

Smart phone for mobile commerce

Yung Fu Chang^a, C.S. Chen^{b,*}, Hao Zhou^c

^a Applied Wireless Identification Group, Inc., 18300 Sutter Blvd., Morgan Hill, CA 95037, United States

^b Electrical and Computer Engineering Department, Miami University, Oxford, OH 45056, United States

^c CISCO Systems, Inc., 4125 Highlander Parkway, Richfield, OH 44286, United States

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ABSTRACT

This paper surveys most of the currently available smart phones in the market. It summarizes its features and characteristics. From this study a set of must-have and desirable-to-have features for future generations of smart phones are described. The main drivers of smart phones that enable convenient and secure mobile commerce services such as electronic wallet, electronic payment, 3G broadband Internet access, and multimedia content are then described. Finally, payer-centric payment architecture is advocated to facilitate the adoption of smart phones for mobile commerce applications, in contrast to the current prevalent mode of payee-centric payment practice.

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1. Introduction

Mobile phone, in general, falls into three broad categories: basic phones, multimedia phones, and smart phones, progressing from 2G (second generation) into 3G (third generation) technology. Although smart phone represents only 5% of the mobile market today, it is expected to reach 20% of 1 billion mobile phones shipping by 2009 according to research firm Gartner and ARC Group [1,2].

Smart phone has become an emerging phenomenon for personal and business voice, data, e-mail, and Internet access. Power-efficient processors, the modern operating system, broadband Internet access, and productivity-enhancing application will propel the popularity of smart phones. It is the product of convergence of regular mobile phone and PDA (personal digital assistant), and positioned as a notebook computer and PDA replacement.

In this paper, the product features of major representative mobile phone suppliers are investigated and summarized. Eleven must-have and eight desirable-to-have features of future generations of smart phones are described. They cover features such as operating systems, processors, keyboards, Internet accessibility, host synchronization, security, and so on.

The main drivers for smart phones that enable convenient and secure mobile commerce services are electronic wallet application, electronic payment application, broadband Internet access, high computing and communication performance, and multimedia contents. To achieve these goals, it is necessary to build mobile commerce

on established habits, practices, and infrastructure, and then add specific mobility value. The key drivers of mobile commerce service adoption are ease-of-use and convenience, as well as security, privacy and reliability. Applications and services that are too complex and time-consuming will discourage consumers from “going mobile”. The challenge is to implement a secure payment scheme so that it remains convenient and simple to use.

There are many competing smart phone operating systems such as Apple iPhone OS, Google Android, Nokia Symbian, Microsoft Window Mobile, Blackberry OS, Palm OS, and others. There is no smart phone platform standard as yet and it may take years to evolve such a standard. In recent years, there is industry trend of open-source the mobile operating system, evidenced by Google's Open Handset Alliance, LiMo, Nokia's acquisition of Symbian and other collaborative efforts forming around the globe with the goal of standardizing smart phone operating system. The standard for mobile commerce will be very application specific. The payer-centric payment application described in this paper should be an excellent candidate.

2. Ideal smart phone features

Smart phone is the product of convergence of regular mobile phone and PDA (personal digital assistant), which can store critical information via personal computer or notebook computer. While vocal call is the common denominator of all mobile phone, smart phone needs to be able to access Internet, e-mails, and corporate database servers. It also must be capable of SMS (short messaging service), MMS (multi-media messaging service), and IM (Instant Messaging). User interface, form factor, and weight are very critical factors for the success of a particular brand of smart phone in the market place.

* Corresponding author. Tel.: +1 513 529 0742; fax: +1 513 529 0746.
E-mail address: chencs@muohio.edu (C.S. Chen).

Listed below are nineteen recommended features for the ideal smart phone. The first eleven are must-have and the last eight are desirable-to-have features.

1. Multi-tasking operating system

To satisfy the multi-tasking, multi-application nature of the smart phone, a multi-tasking operating system is the absolute necessary foundation. The current popular operating systems such as iMac OS.X, Symbian, Microsoft Windows Mobile, Palm, and Linux all have multitasking characteristics.

2. Powerful SOC application processor and DSP communication processor

Multi-tasking operating system won't go too far without the support of a powerful processor. Multi-tasking calls for more and more powerful application specific processors and DSP (Digital Signal Processing) communication processors. Three classes of processors need to be incorporated as the brain into the smart phone. The first one is the radio processor for cellular communication function. The second one is the DSP processor for streaming media capability. The third one is the data processor for data manipulation and general device control functions. Here are some of the example combinations used in today's smart phones:

- i. Intel XScale (ARM core) and MicroSignal (using ADI DSP core)
- ii. TI OMAP and OMAP2 (ARM core and TI DSP core)
- iii. IBM cell processor.

3. Real QWERTY keyboard

For e-mail, SMS, IM, a real QWERTY keyboard is a must-have feature. Here are some of the popular forms of the smart phone keyboard:

- i. Two hands holding and two thumbs typing
- ii. One hand holding and one thumb of holding hand typing
- iii. One hand holding and one thumb of other hand typing.

4. QVGA or larger display with high screen resolution

Larger display with high resolution is needed, especially for web browsing, MMS, gaming, etc. Here are some of the examples:

- i. Palm 650 has a screen with 320×320 resolution at $44 \text{ mm} \times 44 \text{ mm}$, which is 7.2 pixels/mm density
- ii. HP 6315 has a screen with 240×320 resolution at $54 \text{ mm} \times 72 \text{ mm}$, which is 4.4 pixels/mm density
- iii. HP 6515 has a screen with 240×240 resolution at $56 \text{ mm} \times 56 \text{ mm}$, which is 4.3 pixels/mm
- iv. Apple iPhone has a 3.5 inch screen with 480×320 resolutions at $50.8 \text{ mm} \times 76.2 \text{ mm}$, which is 6.4 pixels/mm.

5. Internet access at 2.5G or 3G speed

To be able to serve e-mails, web browsing, multi-media audio/video streaming, Internet broadband access at 2.5G or 3G is a must-have feature.

6. Business productivity tool

As smart phones are replacing notebooks and PDAs, they must have application software and corporate database access for business information including business metrics, real-time business events update, sales and financial information, and inventory information for product availability.

7. E-mail, SMS, MMS, IM services

These become the basic features of a mobile phone and business/personal tools for the digital age. According to a Yankee Group study [4], wireless e-mail has transitioned from a nice-to-have to a must-have application in many enterprises, which is driving adoption of wireless data solutions. Needless to say, they are must-have features.

8. Personal Information Management (PIM)

Features like Phonebook, appointment book, task-book, notes, and calculator are the basic features of PDA, hence these are must-have features for smart phones, if the smart phones are positioned to replace PDAs.

9. Host synchronization

With the increasing functionality of the smart phone, such as e-mails, PIM, business tools, the ability to synchronize with another host

computer and make use of the work done on both devices also becomes essential. Here are some of the popular synchronization technologies:

- i. HotSync – HotSync is the registered trade name for a sophisticated method of linking between a Palm handheld computer and a more substantial notebook, desktop, or other computer. Such a link can be done using a so-called HotSync cable, or using a wireless connection.
- ii. ActiveSync – ActiveSync is a synchronization program developed by Microsoft Corporation. The purpose of the program is to synchronize files, favorites, Personal Information Manager Data etc. between a Windows PC and a PDA running Windows Mobile or Windows CE for handheld PC or for Palm-size PC.
- iii. SyncML – SyncML (Synchronization Markup Language) is the former name (currently referred to as: Open Mobile Alliance Data Synchronization and Device Management) for a platform-independent information synchronization standard.

10. Voice communication and voice-mail

Smart phone, being a phone, still needs to support these basic vocal call features.

11. WiFi for VoIP and Bluetooth for cable replacement

Due to its free or low cost, phones with integrated Wi-Fi and VoIP capabilities are being introduced into the market and have the potential to replace land line telephone services. Smart phones that support WiFi are best suited for local use such as corporate or home networks. Bluetooth enables hand free operation of the smart phone, as well as communication with other computing devices.

12. Gaming

According to Ziff Davis Media's Annual "Digital Gaming in America" [6], cell phone gaming continued its meteoric rise in 2005: the number of households engaged in cell phone gaming nearly doubled again, jumping from 16.3 million in 2004 to 27.9 million in 2005. Gaming is a desirable-to-have feature, extending the smart phone usage and potentially replacing another dedicated gaming gadget.

13. Camera

Without question, camera phones have rapidly become a staple of the mobile phone market. According to InfoTrends [5], by 2009, 85% of the mobile phones shipped throughout the world will include an embedded digital camera. Same trend should apply for smart phones.

14. File management and manipulation

With the added capability for taking and storing pictures, playing music, movies, as well as running business application tools, comes with the need for file management and manipulation.

15. Video/audio streaming

Video and audio streaming is another desirable-to-have feature, extending the smart phone usage and potentially replacing another dedicated viewing gadget.

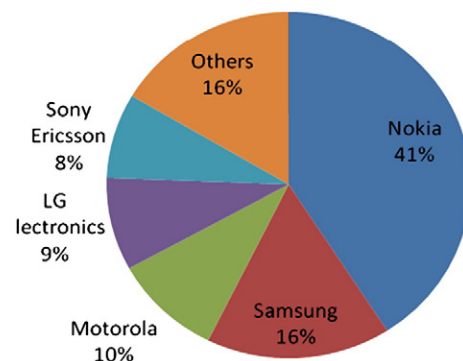


Fig. 1. 2007 global handset market share.

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