

**Mobile Reservation Application for Kedah Public Library  
Corporation (MRA-KPLC)**

**A thesis submitted to the Graduate School in partial fulfillment of the requirements  
for the degree Master of Science (Information and Connection Technology)  
Universiti Utara Malaysia**

**By**

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## ABSTRACT

Mobile technology enables people to access digital information located in the Internet or also beyond the reach of stationary Internet access. The focus of this project is to apply Mobile-application field, particularly in library services. To describe a development of mobile application to be prospect solution in Perbadanan Perpustakaan Awam Kedah or (Kedah Public Library Corporation). The research is dedicated to find new way for those who want to reserve library books and other functions like search source, loan issue, return, renew duration whenever they want, and wherever they are. The research provides methods and techniques to collect the data from interviews to analysis of data using multiple-methods and the Object-Oriented approach. The methodology phases of this project were adopted from Object Oriented Development Life Cycle. Lastly to evaluate this application, a questionnaire usability testing was conducted.

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## **CHAPTER ONE**

### **INTRODUCTION**

This chapter highlights introduction (see 1.1 section), it discusses the problem statement (see 1.2 section), significance of study (see 1.3 section), research question (see 1.4 section), objectives of research project (see 1.5 section), Research Scope (see 1.6 section), and report structure (see 1.7 section).

#### **1.1 Introduction**

In the last two centuries mobility has been redefined, both physical and virtual objects are now mobile. Mobility of physical objects relate to movement of matters, whereas movements of virtual objects relate to movements of bits and bytes (Talukder & Yavagal, 2007). The past century has brought about many changes in information and communications technology, from the invention of the telephone and broadcast technologies to the invention of the personal computer and the internet. These changes have enabled us to exchange information with other individuals and to retrieve data from vast databases instantly (Milroy, et al, 2002; Trappey, et al, 2004). Nowadays, self dealing of library material and other self-service activities are becoming increasingly prevalent as users are given more choice over how they manage their library support, not only do the users have more control, but also self-service helps others by cutting down the need for queuing and releasing staff time to concentrate on providing other value services such as information handling skills training and individual tutorial help (Morgan & Atkinson, 2000).

According to Madam Nurina, a system analyst from Kedah Public Library Corporation-KPLC or (Perbadanan Perpustakaan Awam Kedah), the library has been established in 1978 in Alor Star City, between that year up to 1993 the library was moved from one location to another. Finally, in 1994 the present Sultan of Kedah opened the new site for library located in Jalan Kolam Air within the city center. KPLC plays a vital role to disseminate knowledge among the city community, and its objectives:

- a. To provide useful free and unlimited information.

The contents of  
the thesis is for  
internal user  
only

## REFERENCES

- Abdul Karim, N. S., Darus S. H., & Hussin, R. (2006). Mobile phone application in academic library services: a students' feedback survey. *Wide Information Systems*, 23(1), 35.
- Afonoso, A. P., Silva, M. J., (2005). Dynamic information to mobile users, *mobile networks and applications*, 9(5), 529-536.
- Alahuhta, P., Helaakoski, H., & Smirnov, A. (2005). Adoption of mobile services in business - case study of mobile CRM. *Digital Object Identifier*, 22, 531 – 534.
- Alan, D., Wixom, B. H., Tegarden, D. (2005). *Systems analysis and design with UML version 2.0: an object-oriented approach*. Hoboken, USA: *John Wiley & Sons*.
- Anckar, B., & D'Incau, D. (2002). Value-added services in mobile commerce: An Analytical Framework and Empirical Findings from a National Consumer Survey. *IEEE computer society*, 7, 1444-1453.
- Arrington, C. T. (2001). *Enterprise java with UML*. USA, John Wiley & sons, pp.44
- Arrington, C. T. & Rayhan, S. H. (2003). *Enterprise java with UML*. Indaina, USA: Joe Wikert.
- Barnum, C. M. (2002). "Usability testing and research", New York, *Pearson Education*.
- Bente, S. (2007). Design of Mobile Services Supporting Knowledge Processes on Building Sites. *Digital Object Identifier*, 1, 10-10.
- Birmingham, W. P., Gupta, A. P., Siewiorek, G. D. (1992). *Automating the design of computer systems the MICON*. London: Jones and Bartlett publishers.
- Brown, D. W. (2002). *An introduction to object-oriented analysis objects and UML in plain English*. New York: John Wiley & sons.
- Caron, J.R., Jarvenpaa, S.L., Stoddard, D.B. (1994). Business reengineering at CIGNA corporation: experiences and lessons learned from the first five years. *MIS Quarterly*, 18, 233-50.
- Chau, P., Cole, M., Massey, A., Motoya-Weiss, M., O'Keefe, R. (2002). Cultural differences in consumer's online behaviors. *Communications of the ACM*, 45(10), 45-50.
- Edwards, P. (1993). *System analysis and design*. Watsonville, USA: *McGraw-Hill*.

Gaffney, G. (1998). "Usability evaluation checklist for web sites", available at: <http://www.infodesign.com.au/usabilityresources/evaluation/usabilitytestingmaterials.asp>

George, J.F., Batra, D., Valacich, J. S., Hoffer, J. A. (2004). *Object-Oriented systems analysis and design*. New Jersey: Pearson Education.

Glasgow, Eric. (2002). "A history the Birmingham University Library", *Library Review*, 51, 373-378.

Graham, R. A. (2002). Wireless use in libraries. *Library Hi Tech*, 20, 237-240.

Gruhn, V., Köhler, A., & Klawes, R. (2007). Modeling and analysis of mobile business processes. *Journal of Enterprise Information Management*, 20(6), 657-676.

Harrison, K. C. (1994). Why Library History?. *Library Review*, 43, 9-13.

Heikkinen, T. M., & Still, J. (2005). Business networks and new mobile service development. *Digital object identifier*, 6, 144-151.

Hoffer, J. A., George, J. F., & Valacich, J. S. (2002). *Modern systems analysis and Design*. New Jersey: Pearson Education.

Jing, J., Sumi, A., Elmagarmid, A. (1999), "Client-server computing in mobile environments", *ACM Computing Surveys*, 31,117-57.

Jorns, O., Jung, O., & Quirchmayr, G. (2007). A Privacy Enhancing Service Architecture for Ticket-based Mobile Applications. *Digital object identifier*, 10,139-146.

Jorstad, I., Thanh, V. D., & Dustdar, S. (2005). The personalization of mobile services. *Digital Object Identifier*, 4, 59 – 65.

Kenneth, E. K., Julie E. K., (2008). *System analysis and Design*. New Jersey: pearson Education.

Kifer, M., Bernstein, A., Lewis, P. M. (2006). *Database systems an application-oriented approach*. Boston: pearson Education.

Leventhal, L., Barnes, J. (2008). *Usability engineering process, products, and examples*. New Jersey: Pearson Education. .

Long, A.S.L. (2005). "Regional library systems: a tale of cooperation that grew America's public libraries", *New Library World*, 106, 556-558.

Maamar, Z. (2006). A mobile application based on software agents and mobile web services. *Business Process Management Journal*, 12(3), 311-319.

Marakas, G. M. (2001). *System analysis and design: an active approach*. New Jersey: Pertice Hall.

Marakas, G. M. (2006). *System analysis and design: an active approach*. New York: McGraw-Hill/Irwin.

McCullough, J. (2004). Redesigning library applications for PDAs: ILS vendor perspective. *Library Hi Tech*, 21(4), 393-399.

Milroy, S., Cox, K., Safford, D., Barker, L., Kalani, A., & Wei, L. (2002). *.Net Mobile Web Developer's Guide*. USA, Rockland: Syngress Publishing.

Morgan, S., & Atkinson, J. (2000). Academic libraries. *Library Review*, 49, 448-454.

Muir, I. & Douglas, A. (2001). Where now for the UK public library service? *Library Management*, 22, 266-271.

Munnukka, J. (2007). Characteristics of early adopters in mobile communications markets. *Marketing Intelligence & Planning*, 25(7), 719-731.

Norbayah M. S., & Norazah, M. S. (2007). Mobile phone usage for m-learning: comparing heavy and light mobile phone users. *Campus-Wide Information Systems*, 24, 355-365.

Otthein, H., Michael, B., Ingrid, R., Ulrich, G., Michael, L. (2007). The future of mobile computing: R&D activities in the state of Bremen. *Mobile communications systems; Research and development; Laboratories; Sciences; Germany*, 17(5), 495-504.

Phillip, O., Nayna, P., Chris, A. (2003). A case study of MMO's MADIC: a framework for creating mobile Internet systems. *Electronic Networking Applications and Policy*, 13(4), 311-321.

Rhee, J., Park, H., & Bahg, Y. J. (2004). Mobile service provision system based on sensor and SIP event notification mechanism. *Digital Object Identifier*, 2, 740-743.

Rossi, M., Tuunainen, V. K., & Resonen, M. (2007). Mobile technology in field customer "service big improvements with small changes. *Business Process Management Journal*, 13, 853-865.

Satzinger, J. W., Jackson, R. B., & Burd, S. D. (2002). *System Analysis and Design in a changing world*. New York, McGraw-Hill companies .74.

Spyrou, C., Samaras, G., Pitoura, E., Evridou, P., (2004). Mobile agents for wireless computing: the convergence of wireless computational models models with mobile-agent technologies, *Mobile networks and applications*, 9(5), 517-528.

Talukder, A. K., & Yavagal, R. Y. (2007). *Mobile Computing Technology Applications and Service Creation*. India, Bangalore: McGraw-Hill companies.

Trappey, A. J. A., Trappey, C. V., Hou, J. L., & Bird J.G. (2004). Mobile agent technology and application for online global logistic services. *Industrial Management & Data Systems*, 104(2), 169-183.

Wadley A. L., Broady J. E., & Hayward T. E. (1997). "An evaluation of current public library service to the full-time employed", *Library Management*, Vol. 18, 205-215.

Wei, J. & Ozak, A. (2007). Development of a web-based mobile airline ticketing model with usability features. *Industrial Management & Data Systems*, Vol. 105, 1261-1277.

Wong, C.C., & Hiew, P.L. (2005). Mobile entertainment: model development and cross services study. *Digital Object Identifier*, 2, 1355 – 1359

Yang, H-L., Tang, J-H. (2005), "Key user roles on web-based information systems requirements", *Industrial Management & Data Systems*, Vol. 105 No.5, pp.577-95.