

*A Mobile Application To Guide Hajj Pilgrims*

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**UNIVERSITY UTARA MALAYSIA**

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***A Mobile Application To Guide Hajj Pilgrims***

**A Thesis submitted to Faculty of Information Technology in partial  
fulfillment of the requirements for the degree Master**

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**By**

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## **Abstract**

There are a lot of pilgrims, when they perform the duty, they should face a lot of challenges. With the popularization of mobile, their problems are hoped to be solved by the Mobile Service to Perform Hajj, which is proposed in this study. In this system, the advice and guidance is provided to the pilgrims. The information of Hajj steps, hotels, streets and restaurants can be got from this system by using mobile phones. This study adopts the waterfall methodology to develop this system. With the help from this Mobile service to perform Hajj, it is hoped that pilgrims can find the information they need easily and perform the hajj successfully.

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## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background

Hajj to Mecca is one of the five pillars of Islam. Hajj was made obligatory in the 9th year of Hijra. Hajj is an act of worship just like Salat (five daily prayers) and Sawm (fasting in the month of Ramadan). Muslims from all over the world gather in Mecca in the last month of Muslim calendar and worship Allah. Hajj is a special worship that lasts for several days. This is an occasion that brings Muslims of all countries, colors, and races to one place the Ka'ba. This is a unique opportunity of worshipping Allah collectively in a large gathering at one place (Website of islam, 2009).

On other hand, wireless technology has developed into one of today's hottest topics due to its ability to bring the power of communication and the Internet into the hands of users while overcoming temporal and spatial constraints (Ferrucci, et al, 2008). As the popularity of wireless services grows, manufacturers are enabling wireless devices with an increasing array of features and capabilities. However, a new "buzzword" increasingly

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## References

- Alahuhta, P.; Helaakoski, H. & Smirnov, A. (2005). Adoption of mobile services in business - case study of mobile CRM e-Business Engineering, 2005. ICEBE 2005. IEEE International Conference on 12-18 Oct. 2005 Page(s):531 – 534
- Bahn, S.; Lee, C.; Jo, J.H.; Suh, W.Y.; Song, J. & Yun, M.H. (2007). Incorporating user acceptance into usability evaluation scheme for the user interface of mobile services. IEEE.
- Boehm, B. W. (1988). A spiral model of software development and enhancement. Computer Volume 21, Issue 5, May 1988 Page(s):61 - 72. Digital Object Identifier 10.1109/2.59. IEEE.
- Bultan, T.; Ferguson, C. & Xiang, F. (2009). A Tool for Choreography Analysis Using Collaboration Diagrams. Web Services, 2009. ICWS 2009. IEEE International Conference on 6-10 July 2009 Page(s):856 - 863
- Bultan, T & Xiang Fu. (2007). Specification of Realizable Service Conversations Using Collaboration Diagrams Service-Oriented Computing and Applications, 2007. SOCA '07. IEEE International Conference on 19-20 June 2007 Page(s):122 - 132. Digital Object Identifier 10.1109/SOCA.2007.41
- Carlsson, C.; Hyvonen, K.; Repo, P. & Walden, P. (2005). Asynchronous Adoption Patterns of Mobile Services. System Sciences, 2005. HICSS '05. Proceedings of the 38th Annual Hawaii International Conference on 03-06 Jan. 2005 Page(s):189a - 189a
- Choi, Y.; Yang, J.-S. & Jeong, J. (2008). Application framework for multi platform mobile application software development. Advanced Communication Technology, 2009. ICACT 2009. IEEE.
- Colafigli, C., P. Inverardi, and R. Matricciani. (2001). InfoParco: An Experience in Designing an Information System Accessible through WEB and WAP Interfaces. Proceedings of

the 34th Annual Hawaii International Conference on System Sciences ( HICSS-34)  
IEEE Computer Society 9: 9013

Do Van Thanh & Jorstad, I.(2005).A service-oriented architecture framework for mobile services. IEEE.

Elliott, G., & Phillips, N. (2004). Mobile commerce and wireless computing systems: Person Education, Addison- Wesley Publishing.

Enjo, H.; Tanabu, M. & Iijima, J. (2009). A step toward foundation of class diagram algebra for enterprise service systems Service Systems and Service Management, 2009. ICSSSM '09. 6th International Conference on 8-10 June 2009 Page(s):456 - 460. Digital Object Identifier 10.1109/ICSSSM.2009.5174926

Ferrucci, F.; Gravino, C. & Di Martino, S. (2008). A Case Study Using Web Objects and COSMIC for Effort Estimation of Web Applications. Software Engineering and Advanced Applications, 2008. SEAA '08. 34th Euromicro Conference 3-5 Sept. 2008 Page(s):441 – 448

Fogg, B.J. (1999) Persuasive Technologies. Communications of the ACM, 42(5): 27-29.

Genero, M.; Piattini, M. & Jimenez, L. (2001).Empirical validation of class diagram complexity metrics. Computer Science Society, 2001. SCCC 2001. Proceedings. XXI Internatinal Conference of the Chilean 7-9 Nov. 2001 Page(s):95 - 104. Digital Object Identifier 10.1109/SCCC.2001.972637

Gu Jung & Gil Haeng Lee. (2003).Studies on services with CAMEL features in 3G. Personal, Indoor and Mobile Radio Communications, 2003. PIMRC 2003. 14th IEEE Proceedings on Volume 3, 7-10 Sept. 2003 Page(s):2358 - 2362 vol.3 Digital Object Identifier 10.1109/PIMRC.2003.1259140

Hamidullah, M. (1974). Introduction to Islam (4th Ed.). Lahore: Sh. Muhammad Ashraf. 177-184.

- Hang Zhou; Zhiqiu Huang & Yi Zhu. (2008). Polymorphism Sequence Diagrams Test Data Automatic Generation Based on OCL. Young Computer Scientists, 2008. ICYCS 2008. The 9th International Conference for 18-21 Nov. 2008 Page(s):1235 - 1240 Digital Object Identifier 10.1109/ICYCS.2008.50
- Hao, S., (2008). "The HAJJ Pilgrimage." Personal Stories APRIL 2008 . ISSUE 01,2: 28 – 29.
- Heinonen, K. & Pura, M. (2006). Classifying Mobile Services. Presented at Helsinki Mobility Roundtable, 1-2 June 2006, Helsinki.
- Himdi, T.F. & Sandhu, R.S.(1997). Lattice-based models for controlled sharing of confidential information in the Saudi Hajj system. IEEE.
- Ichikawa, F. Chipchase, J. & Grignani, R. (2005). Where's the Phone? A Study of Mobile Phone Location in Public Spaces. In Proc. IEEE Mobility Conference 2005 in Guangzhou, China, 797 – 804
- Jehun Rhee; Hyunseo Park & Young-Jick Bahg. (2004). Mobile service provision system based on sensor and SIP event notification mechanism. Communications, 2004 and the 5th International Symposium on Multi-Dimensional Mobile Communications Proceedings. The 2004 Joint Conference of the 10th Asia-Pacific Conference on Volume 2, 29 Aug.-1 Sept. 2004 Page(s):740 - 743 vol.2
- JungSook Bae; SookYang Kang; JaeHo Kim; Park, B.H.; KyungSook Kim & GyungChul Sihh.(2007). Provision of User-Centric Mobile Services in Next Generation Mobile Communication Environment. Vehicular Technology Conference, 2007. IEEE.
- Kargin, B. & Basoglu, N. (2006). Adoption Factors of Mobile Services Mobile Business, 2006. ICMB '06. International Conference on 26-27 June 2006 Page(s):41 – 41
- Kargin, B. & Basoglu, N. (2007). Factors Affecting the Adoption of Mobile Services Management of Engineering and Technology, Portland International Center for 5-9 Aug. 2007 Page(s):2993 - 3001. Digital Object Identifier 10.1109/PICMET.2007.4349643

- Khamis, N. & Wah, A, G., (2005). The Student Information System Using WAP Technology. Malaysian Online Journal of Instructional Technology (MOJIT), 2 (1). 11p.. ISSN 1823-1144
- King Tin Lam; Yang Luo & Cho-Li Wang. (2008). A Performance Study of Clustering Web Application Servers with Distributed JVM. Parallel and Distributed Systems, 2008. ICPADS '08. 14th IEEE International Conference on 8-10 Dec. 2008 Page(s):328 – 335
- Krause, S. & Magedanz, T. (1996). Mobile service agents enabling “intelligence on demand” in telecommunications. Global Telecommunications Conference, 1996. GLOBECOM '96. 'Communications: The Key to Global Prosperity Volume 1, 18-22 Nov. 1996 Page(s):78 - 84 vol.1 Digital Object Identifier 10.1109/GLOCOM.1996.594337
- Kung, D.C.; Chien-Hung Liu & Pei Hsia. (2000). An object-oriented web test model for testing Web applications. Quality Software, 2000. Proceedings. First Asia-Pacific Conference on 30-31 Oct. 2000 Page(s):111 - 120
- Lihua;, C. Y. H. ( 2005 ). "Mobile business applications adoption model based on the concepts of task/technology fit." 2: 1346 – 1350
- Luciano.R,(2005). Comparing Software Development Models Using CDM, October 20–22, 2005, Newark, New Jersey, USA. Retrieved July 10th from <http://scholar.google.com/scholar?hl=en&q=Software+Development+Models+Using+CDM.pdf>. Official Website of Minister of Saudi Arabia, retrieved September 14, 2009 from <http://www.hajinformation.com/>
- Philip Samuel & Joseph, A.T. (2008). Test Sequence Generation from UML Sequence Diagrams Software Engineering, Artificial Intelligence, Networking, and Parallel/Distributed Computing, 2008. SNPD '08. Ninth ACIS International Conference on 6-8 Aug. 2008 Page(s):879 - 887 Digital Object Identifier 10.1109/SNPD.2008.100
- Ramsay, M. and Nielsen, J. WAP Usability: 2000 All Over Again. Nielsen Norman Group. Retrived May 15, 2007 from <http://www.useit.com/alertbox/20001210.html>.

- Ryan, C. & Rossi, P.(2005).Software, performance and resource utilisation metrics for context-aware mobile applications. IEEE.
- Samuel, O.O. & Marsden, G.(2009).Supporting Mobile Applications Developer through a Java IDE Using Contextual Inquiry.Computer Science and Information Engineering, 2009 WRI World Congress on Volume 7. IEEE.
- Sangwhan Cha; Kurz, J.B. & Weichang Du. (2009).Toward a Unified Framework for Mobile Applications Communication Networks and Services Research Conference, 2009. CNSR '09. Seventh Annual . IEEE.
- Royce, Winston (1970), "Managing the Development of Large Software Systems", Proceedings of IEEE WESCON 26 (August): 1-9.
- Scott, D.; Beresford, A. & Mycroft, A.(2003).Spatial policies for sentient mobile applications.Policies for Distributed Systems and Networks, 2003. Proceedings. POLICY 2003. IEEE.
- Shaizan, H. & Li, F. (2003) Utilizing IGV Approach In Evaluating the Usability of Web Sites, Journal of Information and Communication Technology,2(2), 25-40
- Skattor, B.(2007).Design of Mobile Services Supporting Knowledge Processes on Building Sites Management of eBusiness, 2007. WCMeB 2007. IEEE.
- Sridhar, V.(2007).Analysis of Inter-Regional Mobile Services Growth in India. IEEE.
- Sulaiman, Shahida; Mohamed, Hasimah; Muhammad Rafie Mohd Arshad,; Ahmad, Anees & Sulaiman, Sarina. (2008).A knowledge-based approach to facilitate queries by hajj pilgrims. IEEE.
- Vaishnavi, V. & Kuechler, B. (2004). Design Research in information system. Retrieved 28, March, 2008, from <http://www.isworld.org/Researchdesign/drisISworld.htm>

Van Halteren, A& Pawar, P. (2006). Mobile Service Platform: A Middleware for Nomadic Mobile Service Provisioning Wireless and Mobile Computing, Networking and Communications, 2006. (WiMob'2006). IEEE International Conference on 19-21 June 2006 Page(s):292 - 299 Digital Object Identifier 10.1109/WIMOB.2006.1696373

Website of El-Hajj.(2009). Retrieved 28 September, 2009 from <http://www.el-hajj.com/2007/>

Website of islam. (2009). HAJJ – Pilgrimage to the House of Allah in Mecca. Retrieved 28 September, 2009 from <http://www.islam.com/hajj/hajj.htm>

Wilson, C., The Atlas of Holy Places & Sacred Sites: an illustrated guide to the location, history and significance of the world's most revered holy sites, University of Michigan Press, 1996.

Yamamichi, N.; Ozeki, T.; Yokochi, K & Tanaka, T. (2007). The evaluation of new software developing process based on a spiral modeling. Global Telecommunications Conference, 1996. GLOBECOM '96. 'Communications: The Key to Global Prosperity. Volume 3, 18-22 Nov. 1996 Page(s):2007 - 2012 vol.3 Digital Object Identifier 10.1109/GLOCOM.1996.591987.

Yanxiang He; Weidong Wen; Hui Jin & Haowen Liu. (2005). Agent-based Mobile Service Discovery in Grid Computing Computer and Information Technology, 2005. CIT 2005. The Fifth International Conference on 21-23 Sept. 2005 Page(s):351 - 355 Digital Object Identifier 10.1109/CIT.2005.58

Yongqing Yang & Jinlong Zhang.(2009). Discussion on the Dimensions of Consumers' Perceived Risk in Mobile Service. Mobile Business, 2009. ICMB 2009. IEEE.