# Chapter 3.7
# PDA Usability for Telemedicine Support*

**Shirley Ann Becker**
*Florida Institute of Technology, USA*

## INTRODUCTION

Telemedicine is broadly defined as the use of information and communications technology to provide medical information and services (Perednia & Allen, 1995). Telemedicine offers an unprecedented means of bringing healthcare to anyone regardless of geographic remoteness. It promotes the use of ICT for healthcare when physical distance separates the provider from the patient (Institute of Medicine, 1996). In addition, it provides for real-time feedback, thus eliminating the waiting time associated with a traditional healthcare visit.

Telemedicine has been pursued for over three decades as researchers, healthcare providers, and clinicians search for a way to reach patients living in remote and isolated areas (Norris, 2001). Early implementation of telemedicine made use of the telephone in order for healthcare providers and patients to interact. Over time, fax machines were introduced along with interactive multimedia, thus supporting teleconferencing among participants. Unfortunately, many of the early telemedicine projects did not survive because of high costs and insurmountable barriers associated with the use of technology.

Telemedicine has been resurrected during the last decade as a means to help rural healthcare facilities. Advances in information and communications technology have initiated partnerships between rural healthcare facilities and larger ones. The Internet in particular has changed the way in which medical consultations can be provided (Coiera, 1997). Personal computers (PCs) and supporting peripherals, acting as clients, can be linked to medical databases residing virtually in any geographic space. Multimedia data types, video, audio, text, imaging, and graphics promote the rapid diagnosis and treatment of casualties and diseases.

Innovations in ICT offer unprecedented healthcare opportunities in remote regions throughout the world. Mobile devices using wireless connectivity are growing in popularity as thin clients that can be linked to centralized or distributed medical-data sources. These devices provide for local data storage of medical data, which can be retrieved and sent back to a centralized source when Internet access becomes available. Those working in nomadic environments are connected to data sources that in the past were inaccessible due to a lack of telephone and cable lines. For the military, paramedics, social workers, and other healthcare providers in the field, ICT advances have removed technology barriers that made mobility difficult if not impossible.

Personal digital assistants (PDAs)[1] are mobile devices that continue to grow in popularity. PDAs are typically considered more usable for multimedia data than smaller wireless devices (e.g., cell phones) because of larger screens, fully functional keyboards, and operating systems that support many desktop features. Over the past several years, PDAs have become far less costly than personal-computing technology. They are portable, lightweight, and mobile when compared to desktop computers. Yet, they offer similar functionality scaled back to accommodate the differences in user-interface designs, data transmission speed, memory, processing power, data storage capacity, and battery life.

## BACKGROUND

Computing experts predicted that PDAs would supplant the personal computer as ubiquitous technology (Chen, 1999; Weiser as cited in Kim & Albers, 2001). Though this has not yet happened, PDA usage continues to grow with advances in operating systems, database technology, and add-on features such as digital cameras. They are being used in sales, field engineering, education, healthcare, and other areas that require mobility. In the medical field, for example, they are being used to record and track patient data (Du Bois & McCright, 2000). This mobility is made possible by enterprise servers pushing data onto these devices without user intervention. Enterprise servers are also capable of pulling data from a localized (PDA) database such that centralized data sources are readily updated.

A PDA synchronizes with laptops and desktop computers, making data sharing transparent. This is made possible by a user interface and functionality that are compatible in terms of computing capabilities and input and output devices (Myers, 2001). Compatibility is a major issue in telemedicine given that medical and patient data gathered or stored on a PDA is typically sent to a centralized data source. Nomadic use of PDAs mandates this type of data integration whether it is real-time or batched data when wireless connectivity is temporarily inaccessible (Huston & Huston, 2000). In addition, telemedicine data sharing is typically asymmetric in that the enterprise server transmits a larger volume of medical data to the PDA. In turn, the PDA transmits only a small volume of patient data to the server (Murthy & Krishnamurthy, 2004).

Though PDAs hold great promise in promoting healthcare in remote regions, the usability of these devices continues to be an issue. There are physical constraints that typically do not apply to a laptop or desktop computer (Table 1 describes these constraints). The user interface of a PDA is modeled after a desktop environment with little consideration for physical and environmental differences (Sacher & Loudon, 2002). Yet, these differences are significant in terms of usability given the small screen and keyboard sizes and limited screen resources in terms of memory and power reduction (Brewster, 2002).

There has been important research on PDA usability, primarily in the effective use of its limited screen area. Early research focused primarily on the display of contextual information in order to minimize waste of the screen space while maximizing content (Kamba, Elson, Harpold, Stamper, & Sukariya as cited in Buchanan, Farrant, Jones, Thimbleby, Marsden, & Pazzani, 2001). More recent efforts are taking into account not only screen size, but navigation, download time, scrolling, and input mechanisms (Kaikkonen & Roto, 2003).

## Related Content

Language Processing in the Human Brain of Literate and Illiterate Subjects
Xiujun Li, Zhenglong Linand Jinglong Wu (2013). *Biomedical Engineering and Cognitive Neuroscience for Healthcare: Interdisciplinary Applications (pp. 201-209).*
www.irma-international.org/chapter/language-processing-human-brain-literate/69920

Integration of Acoustic Emission and Ultrasound for Needle Guidance in Interventional Procedures
Laveena Kewlani, Alfredo Illanes, Björn Menzeand Michael Friebe (2020). *International Journal of Biomedical and Clinical Engineering (pp. 45-55).*
www.irma-international.org/article/integration-of-acoustic-emission-and-ultrasound-for-needle-guidance-in-interventional-procedures/253095

A SVM Based Automated Detection of Uterine Fibroids Using Gabor and Wavelet Features
N. Sriraam, D. Nithyashri, L. Vinodashriand P. Manoj Niranjan (2012). *International Journal of Biomedical and Clinical Engineering (pp. 77-85).*
www.irma-international.org/article/svm-based-automated-detection-uterine/73695

Importance of Biotechnology in the Development of Functional Foods in Emerging Countries: The Case of Chile
Carolina Alejandra Oliu (2017). *Comparative Approaches to Biotechnology Development and Use in Developed and Emerging Nations (pp. 269-281).*
www.irma-international.org/chapter/importance-of-biotechnology-in-the-development-of-functional-foods-in-emerging-countries/169521

Functional Genomics Applications in GRID
Luciano Milanesi, Ivan Merelliand Gabriele Trombetti (2009). *Handbook of Research on Computational Grid Technologies for Life Sciences, Biomedicine, and Healthcare (pp. 149-167).*
www.irma-international.org/chapter/functional-genomics-applications-grid/35692