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Impact of Mobile Computing for Users

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Abstract: A technology of mobile communication will give mobile users capability of accessing information from anywhere and anytime. A mobile is something that we take along with us where ever we go (unlike our computers) and that is one of the reasons many analysts believe that within three years more people will be accessing the Internet from mobile phones than from office or home computers.

Keywords: Component; Mobile devices, Technology, Wireless Networks, Mobile Database, Communication.

I. INTRODUCTION

Mobile cloud computing (MCC) at its simplest, refers to an infrastructure where both the data storage and data processing happen outside of the mobile device. Mobile cloud applications move the computing power and data storage away from the mobile devices and into powerful and centralized computing platforms located in clouds, which are then accessed over the wireless connection based on a thin native client. It is a technology that allows transmission of data, via a computer, without having to be connected to a fixed physical link. Mobile devices are gradually becoming commonplace. A mobile computing environment, consisting of mobile communications and distributed computing, heavily influences conventional information systems or database systems. The computational and networking power of mobile devices is constantly increasing and new technologies are integrated into them to support new functionalities and services. On the other hand, the field of databases and more generally data management is also expanded with new services and applications. Mobile computing has a history of approximately three decades, and interaction design has played an important role throughout about 2/3 of this history, only one good general textbook, by Jones & Marsden (2006), has been published on the topic to date. And although this book is indeed a brilliant starting point for addressing the particular challenges of mobile interaction design, it still doesn't have the completeness and depth of equivalent human-computer interaction and interaction design primers such as Laurel (1990), Shneiderman (1997), Preece et al. (1994), Winograd (1996), Raskin (2000), Dix et al. (2004), Benyon et al. (2005), Lauesen (2005), Bagnara & Smith (2006), Preece et al. (2002), and Rogers et al. (2011). Data communication started in the early 80's and has been improving ever since, but with a great drawback. Using the PSDN (Public Switched Data Network), it does not allow mobility at all.

II. DIFFERENT KIND OF MOBILITY

A. Terminal Mobility: In terminal mobility, the connection is established between two points and not between the two persons calling each other. This type of connection in a session allows the use of communication devices to be shared among anybody. It allows a mobile unit (laptop, cell phone, PDA, etc.) to access desired services from any location while in motion or stationary, irrespective of who is carrying the unit. For example a cell phone can be used by its owner and it can also be borrowed by someone else for use. In terminal mobility, it is the responsibility of the wireless network to identify the communication device.

B. Personal Mobility: In personal mobility the mobility of a person is supported. Thus, a user does not have to carry any communication equipment with him; he/she can use any communication device for establishing contact with the other party. This facility requires an identification scheme to verify the person wishing to communicate.

C. User mobility and device portability. User mobility refers to a user who has access to the same or similar telecommunication services at different places, i.e., the user can be mobile, and the services will follow him or her. Examples for mechanisms supporting user mobility are simple call-forwarding solutions known from the telephone or computer desktops supporting roaming (i.e., the desktop looks the same no matter which computer a user uses to into the network).

With device portability the communication device moves (with or without a user). Many mechanisms in the network and inside the device have to make sure that communication is still possible while it is moving. A typical example for systems supporting device portability is the mobile phone system, where the system itself hands the device from one radio transmitter (also called a base station) to the next if the signal becomes too weak. Most of the scenarios described in this book contain both user mobility and device portability at the same time.

III. Five Characteristics of Mobile Learning Technologies

- **Portability:** The first mobile computers, the precursors to present time's laptops, were developed in the late 1970s and early 1980s inspired by the portability of Alan Kay's Dynabook concept from 1968 (Kay 1972).Ability to move a device within a learning environment or to different environments with ease.
- **Social Interactivity** Allows for data sharing and collaboration between users. Context Sensitivity Ability to gather and respond to real or simulated data unique to a current location, environment, or time.
- **Connectivity:** The wave of mobile computing had its origins in wireless telecommunication. As early as 1973, a Motorola team led by Martin Cooper developed and patented a handheld mobile phone concept that led to the first commercial mobile phone small enough to be carried, the DynaTAC 8000X, in 1983.Ability to be digitally connected for the purpose of communication of data in any environment.
- **Convergence:** One of the most interesting eras of mobile computing began when different types of specialised mobile devices began converging into new types of hybrid devices with fundamentally different form factors and interaction designs. The first phase of this was the emergence of "smart phones", which combined the functionality of a PDA with that of a mobile phone.
- **Individuality:** Ability to use the technology to provide scaffoldng on difficult activities and lesson customization for individual learners.

These characteristics allow mobile computing technologies to produce unique learning experiences, such as, authentic environment; recognition and reflection on accidental learning; enhanced capabilities to correspond with subject matter experts from the classroom to the field; the ability to share data over diverse geographic locations; and the ability to be individually intrigued by the learning at hand that traditional computing environments don't typically allow for. In addition, the personal nature of these devices provides opportunities for seamless integration of the unit into everyday lifestyles encouraging continuous learning opportunities regardless of time sensitivity and location.

APPLICATIONS

Today's mobile devices, such as smartphones and tablets, are an interaction designer's playground, not only because of the rich design space for multi-touch input, but also because these devices incorporate some fairly powerful sensors for 3D spatial input. Mobile computing applications can generally be divided into two categories--horizontal and vertical.

Table 1.

	Palmtops	Clamshells	Handheld Penkeys	Penslates	Laptops
Common Horizontal Applications	Contact Management , to-do lists , simple text editing , scheduling , email or messaging , voice memos .	Contact Management , to-do lists , word processing , spreadsheets , presentations , scheduling , email and messaging , Web browser , voice memos, fax	Normally do not have integrated horizontal applications.	Generally capable of executing same software as laptops. Not normally used for office automation due to slightly limited resources and lack of keyboard	Normally come preloaded with common office automation software : Word processing , spreadsheets , presentation , email, Web browser, fax , databases.
Common Vertical Application Functions	Automated data collection , remote database access , information retrieval	Automated data collection , remote data access , limited office automation.	Automated data collection , remote data access , transaction processing.	Automated data collection , remote data access , remote processing.	Automated data collection , remote data access , remote processing
Common Vertical Applications	Inspection , Auditing , Health care , Surveys , Inventory.	Sales , Inspection , Health care , Surveys , Inventory , Auditing	Trucking , Warehousing , Courier services , Airlines , Utility and field work)water, gas , electric , railroad , telephone, etc (. Restaurant , Inventory , Inspection	**Health Care , Insurance estimation , Decision Support System Access , Warehousing , Shipping , Mapping , Dispatch .**	Sales, Law enforcement , Service industries , Insurance , Engineering.

Although wireless networks and mobile communications can be used for many applications, some of them are given as follows.

1. News Reporting

In the media industry, the timing and quality of coverage is critical. Mobile computing increases the quality of the information from the media crews and significantly decreases the time required to process and transmits the story for publication

2. Transportation and Shipping

Tomorrow's cars will comprise many wireless communication systems and mobility aware applications. Music, news, road conditions, weather reports, and other broadcast information are received via digital audio broadcasting (DAB) with 1.5 Mbits/s. For personal communication, a global system for mobile communications (GSM) phone might be available offering voice and data connectivity with 384 kbits/s. For remote areas satellite communication can be used, while the current position of the car is determined via global positioning system (GPS). Additionally, cars driving in the same area build a local adhoc network for fast information exchange in emergency situations or to help each other keeping a safe distance. In case of an accident, not only will the airbag be triggered, but also an emergency call to a service provider informing ambulance and police. Cars with this technology are already available. Future cars will also inform other cars about accidents via the ad hoc network to help them slow down in time, even before a driver can recognize the accident. Buses, trucks, and train are already transmitting maintenance and logistic information to their home base, which helps o improve organization (fleet management), and thus save time and money.

3. Emergencies

Just imagine the possibilities of an ambulance with a high quality wireless connection to a hospital. After an accident, vital information about injured persons can be sent to the hospital immediately. There, all necessary steps for this particular type of accident can be prepared or further specialists can be consulted for an early diagnosis. Furthermore, wireless networks are the only means of communication in the case of natural disasters such as hurricanes or earthquakes.

4. Business

Today's typical traveling salesman needs instant access to the company's database: to ensure that the files on his or her laptop reflect the actual state, to enable the company to keep track of all activities of their traveling employees, to keep databases consistent etc., with wireless access, the laptop can be turned into a true mobile office. Many companies have implemented and/or are expanding their implementation of a wide variety of mobility and collaboration applications. In a survey commissioned by Cisco Systems, line-of-business decision-makers (e.g., from operations, sales, finance, and corporate management) identified the organization's current and planned mobility and collaboration applications deployment for smart phones and tablets.

5. Education

In the higher education it is very important for all purpose like Viewing documents and accessing employee portals, email, or calendars are widely deployed apps. More than 70% of surveyed respondents have deployed applications that enable employees to view documents, spreadsheets, or presentations. In addition, push email remains a critical mobile application, and 65% of firms have implemented or are upgrading their implementation of this application. Another 16% of firms are planning to implement email or calendar applications.

Results

These examples have demonstrated the types of operational efficiency improvements that can be gained through the use of mobile computing technology. The improvements in efficiency made possible by mobile computing are impressive.

MOBILE AND WIRELESS DEVICES

- Two main types: terrestrial cellular and satellite networks
- Determine to a large extent application architectures and usable protocols
- Communication autonomy is an important feature of the terminals in these networks: thus the terminals are not always reachable for variety of reasons

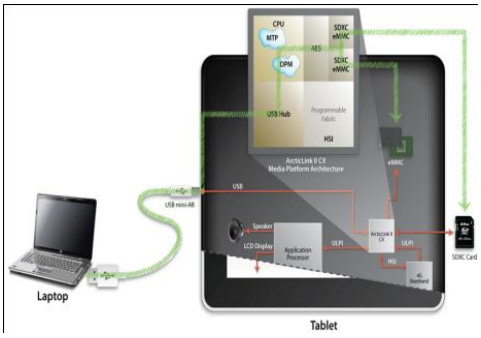
Currently, laptops are considered to be the upper end of the mobile device range. Following list gives some examples of mobile and wireless devices graded by increasing performance (CPU, Memory, Display, Input devices etc.)

Tracking Systems and Sensors:

Spatial tracking systems sense the position, orientation, linear or angular velocity, and/or linear or angular acceleration of one or more objects. Traditionally, 3D UIs have been based on six-degree-of-freedom (6-DOF) position trackers, which detect the absolute 3D position (location in a fixed XYZ coordinate system) and orientation (roll, pitch, and yaw in the fixed coordinate system) of the object, which is typically mounted on the head or held in the hand. A very simple wireless device is represented by a sensor transmitting state information. An example for such a sensor could be a switch sensing the office door. If the door is closed, the switch transmits this state to the mobile phone inside the office and the mobile phone will not accept incoming calls. Thus, without user interaction the semantics of a closed door is applied to phone calls.

Tablets:

Tablets are often used for analytics and modeling as well as to access web meetings and videoconferences. Device form factors also impact employee adoption of particular activities. For example, the larger screen size and processing power of tablets makes these devices ideal for analytics and modeling activities, enabling access to web meetings, and supporting videoconferences. Survey results show that 43% of employees use their tablets to access web meetings, 40% engage in processor-intensive analytics activities, and 33% use tablets to access videoconferences. In comparison, only 10% to 13% of employees use their smartphones to engage in these activities.



Pager:

A very simple receiver, a pager can only display short text messages, has a tiny display, and cannot send any messages. Pagers can even be integrated into watches.

Mobile Phones:

The traditional mobile phone only had a simple black and white text display and could send / receive voice or short messages. Today, however, mobile phones migrate more and more toward PDAs. Mobile phones with full color graphic display, on the internet browser are available.

Personal digital assistant:

PDAs typically accompany a user and officer very simple versions of office software (calendar, notepad, mail). The typical input device is a pen, with built in character recognition translating hand writing into characters. Web browsers and many other software packages are already available for these devices.

Palmtop/pocket computer:

The next step toward full computer are pocket computers offering tiny keyboards, color displays, and simple versions of programs found on desktop computers (Text processing, Spread Sheets etc.,).

Notebook/Laptop:

Finally, laptops offer more or less the same performance as standard desktop computers; use the same software, the only technical difference being size, Weight, and ability to run on a battery.

IV. THE IMPACT ON NETWORK QUALITY AND THE USED EXPERIENCE

Mobile Internet is all about Internet access from mobile devices. Well, it's true, but the ground realities are different. No doubt Internet has grown fast, well really fast! But mobile Internet is poised to grow even faster. The fundamental difference lies in the fact that whereas academics and scientists started the Internet, the force behind mobile Internet access is the cash-rich mobile phone industry. Mobile industry has always been looking for more avenues to make more money and in this attempt; the mobile industry besides carefully finding about the needs and requirements for a mobile data user is also creating new demand patterns also. What makes things even more favorable for the mobile Internet is that it already has a lot of Internet-based content from which to draw. This can be adapted for display on mobiles in a number of ways. A website can be viewed using a phone that is WAP-enabled.

The issue is that with a range of mobile devices and underlying mobile wireless technologies, developing services specific to each type of equipment and specific to a particular technology is troublesome. An application written for specific equipment and a specific technology won't work anywhere else. This calls for a standardization, which provides a generic model where applications can be written without keeping in mind the equipment and the technology. On the equipment side, the wireless devices represent the ultimate constrained computing device with:

1. **Slow Response Times.** A slow network response time, or high latency, impacts the user in a couple of different ways. First, a slow response time causes the user to wait for the requested action to take place. Second, high network latency can impact the quality of real-time applications, such as VoIP or video conferencing. Finally, high latency indirectly impacts the achievable throughput since the TCP protocol requires confirmation for each data packet that is sent before it sends the next packet. With today's 3G network technologies, which are capable of sub- 100ms round trip time (RTT) pings, a slow response time generally indicates network congestion either within the backhaul, air interface, BSC and/or Radio Network Controller (RNC).

2. **Low Average Throughput.** Users may not understand what a megabyte is, but for some reason they all understand the meaning of Mbps, or at least they know that higher is better. Further, even if a consumer is unaware of the actual data rate, a slow connection is readily apparent. Microsoft Outlook is an inherently chatty application that suffers from low throughput and high latency and is susceptible to long synch times.

3. **Poor Coverage.** A poor user experience, such as the inability to connect, a dropped call, or low data rates, is usually due to poor network coverage and not to network congestion. Operators face numerous constraints which limit their ability to deploy a cell site wherever they desire. Further, the effective range of an RF signal has to adhere to the basic laws of physics, so the further a mobile device is from the serving cell site, the poorer the signal quality, and the lower the achievable data rate.

4. **Rapid Battery Consumption.** When a device checks, connects, transmits, receives and acknowledges the receipt of packets of information from a network it consumes more energy and its battery life is reduced. With smart phones, increased battery life has become a key factor leading to consumer satisfaction.

- Smaller displays
- Different input devices (e.g., a phone keypad, voice input, etc.)

However, most important of all, wireless subscribers have a different set of essential desires and needs than desktop or even laptop Internet users. With the emergence of 3G technologies, the constraint on the low data rates may not be as limiting as it is today but is must be understood clearly that, as bandwidth increases, the handset's power consumption also increases which further taxes the already limited battery life of a mobile device. Therefore, even as wireless networks improve their ability to deliver higher bandwidth, the power availability at the handset will still limit the effective throughput of data to and from the device. A wireless data solution must be able to overcome these network limitations and still deliver a satisfactory user experience.

V. A MODEL OF MOBILE COMPUTING

The mobile-computing environment consists of mobile computers, which are referred to as **mobile hosts,** and a **wired network** of computers. The communication between the Mobile hosts and the wired network takes place through the computers referred to as **mobile support stations**. A mobile support station manages the mobile hosts within its cell. But what is a cell? A cell is defined as the geographical area covered by a mobile support station. Mobile hosts may move between cells, thus, necessitating a transfer of control from one mobile support station to another. Since mobile hosts may, at times, be powered down, a host may leave one cell and re-materialize later at some distant cell. Therefore, moves between cells are not necessarily between adjacent cells. Within a small area, such as a building, Mobile hosts may be connected by a wireless local-area network within a small area, which may provide lower-cost connectivity than a wide-area cellular network. This will also reduce the overhead of transfer of control.

VI. CONCLUSION

Mobile Computing and Communications is useful for wireless Networks. The study of different versions will give differences between Mobile Computing and Communications, Access Control, Security etc., the traditional mobile phone only had a simple black and white text display and could send / receive voice or short messages. Today, however, mobile phones migrate more and more toward PDAs. Mobile phones with full color graphic display, on the internet browser are available. It is critical to understand and appreciate that the mobile data traffic in a network is never uniformly distributed. This phenomenon means that at any given location and point in time a network may have reached its maximum capacity in some cells while surrounding cells may have unused and available capacity.

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