# BED SPACES MANAGEMENT SYSTEM FOR THE LIBYAN PUBLIC HOSPITAL AL-JUMHOURIYA IN BENGHAZI

Tarek M. Abuzeid

Universiti Utara Malaysia 2011

# BED SPACES MANAGEMENT SYSTEM FOR THE LIBYAN PUBLIC HOSPITAL AL-JUMHOURIYA IN BENGHAZI

A Project submitted to Dean of Awang Had Salled Graduate School in partial fulfillment of the requirements for the degree Master (Information Technology),

Universiti Utara Malaysia

By

Tarek M. Abuzeid

© Tarek M. Abuzeid, 2011. All rights reserved.

### PERMISSION OF USE

In presenting this project of the requirements for a Master of Science in Information Technology (MSc. IT) from Universiti Utara Malaysia, I agree that the University library may make it freely available for inspection. I further agree that permission for copying of this project paper in any manner, in whole or in part, for scholarly purposes may be granted by my supervisor or in their absence, by the Dean of Awang Had Salleh Graduate School of Arts and Sciences. It is understood that any copying or publication or use of this project or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from my project paper.

Request for permission to copy or make other use of materials in this project, in whole or in part, should be addressed to:

Dean of Awang Had Salleh Graduate School of Arts and Sciences
Universiti Utara Malaysia
06010 UUM Sintok
Kedah Darul Aman.

## **ABSTRACT**

Recently, the online services have used widely in different fields for providing and facilitating user needs. Most of these services give the flexibility and easy to access anytime and anywhere without need to waste the time. This study was initialed for the current issues in determining the bed availability in the Libyan public hospital Al-Jumhouriya in Benghazi for pregnant. Thus, this study successful designed and developed the system based on the System Research Process Methodology. The system was developed based on JSP and MySQL tools and tested on local server. The result of the evolution found that the proposed Bed Reservation System (BRS) was easy to use, useful and achieve the uses intention in using it.

**ACKNOWLEDGEMENTS** 

In the Name of Allah, the Most Gracious and Most Merciful

Praise to Allah for his guidance and blessing for giving me the strength and perseverance

to complete this project. I would foremost like to thank my parents and my wife, for

providing me with the opportunity to pursue my goals and for their love and affection,

which has helped me through the most trying times. Equal gratitude goes out to my

siblings and brothers. I would like to thank my supervisor: Associate Professor Dr.

Wan Rozaini Sheik Osman for her guidance and constant motivation that has enabled

me to complete my project work. Moreover, I would also like to thank her for the

opportunities that she has made available to me.

Many thanks go to my evaluator Dr. Mohd Syazwan B. Abdullah for his tremendous

help in providing me the valuable support, time and feedback are much appreciated.

Tarek M. Abuzeid

May/2011

IV

# TABLE OF CONTENT

PERMISSION OF USE	I
ABSTRACT	II
DEDICATION	III
ACKNOWLEDGEMENTS	IV
TABLE OF CONTENT	V
LIST OF TABLES	VIII
LIST OF FIGURES	IX
CHAPTER 1	
INTRODUCTION	1
1.1 Problem Statement	4
1.2 Research Questions	6
1.3 Research Objectives	6
1.4 Research scope	7
1.5 Report Organization	8
1.6 Summary	9
CHAPTER 2	10
LITERATURE REVIEW	10
2.0 Healthcare Management Information Systems	10
2.1 Setting up Health Records	12
2.2 Web Service	13
2.3 Healthcare Allocation Systems	14
2.4 Related Works	17
2.5 Summary	22
CHAPTER 3	23
RESEARCH METHODOLOGY	23
3.1 Introduction	23
3.2 Analysis Phases	24

3.2.1 Information Gathering	25
3.2.2 System Analysis and Design.	25
3.3 Prototype Implementation Phase	27
3.3.1 The Prototype Implementation	29
3.3.2 Evaluation Sub-Phase	30
3.4 Summary	30
CHAPTER 4	31
SYSTEM ANALYSIS AND DESIGN	31
4.1 BRS Requirements	31
4.1.1 Functional Requirements	31
4.1.2 Non-Functional Requirement	34
4.2 BRS Use Case Diagram	35
4.3 BRS Sequence and Collaboration Diagram	37
4.3.1 Sequence & Collaboration Diagram for Login	37
4.3.2 Sequence & Collaboration Diagram for Search	39
4.3.3 Sequence & Collaboration Diagram for Reservation	41
4.3.4 Sequence & Collaboration Diagram for Manage Doctors	43
4.3.5 Sequence & Collaboration Diagram for Manage Reservation	45
4.3.6 Sequence & Collaboration Diagram for Manage Pregnant	47
4.3.7 Sequence & Collaboration Diagram for Manage Profile	49
4.4 BRS User Interface	51
4.4.1 BRS Home Page.	51
4.4.2 Admin Login Page.	51
4.4.3 Admin Report Page	52
4.4.4 Admin Manage Doctor Page	53
4.4.5 Admin Search Page	54
4.4.6 Admin Cancel Reservation Page.	55
4.4.7 Doctor Login Page	56
4.4.8 Doctor Home Page	57
4.4.9 Doctor Manage Profile Page	58
4.4.10 Doctor Manage Pregnant Info Page	59

4.4.11 Doctor Add Pregnant Page	60
4.4.12 Pregnant Login Page	61
4.4.13 Pregnant Update Profile Page	62
4.4.14 Pregnant Reserve Bed Page	63
CHAPTER 05	65
EVALUATION	65
5.1 System Evaluation	65
5.2 Descriptive Statistics for Usefulness	65
5.3 Descriptive Statistics for Ease of Use	67
5.4 Descriptive Statistics for Behavioral intention to Use the BRS	69
CHAPTER 6	72
CONCLUSION	72
6.1 Introduction	72
6.2 Conclusion	72
6.3 Limitations and Recommendation	73
6.4Future Work	73
References	75
ADDININ	A

# LIST OF TABLES

Table 3.1: Hardware and Software Specifications	27
Table 4.1: BRS Functional Requirement	31
Table 4.2: BRS Non-Functional Requirements.	34
Table 5.1: Descriptive Statistics for Usefulness	66
Table 5.2: Descriptive Statistics for Ease of Use	68
Table 5.3: Descriptive Statistics for Behavioral intention to use the BRS	70

# LIST OF FIGURES

Figure 1.1:	Research Architecture	7
Figure 2.1:	Health care Hospital Information Management	11
Figure 2.2:	Health Care Records Management	12
Figure 2.3:	Web-based Services among Users	14
Figure 2.4:	Healthcare Management System	16
Figure 2.5:	Hospital Support System Architecture (Roberts, et al., 1991)	18
Figure 2.6:	Modified Bed Management Process Flow (Eugene, 2006)	19
Figure 2.7:	eBeds System (Nicholls & Young, 2007)	20
Figure 2.8:	System Process (Zhou & Chusho, 2009)	21
Figure 3.1:	Research Steps (Nunamaker & Chen, 1991)	24
Figure 3.2:	The System Architecture	26
Figure 3.3:	JSP Execution	28
Figure 4.1:	Use Case Diagram for BRS	36
Figure 4.2:	Sequence Diagram for Login	37
Figure 4.3:	Collaboration Diagram for Login	38
Figure 4.4:	Sequence Diagram for Search	39
Figure 4.5:	Collaboration Diagram for Search	40
Figure 4.6:	Sequence Diagram for Reservation	41
Figure 4.7:	Collaboration Diagram for Reservation	42
Figure 4.8:	Sequence Diagram for Manage Doctors	43
Figure 4.9:	Collaboration Diagram for Manage Doctors	44
Figure 4.10:	Sequence Diagram for Manage Reservation	45
Figure 4.11:	Collaboration Diagram for Manage Reservation	46
Figure 4.12:	Sequence Diagram for Manage Pregnant	47
Figure 4.13:	Collaboration Diagram for Manage Pregnant	48
Figure 4.14:	Sequence Diagram for Manage Profile	49
Figure 4.15:	Collaboration Diagram for Manage Profile	50
Figure 4.16:	BRS Home page	51
Figure 4.17	: Admin Login Page	52

Figure 4.18: Admin Home Page	52
Figure 4.19: Admin Report Page	53
Figure 4.20: Admin Manage Doctor Page	54
Figure 4.21: Admin Search Page	55
Figure 4.22: Admin Cancel Reservation Page	56
Figure 4.23: Doctor Login Page	57
Figure 4.24: Doctor Home Page	58
Figure 4.25: Doctor Manage Profile	59
Figure 4.26: Doctor Manage Pregnant Info Page	60
Figure 4.27: Doctor Add Pregnant Page	61
Figure 4.28: Pregnant Login Page	62
Figure 4.29: Pregnant View Profile Page	62
Figure 4.30: Pregnant Update Profile Page	63
Figure 4.31: Pregnant Reserve Bed Page	64
Figure 5.1: Average of Usefulness Histogram	67
Figure 5.2: Average of Ease of Use Histogram	69
Figure 5.3: Average of Intention Histogram	70

### CHAPTER ONE

# INTRODUCTION

Across the globe, many governments have resorted to the use of ICT applications in healthcare delivery in an effort to increase efficiency with varying degree of success (Hägglund, Scandurra, & Koch, 2010). The European Union as a regional unit in 2004 adopted eHealth Action Plan to facilitate a more harmonious and complementary European approach to eHealth which required member states to formulate tailored national and regional eHealth strategies to respond to their own specific needs (Shohet & Lavy, 2004; Vimarlund & Olve, 2005). This has resulted in a range of projects being implemented or in the process of development in most of these countries, for instance: fully functional ICT infrastructure purposely for eHealth (e.g. Denmark, Sweden, and Norway); Electronic Health Record systems (e.g. Austria, the Czech Republic, Denmark, Estonia, Finland, Romania, Slovakia, Sweden, and Spain); national health portals (e.g. Denmark, Finland, France, Hungary, Luxembourg and Slovakia); forms of eCards (e.g. Austria, France, Germany, Slovenia, and Italy) and ePrescription (e.g. England, Finland, Greece, Portugal, Spain, Sweden and Northern Ireland) (Doupi, Hamalainen, & Ruotsalainen, 2005; Piotti & Macome, 2007).

However, a number of considerations were assigned by different organizations for providing the end users with the suitable facilities to proceed through the e-services. The available functionalities into these systems are capable to carry out a certain needs based on the client requests (Hernández & Blanquer, 2005; Lymberis & Dittmar, 2007; Rahimi & Vimarlund, 2007).

# The contents of the thesis is for internal user only

### References

- Anderson, J. G. (1997). Clearing the way for physicians' use of clinical information systems. Communications of the ACM, 40(8), 83-90.
- Armstrong, E., Ball, J., Bodoff, S., Carson, D. B., Evans, I., Green, D., et al. (2005). The J2EE 1.4 Tutorial (For Sun Java System Application Server Platform Edition 8.1 2005Q2 UR2). Sun Microsystems, June, 7.
- Bekker, R., Koole, G., & Roubos, D. (2009). Bed reservation, earmarking and merging of clinical wards. Retrieved 23-March, 2011, from <a href="https://www.vumc.nl/afdelingen-themas/239911/.../ORHealth-Bekker-18nov.pdf">www.vumc.nl/afdelingen-themas/239911/.../ORHealth-Bekker-18nov.pdf</a>
- Bergsten, H. (2003). JavaServer pages: O'Reilly & Associates, Sebastopol: Inc, CA, USA.
- Blumenthal, D. (1999). Health care reform at the close of the 20th century. *The New England Journal of Medicine*, 340(24), 1916.
- Bose, R. (2003). Knowledge management-enabled health care management systems: capabilities, infrastructure, and decision-support. *Expert Systems with Applications*, 24(1), 59-71.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.
- Davis, K. (2008). Slowing the growth of health care costs—learning from international experience. New England Journal of Medicine, 359(17), 1751-1755.
- Delot, T., Cenerario, N., Ilarri, S., & Lecomte, S. (2009). A cooperative reservation protocol for parking spaces in vehicular ad hoc networks. Paper presented at the Proceedings of the 6th International Conference on Mobile Technology, Application & Systems New York, NY, USA.
- Doupi, P., Hamalainen, P., & Ruotsalainen, P. (2005). eHealth in Europe: Towards higher goals. World Hospitals and Health Services, 41(2), 35.
- Eugene, B. (2006). A New Approach to Acute Care Hospital Bed Management A Case Study. Retrieved 2-April, 2011, from <a href="https://www.mapgistics.com/pdf/Bed\_Management.pdf">www.mapgistics.com/pdf/Bed\_Management.pdf</a>
- Fottler, M. D., Ford, R. C., Roberts, V., & Ford, E. W. (2000). Creating a healing environment: the importance of the service setting in the new consumer-oriented healthcare system. *Journal of Healthcare Management*, 45, 91-107.
- Geary, D. (2008). Core Java server faces. Pearson India: Education.
- Gellersen, H. W., & Gaedke, M. (1999). Object-oriented web application development. *Internet Computing, IEEE, 3*(1), 60-68.

- Hägglund, M., Scandurra, I., & Koch, S. (2010). Scenarios to capture work processes in shared homecare--From analysis to application. *International Journal of Medical Informatics*, 79(6), 126-134.
- Hernández, V., & Blanquer, I. (2005). The Grid as a healthcare provision tool. *Methods of information in medicine*, 44(2), 172-176.
- Hoffer, J. A., George, J. F., Valacich, J. S., McFadden, F. R., & Prescott, M. B. (1999). Modern systems analysis and design. Addison-Wesley: New York.
- Holland, C., & Light, B. (2002). A critical success factors model for ERP implementation. Software, IEEE, 16(3), 30-36.
- Hunt, D. L., Haynes, R. B., Hanna, S. E., & Smith, K. (1998). Effects of computer-based clinical decision support systems on physician performance and patient outcomes. *JAMA: the journal of the American Medical Association*, 280(15), 1339.
- Jamison, D. T., & Bank, W. (2006). Disease control priorities in developing countries. DCPP Publications, London.
- Kirkegaard, C., & Møller, A. (2006). Static analysis for Java Servlets and JSP. Static Analysis, 336-352.
- Lee, S. M., & Hong, S. (2002). An enterprise-wide knowledge management system infrastructure. *Industrial Management & Data Systems*, 102(1), 17-25.
- Lewis, J. R. (1995). IBM computer usability satisfaction questionnaires: psychometric evaluation and instructions for use. *International Journal of Human-Computer Interaction*, 7(1), 57-78.
- Liang, H., Saraf, N., Hu, Q., & Xue, Y. (2007). Assimilation of enterprise systems: The effect of institutional pressures and the mediating role of top management. *Management Information Systems Quarterly*, 31(1), 6-8.
- Lieberman, M., Helper, S., & Demeester, L. (1999). The empirical determinants of inventory levels in high-volume manufacturing. *Production and operations management*, 8(1), 44-55.
- Lin, H. X., Choong, Y. Y., & Salvendy, G. (1997). A proposed index of usability: a method for comparing the relative usability of different software systems. *Behaviour & Information Technology*, 16(4), 267-277.
- Lymberis, A., & Dittmar, A. (2007). Advanced wearable health systems and applications-Research and development efforts in the European Union. *Engineering in Medicine* and Biology Magazine, IEEE, 26(3), 29-33.
- McNurlin, B. C., & Sprague, R. H. (2001). *Information systems management in practice*: Prentice Hall PTR: United State.

- Milanovic, N., & Malek, M. (2004). Current solutions for web service composition. *Internet Computing, IEEE*, 8(6), 51-59.
- Murugesan, S., Deshpande, Y., Hansen, S., & Ginige, A. (2001). Web engineering: A new discipline for development of web-based systems. *Web Engineering*, 3-13.
- Ngai, E. W. T., Poon, J. K. L., Suk, F. F. C., & Ng, C. (2009). Design of an RFID-based healthcare management system using an information system design theory. *Information Systems Frontiers*, 11(4), 405-417.
- Nicholls, A. G., & Young, F. R. (2007). Innovative hospital bed management using spatial technology. *Spatial Science Queensland*, 2007(2), 26-30.
- Nunamaker, F., & Chen, M. (1991). Systems development in information systems research.

  Paper presented at the Proceedings of the Twenty-Third Annual Hawaii International Conference on System Sciences, Kailua-Kona, HI, USA
- Piotti, B., & Macome, E. (2007). Public healthcare in Mozambique: Strategic issues in the ICT development during managerial changes and public reforms. *International journal of medical informatics*, 76, S184-S195.
- Procter, S., & Brown, A. D. (1997). Computer-integrated operations: the introduction of a hospital information support system. *International Journal of Operations & Production Management*, 17(8), 746-756.
- Rahimi, B., & Vimarlund, V. (2007). Methods to evaluate health information systems in healthcare settings: a literature review. *Journal of medical systems*, 31(5), 397-432.
- Roberts, M. S., Dreese, E. M., Hurley, N., Zullo, N., & Peterson, M. (1991). Blending Administrative and Clinical Needs: The Development of a Referring Physician Database and Automatic Referral Letter. Paper presented at the Proceedings of the Annual Symposium on Computer Application in Medical Care US.
- Serrano, M., Maguitman, A., Boguñá, M., Fortunato, S., & Vespignani, A. (2007). Decoding the structure of the WWW: A comparative analysis of Web crawls. *ACM Transactions on the Web (TWEB)*, 1(2), 10-15.
- Shohet, I. M., & Lavy, S. (2004). Healthcare facilities management: state of the art review. *Facilities*, 22(7/8), 210-220.
- Sprague, L., & Wacker, J. (1996). Macroeconomic analyses of inventories: learning from practice. *International journal of production economics*, 45(1-3), 231-237.
- Stoneburner, G., Goguen, A., & Feringa, A. (2002). Risk management guide for information technology systems. *NIST Special Publication*, 800, 30-32.
- Vimarlund, V., & Olve, N. G. (2005). Economic analyses for ICT in elderly healthcare: questions and challenges. *Health Informatics Journal*, 11(4), 309-3011.

- Wickramasinghe, N. S., Fadlalla, A. M. A., Geisler, E., & Schaffer, J. L. (2005). A framework for assessing e-health preparedness. *International Journal of Electronic Healthcare*, 1(3), 316-334.
- Widenius, M., Axmark, D., & DuBois, P. (2002). *MySQL reference manual*. O'Reilly & Associates, Sebastopol: Inc, CA, USA.
- Yang, J. T., Huang, J. L., Wang, F. J., & Chu, W. C. (2002). Constructing and Object-Oriented Architecture for Web Application Testing. *Journal of Information Science and Engineering*, 18(1), 59-84.
- Zhou, F., & Chusho, T. (2009). A Web Application Framework for Reservation Systems and its Reusability Evaluation. Proceedings of the International MultiConference of Engineers and Computer Scientists, Vol 1.