

Mobile Access to Cultural and Historical Heritage Web Pages

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Abstract. The main focus of attention in this paper is the access to websites of leading regional, national and world museums. Their accessibility from desktop and mobile devices is hereby evaluated. The paper covers a detailed analysis of the mobile operating systems, their market share in Bulgaria and the opportunities they offer to the users. The need for contemporary cultural and historical heritage websites which maintain lighter but fully-functioning mobile versions, facilitating and making their access from portable devices easier, is also well-grounded here.

Keywords: Historical Museums Web-Sites, Mobile Access, Mobile Operating Systems, Mobile Phones, Smart Phones

1 Introduction

Ever since its formation in 1988 till now (Q3 2012/third trimester), one of the fastest developing segments of the economy is the mobile communications market. There are many factors contributing to this development: increase in the demand for mobile services, the working out of new technologies, as well as their very quick reach to the end-user.

According to a survey carried out by IAB (Interactive Advertising Bureau) Bulgaria, 500 000 people countrywide use Internet from their mobile phones, while 19% of all internet users use more than one device for internet access. The same sharp increase in the number of mobile internet users has triggered the initiative to carry out a survey on the possible access to cultural and historical heritage websites.

Mobile devices have already outpaced the majority of media we rely on every day, including computers. Today, more people access the Web via a mobile device than via a computer, and the disparity between the two will grow more rapidly in the years to come. The sheer size of the mobile web - the largest, most available mass medium to mankind - is good justification to create mobile products [1].

According to Brian Fling, over 3.6 billion people own or have access to mobile devices in 2009. Of those, over 1.6 billion (or 25% of the world's population) have access to the Web through a mobile device - a number which grows by the year. What is

interesting is that just 1.1 billion people have access to Internet-connected desktop computers [1].

2 Access to Cultural and Historical Heritage Web-sites

Historical museums and their presence on the Internet are essential for the promoting the cultural and historical heritage of a given nation. In this paper we look into the websites of the Museum of National History, the Regional History Museum - Veliko Tarnovo, the Regional Museum - Burgas, the Berman Museum of World History and the British Museum.

2.1 Access from Desktop PC-platforms

Some websites fail to load in some of the leading browsers, and this a recurrent issue. This section of the paper deals with a description of the functionality of the sites in question. To carry out the survey the following popular browsers are to be used: Internet Explorer, Mozilla Firefox, Opera and Google Chrome.

All five websites are successfully loaded and are fully functioning in the four desktop browsers for PC.

2.2 Mobile Access

Reasons for using mobile versions of existing websites:

- The content being most easily approachable for the user;
- Loading speed and work in the website;
- Handy interface;
- Easier website management, reading and sharing of information.

Table 1. Mobile access to Museums' Web-sites

Museum URL	Organization	Available SWF files	Mobile Platform
http://www.historymuseum.org	The National Museum of History – Sofia, BG	-	No
http://www.museumvt.com	The Regional Museum of History in V. Tarnovo, BG	Only on Home Page	No
http://www.burgasmuseums.bg	The Regional Museum, Burgas, BG	-	No
http://www.bermanmuseum.org	Berman Museum, Anniston, AL, USA	-	No
http://www.britishmuseum.org	British Museum, UK	-	Yes

Table 1 makes a comparative analysis of the web pages of five randomly chosen Bulgarian and international museums by tracing whether they also have a mobile version available.

When accessing existing Websites through mobile devices, the lack of heavy SWF elements is a priority, due to the small data transfer and the higher loading speed. For that reason we look into the enumerated web pages and check for the presence of Flash elements in them.

The use of Flash elements (SWF – Shockwave Flash or Small Web File) in internet web pages enriches their content and layout; however they impede the access to them, especially from portable devices. Another main disadvantage of SWF files is the fact that they demand a very quick internet access and they generate traffic in great volumes. At the same time they take away many of the resources thus loading the processor to the maximum, they use up a great amount of the operating memory, which leads to a big energy loss and to a quick depletion of the batteries of mobile devices.

2.3 Challenges, tools and approaches of creating the mobile versions of web pages

Given that the mobile phone is a very different kind of device from the desktop computer, their use is quite different. Unlike computers, mobile phones are portable, personal, always connected and we carry them with us at all times. We can begin to predict the shape of the future by studying mobile use in the most sophisticated and networked markets. At the same time as use of mobile-based Internet is seeing rapid growth globally, data from Global TGI, an international network of market and media research companies including Experian Simmons, show that Japan is still far ahead of the rest of the world [6].

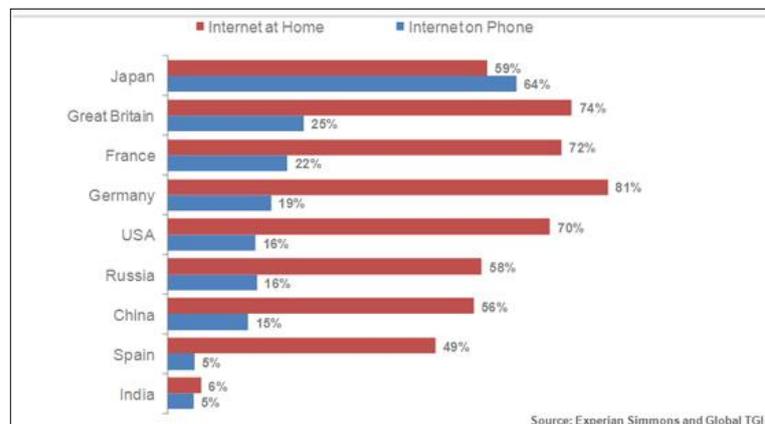


Fig. 1. Internet Access: At home versus On mobile phone [6]

For marketers, one of the main advantages of using mobile as a communication channel is the portable web access and the resulting ability to deliver content and offers to consumers on the move. Looking at the way in which Japanese consumers

use the Internet via their mobile phones (Fig. 1), the opportunity is clear. More than a quarter of mobile Internet users in Japan use their cell phone to obtain coupons and 15% use them for competitions and promotions. Thirty-seven percent of the handsets owned by Japanese consumers are GPS enabled, suggesting great potential for marketers to leverage location-based messaging [6].

Mobile Design Tools: mobile design requires understanding the design elements and specific tools. The closest thing to a common design tool is Adobe Photoshop, though each framework has a different method of implementing the design into the application [1].

Some frameworks provide a complete interface toolkit, allowing designers or developers to simply piece together the interface, while others leave it to the designer to define from scratch. In Table 2 is shown each of the design tools and what interface toolkits are available for it [1].

Table 2. Design tools and interface toolkits

Mobile framework	Design tool	Interface toolkits
Java ME	Photoshop, NetBeans	JavaFX, Capuchin
BREW	Photoshop, Flash	BREWUI Toolkit, uiOne, Flash
Flash Lite	Flash	Flash Lite
iPhone	Photoshop, Interface Builder	iPhone SDK
Android	Photoshop, XML-based themes	Android SDK
Palm webOS	Photoshop, HTML, CSS, and JavaScript	Mojo SDK
Mobile web	Photoshop, HTML, CSS, and JavaScript	W3C Mobile Web Best Practices
Mobile widgets	Photoshop, HTML, CSS, and JavaScript	Opera Widget SDK, Nokia Web Runtime
Mobile web apps	Photoshop, HTML, CSS, and JavaScript	iUI, jQTouch, W3C Mobile Web App Best Practices

The mobile web is the only ubiquitous platform for delivering content to mobile devices. There are *two basic approaches* to creating cross-platform mobile designs: content adaptation, where many versions of the existing site may be created, or no content adaptation. It is important to understand that the rendering of many of the standards and techniques are measured on a sliding scale of consistency across multiple devices. Many mobile standards coming from the desktop web world mistakenly assume that because a mobile browser renders elements inconsistently there is no web standards support within the mobile web. The mobile web has actually been very standardized, with defined specifications - in some cases, standards older than the specifications we use on the Web. The problem is the technical constraints of the device and the inability to update the browser technology that ships with devices. Together with low consumption of the mobile web, the problem has been somewhat ignored for years [1].

Due to the speedy development of mobile devices and accompanying software, what can be envisaged is that the differences between them will gradually be reduced. Thus, the need for careful study and applicability of specific methods for the creation of websites with mobile-compatible versions will become obsolete. Therefore, the following section of the paper highlights the survey and development of mobile operating systems. Having a good grasp of these systems is a prerequisite for the creation of universal web pages with mobile compatibility.

3 Overview of Contemporary Mobile Operating Systems

The aim of the GSM industry towards miniaturization (Groupe Spécial Mobile, later bearing the name Global System for Mobile Communications) has been more and more accentuated upon over the last years. The appearance of PDA (Personal Digital Assistant) and Smartbook/Smartphone paved a way to a new beginning for the GSM and computer industry. There is an evident tendency towards breaking down of the borders between PDA, Pocket PC, Smartphone, Netbook and Tablet PC [2].

There are two tendencies – the one: laptops and netbooks tend to have a 3G GSM integrated in them (e.g. Toshiba NB200 3G) and the other: “smart” phones are being provided with more and more powerful processors, graphic accelerators, larger operating memory and an operating system with more beautiful and more convenient graphic interface. The aim is to satisfy all user groups – from the youth looking for entertainment – to managers of high authority, looking for a permanent internet connection in the office [2].

3.1 Nokia Symbian ver. 10.1

Initially the name smart phone was only used to refer to GSMs, managed by Symbian. A strong impetus in the development of this platform is provided by Nokia which has purchased the majority package of the “Symbian foundation”. Nokia aims at retaining its domineering position by turning Symbian into an open system, free of charge to mobile phone manufacturers. Recent releases of this operating system took place in 2010 - Symbian^3, in 2011 – Symbian Anna and in 2012 – Nokia Belle.

Advantages: It maintains a multitasking mode of operation; systematic requirements towards the volume of the operating memory and power of the processor – it works securely with 512 MB RAM and a 1 GHz processor; it makes use of 16 million shades of colour; there is a unified portal for applications of the new version of OS: “Ovi Store” development, renamed to “Nokia Store”; there are multiple programs available – not only for entertainment, but also office oriented. Unfortunately, most of them are paid for; maintenance of NFC technology (Near Field Communication), allowing for easy sharing and exchange of data, as well as the opportunity for online payment; good maintenance of not only resistive but also capacity Touch-displays.

Disadvantages: Out-of-date graphic interface – a great number of GSM manufacturers upgrade it using their own SHELL, which in turn loads down the system resources; not a very good PC synchronization; the existence of many versions confuses

the user and there is no compatibility of the applications; most of the applications for Symbian are paid for and require additional certification during the installation process. This additional protection against piracy creates discomfort among users; to some of them this is an insurmountable barrier and they do not install the additional software on their GSMs.

Typical representatives: Nokia 603, 700, 701, Nokia N8, Nokia 808 Pure View.

The smart phones that will be provided with this update are the models: Nokia 701, Nokia 700, Nokia 603, Nokia E7, Nokia X7, Nokia C7, Nokia Oro and Nokia C6-01. At the beginning of 2011 Nokia announced a change in its strategy in relation to Symbian – the access to it by phones of the cheaper market segment will gradually be restricted over the next two years, whereas with the rest of the phones it will be replaced with the mobile operating system Windows Phone 7 by Microsoft.

3.2 Microsoft Windows Phone 7

At the beginning of 2010 Microsoft introduced the new operating system Windows Phone 7 as the new receiving apparatus of Windows Mobile. It is not compatible with the previous program-apparatus platform, i.e. the smart phones with Windows Mobile 6.x cannot be upgraded to Windows Phone 7 [3].

Windows Phone 7 has nothing to do with the previous Windows Mobile OS. Unlike the unfriendly interface of WM, which is difficult to manage in comparison with the present-day ones, adapted to touch screens, Windows Phone 7 has an originally new user interface, called Metro. The Operating system differs in its working process and is uniquely optimized with its touch-screen interface.

In its initial version the new Windows Phone does not maintain functions such as copy&paste or multitasking – flaws which the company was quick to eliminate with Upgrade 7.5 (Mango), which is state-of-the-art even today.

Advantages: Extremely convenient user interface – with the so called Microsoft “dynamic plates” and “hubs” which satisfy the need for user experience; excellent integration into the social networks; improved Cloud-service - with Skydrive, the user gets up to 25GB free online disc space; quick response and multi-touch browser functionality; minimum hardware requirements for the phone manufacturers - 1GHz processor, 512 MB RAM, capacitive screen with resolution of WVGA at the minimum, multi-touch, at least a 5-MPx camera, accelerometer, proximity and light sensors, a compass, GPS.

Disadvantages: There is no unified mail box; there is no USB Mass Storage option; there is no option for a video display from the browser – it lacks Flash and HTML5 maintenance; there is no unified search, unlike the main competitors on the market; multitasking is only devised for Microsoft applications (First party apps); it does not maintain file sharing through Bluetooth; there is no NFC maintenance.

It is envisaged that the last disadvantage will be removed by Microsoft by the end of 2012 with the new version - Windows Phone 8 (Apollo). It will probably include the maintenance of a four-core processor, a display with HD-resolution and the possibility for a free exchange of information among a wide range of Windows devices – from desktop computers and laptops to tablets and mobile phones [4].

Typical representatives: Nokia Lumia 710, Nokia Lumia 800, HTC Titan и Samsung Omnia W.

3.3 HP WebOS

PALM is the third long-term manufacturer of mobile “smart” phones. At the beginning PALM manufactures only Pocket PC unanimously referred to as palmtops. In recent years it lags behind in the integration of Pocket PC and GSM. In order to gain their market place in 2009 they promote and release into the market a new version of the WebOS operating system and a new SmartPhone PALM PRE. In April 2010 the company is taken over by Hewlett-Packard, and the name WebOS changes to HP WebOS. In recent years it lost its market share to Android и Apple iOS.

Typical representatives: Palm Pre, Palm Pre 2, HP Palm 3, HP TouchPad.

3.4 Bada 2.0

It is worked out and maintained by Samsung. The name of this OS can be literally translated from Korean and means “ocean”, and the company is hoping to use this platform in its most widely used models, creating “smart phones for everyone”.

Unfortunately, this initiative is not met with great enthusiasm from the users. Irrespective of this, Samsung have not given up on Bada and in 2011 they released a new 2.0 version of their operating system. It includes a detailed user interface with the maintenance of a number of open windows (multitasking), as well as the voice recognition function, which can even be used for creating text messages (as an alternative to keyboard typing). The web possibilities of the operating system are also improved - Wi-Fi Direct maintenance is also added, HTML 5, as well as the latest version of Flash, and, of course, NFC.

The devices which maintain these applications are only phones of the Samsung brand: Wave 3, Wave M and Wave Y.

3.5 BlackBerry OS

Research-In-Motion (RIM) is the only leading company on the market of business mobile decisions and one of the companies claimed to have been the founder of the “business phones” class, thanks to its popular BlackBerry brand. Up until 2007 their smart phones purposefully had no integrated cameras so as not to allow business espionage. Another characteristic feature of the RIM company policy is the selling of their apparatuses engaged with a contract signed with a mobile operator on the basis of internet and e-mail traffic. What is more, most of the RIM GSMs, created two years ago, do not have a WiFi module. A typical example of this is the multimedia Black Berry Storm 9500, having GPS navigation, 3G module, a camera, a big Touch-display.

The latest version of the operating system is BlackBerry OS 7.0., which is yet another specialized operating system, created by a specific manufacturer of mobile

phones (RIM) and is meant for application only among devices carrying its brand name.

Advantages of the operating system: It does not require great system resources; it maintains a multitasking mode of operation; it is quick-functioning and has a very good optimization when working with a number of applications; unique system for immediate e-mail – PUSH e-mail exchange, which has turned into a corporate standard and serves as an example to other manufacturers; it is business oriented – it offers enough programs for mobile office and business applications.

Disadvantages: It is only incorporated into RIM phones; it has no improvements (through the years) to satisfy user experience (User Experience or UX); RIM do not envisage up-grade options for the older models, using BlackBerry OS 5; there is no great variety of programs for application to choose from; it has a weak multimedia maintenance.

Typical representatives: BlackBerry Torch 9860, BlackBerry Bold 9900, BlackBerry Curve 9320.

3.6 Apple iOS X

Similarly to the distant 1984, when Macintosh and the graphic user interface appeared on the market, the same thing happened in 2007 with the appearance of iPhone, Apple which triggered a revolution in itself.

iOS (once iPhone OS) is a mobile operating system of the company Apple Inc. initially worked out for iPhone, it is used in mobile devices such as iPod Touch, iPad and Apple TV by Apple. As of 1 of September 2010 in App Store by Apple online newspaper there have been more than 500 000 applications for iOS [5]. Apple does not allow iOS to work with the hardware of third parties.

Advantages: Incredibly handy graphic interface, allowing you to work with only one hand; working without a stylus but with only slight touching of the capacity display; it is open to the development of applied software by specialists; the availability of thousands of free programs.

Disadvantages: It is only committed to Apple phones; before iOS 4 there is a lack of complete multitasking due to Apple concerns that the many exterior applications would deplete the battery too quickly when working in a multitasking mode; it does not maintain exchange of files through Bluetooth.

Typical representatives: Apple iPhone 4, Apple iPhone 4S.

3.7 Google Android

Google set their challenge to the manufacturers of “smart” phones by representing their own operating system with an open code. This characteristic of Android bears its popularity among manufacturers of GSM and NETBOOK systems. The Android operating system is used for notebooks and ultra portable laptop management which became popular in 2008. They have earned great success since big companies such as HTC, Samsung, LG and Motorola have introduced their own models with the same operating system in less than a year.

Advantages: Free open system; quick refresh and maintenance; a multiple number of free programs; NFC function, providing undisturbed sharing between two NFC devices of applications, music, video, accessible with one touch of the screen; quick work and multitasking; handy browser, maintaining HTML5 and Flash, thus the internet web pages are loaded on the mobile devices in a similar way to the desktop systems.

Disadvantages: The programming code is still not optimized and error-free; contrary to the unification of other operating systems, the segmentation style is hereby applied due to the different resolution capacity and screen size within a number of mobile devices, which maintain it; it requires a large capacity for the operating system.

Typical representatives: Samsung Galaxy Nexus, HTC One X, Samsung I9300 Galaxy SIII, Motorola Droid Razr and Bionic.

In June 2012, seven months after the introduction of the latest version Android 4.0 (Ice Cream Sandwich), this version was installed to as few as 4.9 % of the devices by Android. The purpose of the mobile platform is to unite all Android-based devices, be it phones or tablets.

3.8 Mobile Operating Systems Used in Bulgaria – Annual Increase for 2011

Mobile operators are familiar with the number and type of devices registered in their networks. Each device has a unique number (IMEI – International Mobile Equipment Identity), and the first 8 digits of every IMEI specify the manufacturer and the model, as well as the type of operating system accordingly (if the device is a smart phone).

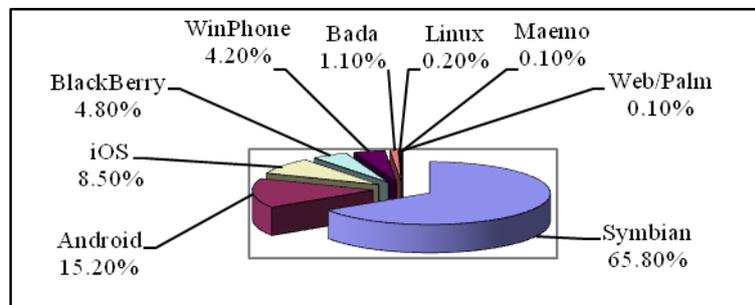


Fig. 2. Mobile Operating Systems (at 1.04 million smartphones used in Bulgaria at the end of 2011) *Source:* „Mobile Review” OOD, 2011 [7]

According to an estimate by “Mobile review” OOD, on the survey of market agencies based on the market shares of individual operators as well as the results of NSI in “Counting 2011”, the number of individual (personal or business) mobile phones or other GSM/3G devices used daily in Bulgaria at the end of 2011 is about 8.5 million. Up to 30% of the active SIMs are in “second” or “third” devices – second and third phones, USB modems, tablets, etc. About 10% of the population does not have mobile phones.

The share of smart phones (tablets excluded) is above 12% of the used personal devices or slightly over 1.04 million [7]. As of the beginning of 2011 their number is about 700 000. Still, almost 2/3 of smart phones are provided with the Symbian operating system (Fig. 2), however, their relative share among all smart phones has dropped around 14% over the last year. The other operating system that fails to make use of the common increase is Windows Phone/Mobile, whose share is above 4%.

Android, with an increase from 3.5 to up to 4.5 times more with some mobile operators, is *the most aggressively increasing operating system with a share of over 15% of the smart phones*. iOS also marks a noticeable increase – on average the Apple phones are 2.5 more towards the end of 2011 in comparison to 2010, and closing down to 9%. Blackberry grows above average on the market, yet with lower pace and is aiming at 5%. Another advancing competitor of 2010 is the newly emerged software platform of Samsung - Bada, which takes up about 1% of the share. Linux, Maemo, Palm/WebOS together have about 0.5% share of all smart phones.

4 Conclusion

This paper creates an overview of the up-to-date versions of mobile operating systems. Their advantages and disadvantages have been summed up. Their opportunities to work with multimedia content - HTML5 and Flash, have been looked into.

What is accentuated upon in section 3 – the mobile systems in use in Bulgaria – is the rapid increase in the number of mobile users. Data of the increase in comparison to previous years has been introduced. This data gives reason to conclude that the Internet access from portable devices is on the increase, and this provides stable argumentation for the availability of mobile versions of the existing web pages.

The comparative analysis of the web pages of the five regional and national museums has been introduced. Their accessibility from mobile devices, as well as the existence of a mobile platform for their quick and at the same time fully-functioning access is looked into.

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