iPad Usage Design As Alternative Media In Medical Informatics Activities

Budi Berlinton Sitorus
Universitas Pelita Harapan
Jl.M. Thamrin No.2, Karawaci , Tangerang
Mobile : (0813-7484-9585) Fax : (021-5460910)
e-mail: budi.sitorus@uph.edu

Abstrak

Di awal tahun 2010, sebuah perangkat layar sentuh iPad diluncurkan dengan tawaran berbagai fitur yang disediakan. Komputer tablet dengan bentuknya yang semakin tipis dan ringan memiliki kecenderungan untuk menggantikan peran laptop atau Personal Computer (PC). Informatika medis merupakan satu disiplin ilmu yang melibatkan sains informasi, sains komputer dan pelayanan kesehatan. Salah satu perangkat yang cukup banyak digunakan dalam aktifitas informatika medis adalah laptop. Berdasarkan penelitian yang dilakukan maka dilakukan perancangan iPad sebagai media alternatif untuk digunakan dalam aktivitas Informatika medis melalui fitur-fitur yang disediakan oleh perangkat ini. Diharapkan dengan rancangan ini maka iPad akan dapat digunakan dalam aktivitas informatika medis sehingga aktivitas-aktivitas tersebut menjadi lebih efektif.

Kata kunci: *iPad, informatika medis, layar sentuh*

Abstract

In early 2010, a touch screen device, iPad, was launched along with offers of various features provided. Tablet computer with its thinner shape and lighter tends to replace role either laptop or personal computer (PC). Medical informatics is a field that involves information science, computer science and health care. One of devices commonly used is laptop. According to the research conducted, a design of iPad usage as alternative media in medical informatics activity was created through its features. This design was expected to make iPad be useful in medical informatics activities and create them to be more effective.

Keywords*: iPad, medical informatics, touch screen*

1. Introduction

The most common touch screen technology used nowadays is transparent panel coated with thin layer of conductive electrostatic material which detects current flows while touched [6]. When the tip of the finger touches screen, this device will detect the alternating current around the touched area, and the signals are sent to CPU to determine the next steps being taken. The usage of this touch screen technology grows rapidly. It can be seen according to IHL Consulting Group data, that customer in the United States spent $123 billion for kiosk customer in 2003, 80% grows compared to previous year [25].

Touch screen is type of monitor with plastic as the outer layer, and behind this is cross invisible infrared light. This touch screen technology is easy to use, more at the time one needs information instantly [26]. Based on the research by Radvan, computerized health information program indicated potentials to improve knowledge, attitude and behavior [1]. In this research , Radvan used touch screen technology to conduct two methods, (1) through intercept survey and (2) utilization study. Other benefit of the touch screen technology is logging of touch screen user's activities may be analyzed to see the behavior of the users. This was shown by the research conducted by Nicholas and colleagues to the public health devices that used touch screen technology across England in [2]. In the research, a matrix to categorize the users based on the usage patterns of the touch screen technology was returned and also a method for accessing kiosk utilization of the touch screen technology was proposed

The usage of the touch screen are also applied to the delivery of e-government through touch screen technology kiosk referred to the research of Slack & Rowley in 2004. In that research proprosed the strategic challenges how to deliver e-government through kiosks which need some negotiations for some years in the future to the success of kiosk application in enhancing accessibilities and involvement with[2]. The touch screen technology was also used by Ohbayasi in his research in 2000, in creating the nuclear particle data retrieving system using iPad [3].

Marion Ball as academic representative of the United States inferred the the application of the information concepts to all health profession academics is more appropriate as health information [4]. Information exegesis between the health information versus medical informatics was based on differences in language and academic tradition [5]. Degoulet P and Fieschi M inferred that integrated process of the heatlh care in patient individual level is more appropriate as clinical informatics [6]. To a moderate academic group, the consideration of the differences of the health informatics and medical informatics is not a big problem. Mark Musen is one that consider the historically fierce debates concerning whether our field should be called medical informatics or health informatics seem less important when our focus is on the unifying methodology" [27].

Based on the research, more than 50% of physicians in Organisation for Economic Co-operation and Development (OECD) countries and by 75% of United States residents used personal digital assistant (PDA) and Smartphones [7][8][9]. Those indicate significantly increasing of the handheld users. Instead of the manual procedures, handheld computers are used to access medical literature, display electronic pharmacopeias, track patients, or prescribe drugs [10]. In his research, Lal et al. used handheld computers for data collection in burn patients [11]. Handheld computers were found to be 23% faster and 58% more accurate than paper and pencil recording. Their multiple functionalities associated with user-friendly touch screen technologies make them a particularly attractive alternative to paper-based diaries or questionnaires for patients' self reporting use, particularly children and young adults[12][13][14] the electronic format of handheld computers allows the capture and recording not only of text data but also of virtual electrocardiograms, electrochemical data and photographs. These can be encrypted and transmitted to a central database management system through a wireless connection to a local area network (LAN) or the Internet.[15][16]. Since 2000, more than 40,000 handhelds have been sold in 48 countries for use in clinical trials [15]. According to research conducted by Haller G. et.al, the use of handheld computer was found to be slower and less accurate for the purpose of data recording, and this open new perspectives for the development and use od different devices such as tablet-PC for collecting data in clinical [17].

Research conducted by McAlearney showed that the size of the handheld computers became a problem during the data entry process [18]. This open an opportunity to bigger size device such as iPad as an alternative media to use in medical informatics activities. Research of Rossi in 2006 described that Innovations in hardware and software technologies and more particularly the development of tablet personal computers and ultralight laptops with foldable screens will increasingly challenge the use of handheld computers in clinical research in the future [19]. The use of computers and the related technology is essential for communication and information-sharing with colleagues, for public and patient education, and for professional development [19][20][21][22][23][24].

Based on an initial research of exploring the iPad potentials as an alternative media in medical informatics activity, a design of iPad usage to be a media in increasing effective process in medical informatics activities was proposed [28]. It started with investigating its standard features and then categorizing the potentials of the standards features to use it as useful media in activity. Not all of them are potential to use in medical informatics activity, and from the research showed that it was also possible to develop specific application to increase the effective process and enhance the health service to the patient. Within some activities in medical informatics, a scenario was chosen to show the use of the iPad in that activity, which was the use of the iPad for showing the X-ray photo to the patients through existing room TV instead of using the manual way by placing the X-ray film to the light provided in place.

2. Research Method

Research was divided into two stages, as seen in Figure 1. There were four main steps , two steps in the first phase and two other steps in the second phase. The first step was investigation of the iPad features that potential to the activity of medical informatics. The second step was categorizing them.

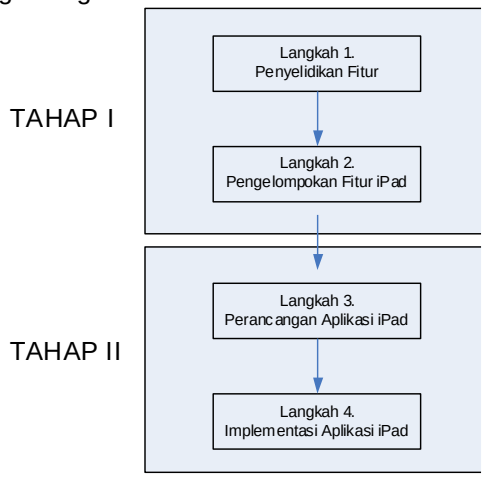

Figure 1. Research Phases [28]

The design of iPad usage was derived from first phase of the research. The result of the first phase was shown in Table 1. Most of iPad standard applications have great potential be used in medical informatics activity.

Table 1. Potentials iPad Apps [28]

Nama Aplikasi	Berpotensi
Calendar	Y
Contacts	Y
Notes	Y
Maps	T
Videos	Y
YouTube	Y
iTunes	Y
App Store	Y
Game Center	T
Safari	Y
Mail	Y
Photos	Y
iPod	Y

Note : Y = Ya ; T = Tidak

There are two groups of the application, general and specific purposes application. Standard applications that come with iPad are in the general purposes group. To fulfill the needs of specific tasks, therefore it is possible to build new application. Application to run on iPad is built using iOS programming. Here in the following is the algorithm of using the iPad as alternative media.

Algorithm:
Step 1: Find a scenario of medical informatics activities for iPad

Step 2: Choose standard application to use
Step 3: Replace the old method to new method with iPad as media
Step 4: Get benefit value from the new method

The first step is to find one scenario of the activities in medical informatics. There are a lot of activities in medical informatics. One of the common activities is procedure for displaying an x-ray image to a patient. Normally an x-ray photo is placed in a box with neon light inside or behind the box. In hospital, either each room equipped with the box or it is located in the center room in the ward where the doctors gather to discuss about the condition of the patients. The size of the x-ray photo plastic material is not quite handy. In the second situation, it is difficult for the patient to see the result of the x-ray photo, and for this case, doctors will only show the result to patients relatives. Both cases show an ineffective process. Therefore, a digital image of x-ray photo may solve this problem, and it is possible to be displayed using an iPad. The second step is to choose standard application to use for the case. In this case, possible apps to use are Email and Photos Applications. Photo application is used for displaying any supported digital photo file and email application is used for receiving the x-ray photo in digital format having converted from original form, plastic material x-ray photo. The next step is to replace the old method to the new method where iPad used as media to display the x-ray photo. The final step is to get benefit from applying the new method.

Other alternative may be used to display the digital x-ray photo instead of showing directly the photo to the patient from iPad, which is displaying the x-ray photo through iPad to an TV. It is possible to mirror iPad display to a TV, monitor, projector or LCD display that uses a VGA connector. This can be done to use existing equipment in patient room, for TV in one of the common equipment provided in room. By using this method it is possible not just for the patient to see the display of the x-ray photo, even the patient relatives. To enable this function in iPad, either a VGA adapter or AV adapter cable should be user. The new method will return efficiency in one of medical informatics activities.

3. Results and Analysis

The new design of using iPad as media in one chosen activity that replace the old method of displaying x-ray photo to patient can be seen in Figure 2. In the figure, the x-ray photo is easily scaled by finger tips. By this new design, the doctor is able to explain the x-ray to the patients closer, despite in the old method, patient must see the result of the x-ray photo at a distance between his/her bed to the location where the light box for displaying it located, even sometimes the box not located in the room but somewhere in the ward. Figure 3 shows diagram several ways to extend the iPad display to other equipments.

Figure 2. Scalable X-ray Photo

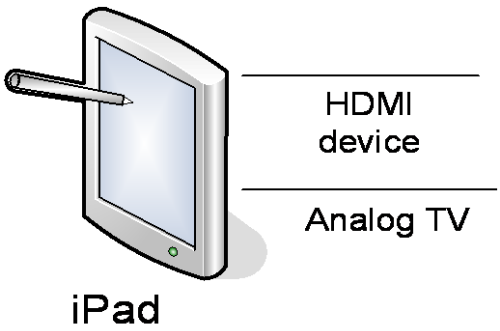

Figure 3. Extending iPad Display

The most common existing TV placed in patient room is an analog TV. To extend iPad to an analog TV , a composite AV cable is required, then the x-ray photo displayed on iPad willalso be mirrored to the TV. In this case, the patient and other are possible to see the x-ray photo.

In this research, two iPad standard applications were employed to support this new method. They were photo and email application. Email application was used to receive x-

ray photos in digital format and photo application was to display the photo. Email application is not the only way to receive the data. iPad used in this research supported several ways for the purpose of retrieving, and it can be seen in Figure 4. Figure 4 shows that iPad supports to communicate to other device via Cable, 3G, WiFi and Bluetooth, therefore it is possible to receive the x-ray data from one of them.

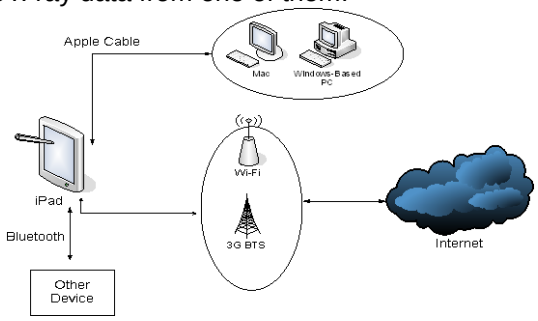

Figure 4. Several Ways iPad to Communicate

The new method proposed to make the iPad as alternative media in a medical informatics activity seems quite promising to improve the quality of the medical service. It is shown by the doctor which may be closer to the patients to explain about x-ray photo and the time efficiency of processing digital data instead of manual data of the x-ray photo in form of plastic material and larger size. Although this new method offers some benefit, some aspect must be consider carefully to ensure that the person must be capable to operate the device otherwise it may create new problem. To anticipate this, an intensive training about how to use the device should be provided.

4. Conclusion

The design to make iPad as an alternative media in medical informatics activity will benefit the medical service by the improvement of the service, especially services to the patients and also the efficiency of the time to finish activity instead of the old procedure. The development of the research is possible to apply the role of the iPad as alternative media in other medical informatics activities.

References

[1] Radvan D., et.al, HEALTH C.H.I.P.s: opportunistic community use of computerized health information programs, Health Education Research, Oxford University Press. 2004; 19(5).
[2] Slack F., Rowley J.E., Challenges in the Delivery of E-Government through Kiosks, Journal of Information Science. 2004, 30: 369-377.
[3] Nicholas D., et.al,2003, An Evaluation of the Health Applications (and Implications) of Digital Interactive Television: Case Study of the Livinghealth Channel, Journal of Information Science June 2003; 29(3): 181-192.
[4] Ball MJ. , Commentary on Reinhold Haux: Aims and Tasks of Medical Informatics. International Journal of Medical Informatics.1997; 44 :39-44.
[5] Hasman A, Haux R, Albert A. A systematic view on medical informatics. Computer Methods and Programs in Biomedicine. 1996 ; 51:131-139.
[6] Degoulet P, Fieschi M. , Critical dimensions in medical informatics. International Journal of Medical Informatics. 1997 ; 44: 9-20.
[7] Miller RH, Hillman JM, Given RS. Physician use of IT: Results from the Deloitte Research survey. J Healthc Inf Manag.2004; 18(1):72– 80.
[8] Martin S. MD's computer, PDA use on the upswing. CMAJ.2002;167(7):794.
[9] Garritty C, El Emam K. Who's using PDAs? Estimates of PDA use by health care providers: A systematic review of surveys. J Med Internet Res.2006;8(2):e7.
[10] Fischer S, Stewart TE, Mehta S, Wax R, Lapinsky SE. Handheld computing in medicine. J Am Med Inform Assoc.2003;10(2):139–49.
[11] Lal SO, Smith FW, Davis JP, et al. Palm computer demonstrates a fast and accurate means of burn data collection. J Burn Care Rehabil. 2000;21(6):559–61; Discussion:8.
[12] Palermo TM, Valenzuela D, Stork PP. A randomized trial of electronic versus paper pain diaries in children: Impact on compliance, accuracy, and acceptability. Pain. 2004;107(3): 213–9.

[13] Palen LA, Graham JW, Smith EA, et al. Rates of missing responses in personal digital assistant (PDA) versus paper assessments. Eval Rev.2008;32(3):257–72.
[14] Bobula JA, Anderson LS, Riesch SK, et al. Enhancing survey data collection among youth and adults: Use of handheld and laptop computers. Comput Inform. Nurs. 2004;22(5):255– 265.
[15] Liao WY, Lee YG, Huang CY, et al. Telemetric electrochemical sensor. Biosens Bioelectron 2004;20(3):482–90.
[16] Pettis KS, Savona MR, Leibrandt PN, et al. Evaluation of the efficacy of hand-held computer screens for cardiologists' interpretations of 12-lead electrocardiograms. Am Heart J.1999;138(4Pt 1):765–70.
[17] Haller et.al, Handheld vs. Laptop Computers for Electronic Data Collection in Clinical Research : A Crossover Randomized Trial, Journal of the American Medical Informatics Association. 2009; 16(5): 658.
[18] McAlearney AS, Schweikhart SB, Medow MA. Doctors' experience with handheld computers in clinical practice: Qualitative study. BMJ 2004;328(1162):1–5.
[19] Candy PC. Preventing "information overdose": developing information literate practitioners. J Contin Educ Health Prof. 2000;20:228–237.
[20] Kaufman DM, Jennett PA. Preparing future physicians: integrating medical informatics into the undergraduate medical education curriculum. StudHealth Technol Inform. 1997;39:543–546.
[21] [Contemporary issues in medicine—medical informatics and population health: report II of the Medical School Objectives Project. Acad Med. 1999;74:130–141.
[22] Moehr JR, Grant A. Medical informatics and medical education in Canada in the 21st century. Clin Invest Med. 2000;23:275–280.
[23] Candler C, Andrews MD. Technology in medical education: how the OU College of Medicine has used technology to enhance the medical education experience. J Okla State Med Assoc. 2004;97:8–10.
[24] Carney PA, Poor DA, Schifferdecker KE, Gephart DS, Brooks WB, Nierenberg DW. Computer use among community-based primary care physician preceptors. Acad Med. 2004;79:580–590
[25] Morley D., Parker C.S., Understanding Computers : Today and Tomorrow, Thomson, 2007 O'Leary T.J, O'Leary L.I., Computing Essensials, Mc.Graw Hill, 2010
[26] Musen AM. , Medical Informatics: Searching for Underlying Components Methods of Information in Medicine 2002.
Sitorus B.B., Exploration of iPad Potentials as Media for Medical Informatics Applications, Report number : P-003-FIK/IV/2011. 2011.