-mail services providers, such as AOL and Compuserve, which created closed and proprietary technologies along with a marketing strategy focused on convincing the consumer of the need to use these technologies. This business model coexisted alongside the increasingly more established ecosystem of the non-commercial internet, where value relationships were increasingly generated on the basis of the creation of mashups or the combination of information without closed proprietary licences.

6 Cross-compiling is the technique whereby it is possible to compile (go from source code or code written by human programmers to binary, or understandable by the machine) in a different environment from the one in which we are working. Cross-compiling aids the development of embedded applications as it allows the programmer to work in a known environment (a work station or a desktop computer) with common, known and generally more powerful tools.

7 Proxy browsers (including Opera Mini and Teashark) are programs designed for mobile terminals and are adapted to the lower processing capacity and speed of these devices. Instead of connecting directly to the internet, these programs send the requests to an intermediate machine (proxy), which processes them as though they were the user and serves them again to the terminal compressed, simplified and suitable for the user to view.

8 This is a trend promoted by developments by two independent companies: Opera in its Advanced version for java MIDP2 and Basic version for MIDP2; and Teashark. Both include the legacy started by the Japanese DOCOMO at the end of the 1990s.

9 For more information about the investment by European telephone operators in 3G telephony licences to use frequencies, consult the research entitled *Can Mobile Telephony Become an Architecture of Participation?* by Jason Wilson (2006).

10 The W3C Mobile Web Initiative, with the work entitled Mobile Web Best Practices 1.0, proposes steps to be followed to ensure standards in this type of web application, in line with the thinking of experts of the likes of Berners-Lee who believe that the design of differentiated applications for mobiles could contribute to the fragmentation of the web. In this vein, other authors criticise the development of specific platforms for accessing certain types of websites, as occurred in the development of the Japanese Mobile Web (i.e. N different standards for N specific operator companies). We recommend reading Andreas Bovens, *Mobile Web development in Japan: A Tag Soup Tale*.

11 <http://www.foaf-project.org>.

12 Such as the NX and VNC free protocols and systems or the Yugma commercial ones. <http://www.yugma.com>.

13 The 3GSM 2007 held in Barcelona was the meeting point of seven European mobile operators (Vodafone, France Telecom, Telefónica, Deutsche Telekom, Hutchison Whampoa, Telecom Italia and Singular) to promote a strategic alliance in order to create a tool that competes with Google — the research market leader on the internet — and that can obtain part of its advertising

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Mobile Web 2.0

Theoretical-technical framework and developing trends.

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Synergy between novel technology and use patterns has enabled the convergence of mobile devices and web 2.0 applications. This synthesis is a new conceptual space called mobile Web 2.0.

Planeta Web 2.0 *planetaweb2.net*
Mobile Web 2.0. Future Text
Mobile Communication and Society
Web 2.0 Summit
Mobile 2.0 Conference
Mobile Web 2.0. AMF Ventures
Mobile Monday

CONVERGENCE: EVOLUTIONARY ASPECTS

		Before 1980	1980/89	1990/99	2000/05	2007/2010
MOBILE TELEPHONY	Social	Mobile technology starts in the 50s, centered around military uses and later business uses (on vehicles) with high costs. Technology restrictions, a complex regulation, lack of commercial interest and limited facilities delay the mobile evolution until 1990.	Commercial mobile telephony starts, with big and expensive devices. Manufacturers focus on offering an experience as close as possible to use of the traditional phone. Voice transmission is the exclusive traffic. Mobile telephony is a luxury for rich people.	Users must adapt to pre-existing business models. A slow overcrowding starts, mainly in business uses. Mobile data industry (SMS, ringtones, etc) emerges, but the mobile Internet does not exist in the majority of world markets.	(2002) More mobile phones than land lines. Twice as many mobile phones as PC's. Slow introduction of the Internet and smartphone. Users locked in to incompatible proprietary technologies. Business is based on a manufacturer-carrier power relationship. Services are dependent on the carriers' networks.	(2007) 2.6 billion mobile phone users around the World. Only 200 million 3G users (6.7%). The transition to 4G and a new in-built obsolescence of devices is predicted for 2010. Mobile Web is slowed down by the high costs of Internet connection in the majority of countries. A slow migration to flat rate data plans.
	Technical	The 0G preceeds cellular technology. That represents the start of the industry, with portability and coverage problems. (1956) Ericsson launches a 40 kilos device. (1972) The first mobile phone is launched by B-Netz in Germany without human operators for connecting calls.	The first generation (1G) of wireless telephony is born, with analog radio signals. It permits only voice. Low capacity of traffic and security. The FCC establishes the first market regulation, at the request of AT&T 10 years earlier.	The second generation (2G) of wireless telephony, with digital radio signals. Voice data can be compressed and transmitted with a higher efficiency. Smaller devices and a better use of battery. The mobile data industry starts, but HTML is too heavyweight.	(2003) The third generation (3G), digital with a larger compression capacity and data transmission (5-10 MB/sec) with lower costs. The business model impedes third-party developers by means of property APIs, libraries, and OSes.	A bigger interface and standard browser facilitate the mobile Internet and the network technologies. Software and service companies to focus on the creation of value. (2010?) 4G will be an integrated IP system. 100 MB to 1 GB/sec. Bigger capacity of distribution and access to multimedia contents.
INTERNET WORLD WIDE WEB	Social	(1977) 111 Internet servers around the World, in research and government offices. Computers or Internet consumption do not exist outside of this environment. Two milestones: (1971) Intel develops the microchip and (1976) Apple designs the first personal computer.	(1983) The Defense Department gives up the Internet control. E-mail is the main killer app, with Telnet for accessing remote machines, Gopher and Archie for shared directories. (1981) The first PC is launched by IBM. (1984) The Macintosh is born.	(1993) Web connections are 1% of Internet traffic. Netscape sets records in the stock market and the Web increases to 16 million users. Since 1994 technical and political-economic aspects are developed in parallel helping success of Internet via Web.	(2000) Hundreds of overvalued companies operating on Internet without profitability fall down. Static webs with low interaction are changed by communities based on collective intelligence. Web 2.0 is born. The market is rebuilt with the Google leadership.	Development of an "always-on" and "in-motion" active web consumer. More collaborative applications. Will the Internet economy be a new bubble or an ads-based model? More powerful search engines and folksonomies to improve information access. Will the semantic Web be developed?
	Technical	(1966) L.Roberts develops at MIT the concept of the computer network. (1969) 4 computers are connected in an embryonic Internet. (1972) ARPANET introduces the first killer app: e-mail.	Convergence conditions to personal Internet consumption. The development of LANs and Ethernet and the improvement of CPUs lays the groundwork for wide-spread Internet use. The Minitel system in France. Limited communication by e-mail. 1024 Internet	Berners-Lee creates a solution for network connectivity on the Internet. The World Wide Web is built. Convergence of: computers with capacity of working on the network, efficient browsers, optimal speed of data transmission and business interest.	256KB to 2 MB/sec. Surfing speed is doubled. Transmission of big text and picture files is facilitated with an adequate speed. Standards like Bluetooth and Wi-Fi permit the ubiquitous connection of computers to Internet.	Tens of MB/sec. Good quality of image and sound on the network. Sophisticated graphics and creation of 3D virtual worlds. Will the Web be the whole platform?

PHYSICAL MOBILITY + CONVERGENCE CONNECTIVITY

MOBILE WEB 2.0 PRINCIPLES

O'REILLY
The adaptation of O'Reilly's Web 2.0 principles (2005)

The Web as a platform is a good paradigm for mobile devices due to their low memory and processing power.

Mobile Web 2.0 allows the integration of *database access*. Ubiquity more an efficient classification.

The end of the software release cycle liberates users from expensive and slow updates of their mobile devices.

Lightweight programming models. In small interfaces and limited memory: graphical austerity and protocols.

Software above the level of a single device. Multiplatform apps (computers and mobile devices) and complementarity.

Rich user experiences. Web searching, location-based services and short content production.

Collective intelligence. Challenges the mobile data industry model of locked contents from carriers.

Mobile search is based on context of place and time. Users have less patience and less interest in serendipity.

Location-based services are a distinctive attribute. Web 2.0 offers organic data based on context.

AJAX as a flexible system with a better interaction and optimization of network resources.

Assembling of apps. More efficient uses of mobility and capture of point of inspiration.

Global networks that can be accessed outside the user's home country. No roaming or monopoly markets.

Tags allow multiple phone numbers in a intuitive way, decreasing carriers restrictions.

Ubiquity and multimedia capacity of mobile devices turn information consumers into content creators.

JAOKAR; FISH
Mobile Web 2.0 (2006)

MOBILE INDUSTRY. LIMITATIONES AND BUSINESS MODELS

LIMITATIONS
Originally designed like traditional phones. Slow evolution to smartphone.

Under-utilized devices due to carriers' business model and their limitations of third-party development.

High cost of software development due to poor programming environments, incompatible OS libraries and the need for cross-compilation of code.

The technology's inherent need for low power consumption and reduced physical size place large constraints on interaction and computational power.

Limited innovation of carriers. Fear to changes the status quo in mobile data industry (around voice, text messaging and ringtones).

Despite use of common protocols like Bluetooth and Wi-Fi, users are locked into incompatible proprietary technologies.

Difficulties in promoting web standards. The W3C impulses the integration between computers and mobile devices.

Touch-screen interfaces (iPhone, HTC, Nokia, LG) permit the use of desktop websites, enabling better usability without sequential access.

To take advantage of time without computing power (transportation, public places, etc.) by staying connected.

Mobile devices allow users to capture snippets at the point of inspiration and then retrieve and reuse them via desktop websites.

Mobile Web 2.0 services will allow capture of multimedia data while mobile and management of that data via web apps.

Transition of voice to watch and listen business. High added value (live sports, the latest news) that users cannot wait to consume at home.

Users will want entertain themselves and others with short multimedia contents while in mobile situations.

BUSINESS MODELS
Encourage low cost standards and natives apps with simple interfaces.

APPLICATIONS SELECTION

Multimedia: mosh beta NOKIA, YouTube, myspay, yelago, Vringo, facebook, mystrands, mazeo

Location-based services: meetmoi, SignalMap, SOCIALIGHT, PLAZES, dodgeballi, loopt

Capturing the point of inspiration: twitter, bluepulse, jaiku, AbbyMe

The long tail: FUNAMBOL, Gumiyo, BUDDYBUZZ, campusmóvil

Credits
September 2008

Infographics based on:
Pardo Kuklinski, Hugo (GRID-UVic);
Brandt, Joel (Stanford HCI Group);
Puerta, Juan Pablo (Craigslist, Inc)
Mobile Web 2.0. A theoretical-technical framework and developing trends. 2008

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http://online-journals.org/i-jim/article/view/535/621

Graphic design:
Marián Pérez Sánchez
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http://hci.stanford.edu/jbrandt/hugo/infographic/MobileWeb2_English.pdf