

**ELECTRIC BILLING WEB-BASED SYSTEM APPLICATION
OF MAYBANK STUDENTS' RESIDENTIAL HALL**

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**ELECTRIC BILLING WEB-BASED SYSTEM APPLICATION
OF MAYBANK STUDENTS' RESIDENTIAL HALL**

A project submitted to Dean of Postgraduate Studies and Research in partial
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By
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Abstract

Many organizations using the traditional ways of manual processing to inform their customers or members about the electrical billing fees, one of these associations is Kolej Maybank student residential hall in Universiti Utara Malaysia. Maybank office is suffering from many problems such as, wasting staffs effort, time consuming and need a lot of money to provide the students their electric billing every month. As a result it is very important and there is a need to design and develop a web-based application of electric system to provide the students any time and any date of electric billings. The general methodology was used in this study and the Rational Unified Process (RUP) in the development phase of the system. After developing the system, the usability and functionality of the system was evaluated. The evaluation of the system usability and benefit is validated by the users of the system who are students' tenants in Kolej Maybank, through electric web based application system. As a result, the electric web based application system increased the efficiency of staff process, reduces the errors in electrical bills calculations may happen in paper process, and satisfies all the students.

Dedication

I dedicate this humble work to my father Prof. Dr. Rajab Saeed Shahwan and mother; the spring of loyalty, affection, and dedication. They raised me on the principles of virtue, to my teacher Dr. Saed Shahwan, to my dear wife and to my sisters; who spared no effort helping me during my school years.

I dedicate this work to Jordan, Palestine, Libya, Iraq, Malaysia, and all Arab and Muslim countries.

I dedicate this work also for all my relatives, my grandfather and my grandmother souls.

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CHAPTER ONE

Introduction

1.0 Introduction

Every year the technology increase and the online services and the communication ways are increasing between the organizations and the users. Also the information system technology as well as enlarge in the entire world and we can take the advantages of it via applying it in many factors in our life. Critical problem of many organizations that they don't want to apply the technology or automating thing to the organizations to stay ahead from new economy that may it will be a huge problem to manage content.

Instead, many organizations are still using the manual process of documents in file cabinet like what happen in most of the organizations. However, it is logically that we capture the data into information systems that can be easily retrieved and make the job easier, solving many problems like time wastage and loss of money and effort (Suzuki, 2009).

To date, automating the manual document processes takes many more advantages like retrieving the data about the users and takes the advantages of advanced document process techniques (Suzuki, 2009).

Thus this study discuss and show how to solve the problem of electricity for the students of Kolej Maybank residential via designing a web-based system to provide a monthly electricity bill for all the students in Kolej Maybank.

The contents of
the thesis is for
internal user
only

6.0 References

Acunetix, (2008). (n.d.). Web application security. *Web Applications: What are they? What of them?*. Retrieved May 16, 2010, from <http://www.acunetix.com>

Antipolis, S. (2010, Jan 20-22). *Electronic Invoicing in Europe*. Paper presented at the European Commission Conference, E-invoices & Complains, Madrid, Spain.

Bakshi, K., & Karger, D. (2005). *Semantic Web Applications*. MIT Computer Science and Artificial Intelligence Laboratory, Cambridge, USA. Retrieved May 16, 2010, from <http://www.ifi.uzh.ch/ddis/fileadmin/events>

Brown, A., & Hellerstein, J. (2007). Reducing the Cost of IT Operations. Is Automation Always the Answer?. *Watson Research Center*, NY, USA. Retrieved May 12, 2010 from <http://www.usenix.org/event/hotos05>

Bryant, C. (2009, April 24). *E-invoicing: time to seize the opportunity*. Paper presented at the E-Invoicing and Digital Media Service. Conference. Helsinki, Finland.

Carvalho, A. (2004). *Sequencing ICT in post-Conflict/Low-Capacity countries undergoing decentralization*. Case Study: Sierra Leone and Rwanda. Retrieved April 16, 2010 from <http://citeseerx.ist.psu.edu/viewdoc>

Davis, J. (2002). *A Guide To Web Marketing Successful Promotion On The Net* (1st ed.). London, UK: Kogan Page Limited.

Day, M. (2003). *Collecting and preserving the World Wide Web*. A feasibility study undertaken for the JISC and Wellcome Trust, University of Bath, UK. Retrieved May 15, 2010, from <http://citeseerx.ist.psu.edu/viewdoc>

Dhamhere, A., & Dovrolis, C. (2008). *Measurement, Economics, Ten years in the evolution of the internet ecosystem*. Retrieved June 16, 2010 from <http://delivery.acm.org/10.1145/1460000/>

Dourish, P., Edwards, W., LaMarca, A., Lampert, A., Petersen, K., Salisbury, M. et al. (2000). Extending Document Management Systems with User-Specific Active Properties. *ACM Transactions on Information Systems (TOIS)*, 18(2), 140–170.

Friedrich, D. (2005). *Usability and benefits of UML for plant automation – some research results*. Retrieved June 13, 2010, from http://www.imamu.edu.sa/DContent/IT_topics

Gilheany, S. (2001). *Brief overview of document management. Archive planning*. Retrieved May 22, 2010, from <http://www.archivebuilders.com/>

Groover, M. (2007). *Automation, Production systems, and Computer-Integrated Manufacturing*. (3rd ed.). New Jersey, USA: Pearson Education Inc.

Hair, J., Black, W., Babin, B., Anderson, R., & Tatham, R. (2006). *Multivariate Data Analysis*. (4th ed.). New York, USA: Prentice-Hall Inc.

Hanney, S., Davies, A., & Buxton, M. (1999, Dec). Questionnaire. *Assessing benefits from health research projects: can we use questionnaires instead of case studies?*. Retrieved Mar 26, 2010 from <http://docserver.ingentaconnect.com>

Hennicker, R., & Koch, N. (2001). *Systematic Design of Web Applications with UML*. Idea Group Publishing: München, Germany. Retrieved March 12, 2010 from <http://citeseerx.ist.psu.edu/viewdoc>

Hoffer, J., George, J., & Valacich, J. (1999). *Modern System Analysis and Design* (2nd ed.). United Kingdom: Addison Wesley Longman.

Hussain, S. (2009, Feb 15-18). *E-Commerce Case Study: Omani Electricity E-Billing and E-Payment Paradigm Shift Based On Smart Kilowatt Hour (kWh) Meters*. Paper presented at the International Conference on Communication, Computer and Power, Muscat, Oman.

John, O. (2004, Feb 19). *Should We Trust Web-Based Studies?*. Unpublished lecture notes, University of California, Berkeley, U.S.

Jollie, C., & Cantillon, P. (2003, Apr 19). ABC of Learning and Teaching. In *Web based learning*. Retrieved Jun 11, 2010, from <http://www.bmjjournals.org/cgi/content/326/>

Karlsson, S. (2008). *Research and development of a cost efficient finvoice B2C billing solution*. Retrieved June 12, 2010, from <http://www.essays.se/essay/59596133bb/>

Kuljis, J., & Paul, R. (2000, Jul 6). *A Review of web based simulation: thither we wander?*. Paper presented at the Winter Simulation and Modeling Conference, Uxbridge, UK.

Koivunen, J. (2006). *E-Invoicing in Finland: The Example of South Karelia*. Case Study, Information Society and Media, European Commission. Retrieved June 01, 2010 from <http://www.emic.pt/images/stories/publicacoes>

Krishna, V., Deshpande, P., & Srinivasan, S. (2004). Towards Smarter Documents. In Grossman, D. (ED.), *Information and Knowledge Management: Proceedings of the Thirteenth ACM International Conference on Information and Knowledge Management held on 8-13 November, 2004* (pp. 634-641). Washington D.C., USA: ACM.

Kruegel, C., & Vigna, G. (2003). *Anomaly Detection of Web-based Attacks*. Retrieved June 11, 2010 from <http://www.cs.ucsb.edu/~vigna/publications/>

Kurtz, T. (2004, September). Software assurance of web-base applications (SAWBA). Retrieved May 18, 2010, from <http://www.docstoc.com/docs/6802761>

Mackiewicz, R. (2006). In *The Benefits of Standardized Web Services Based on the IEC 61970 Generic Interface Definition for Electric Utility Control Center Application Integration*. Retrieved June 15, 2010 from <http://www.ieee.org>

Meier, J., & Sprague, R. (1996). Toward a better understanding of electronic document management. In Clemons, E. (ED.), *International Conference on System Science: Proceedings of the 29th Annual Hawaii International Conference on System Science held on 3-6 January, 1996 at the Department of Information & Computer, California University* (pp. 53-61). Hawaii, USA: IEEE Computer Society.

Merton, R., Fiske, M., & Kendall, P. (1990). *The focused interview*, (2nd ed.). New York, USA: New Macmillan Inc.

Meyer, T. (August , 2009). *E-invoicing: Crown or catalyst of an efficient billing process?*. Deutsche Bank Research, Germany. Retrieved May 22, 2010 from <http://www.e-invoice-gateway.net>

Mortazavi, A. (2008). *RUP Methodology*. Unpublished lecture notes, Harvard University: USA.

Netter, M., & Pernul, G. (2010, Feb 22-24). *Integrating security patterns into the electronic invoicing process*. Paper presented at the Electronic Invoicing Conference in Europe, Madrid, Spain.

Pinhanez, C. (2007). *A Services Theory Approach to Online Service Applications*. In Aylor, J. (ED.), *Services Computing Conference (SCC'07): Application and Industry Track: Proceedings of the 6th IEEE Services Computing Conference held on 9-13 Jul, 2007* (pp. 395-402). Utah, USA: IEEE Computer Society.

Porter, M. (March, 2001). *Strategy and the Internet*. Retrieved July 15, 2010, from <http://www.cis.gsu.edu/>

Robin, H., Pronovost, P., & Daetti, G. (2001). The advantage and disadvantage of process-based measures of health care quality. *Quality In Health Care*, 13(6).

Schwabe, D., & Rossi, G. (2001). Designing personalized web applications. In Lyu, K. (ED.), *International Conference on World Wide Web: Proceedings of the 10th International Conference on World Wide Web held on 1-5 May, 2001* (pp. 275-284). Hong Kong, China: ACM.

Seifried, T., Jervis, M., Haller, M., Masoodian, M., & Villar, N. (2008). Interactive Displays and Next-Generation Interfaces. In Müller, T. (ED.), *International Conference on Tangible and Embedded Interaction: Proceedings of the Second ACM International Conference on Tangible and Embedded Interaction held on 18-20 Feb, 2008* (pp.81-88). Bonn, Germany: ACM.

Sheridan, M. (1992). *Telerobotics, Automation, and Human Supervisory Control*. (1st edition). U.S: Massachusetts Institute of Technology.

Sridharan, K. (2004). A course on web languages and web-base applications education. *IEEE Transactions on Education*, 47(2), 213 – 253.

Suzuki, R. (2009). Filing Cabinets. In *Make your paper file cabinets searchable*. Retrieved Jun 16, 2010, from <http://www.slideshare.net/adi727>

Takahashi, K., & Liang, E. (n.d) (1997). In *Analysis and design of web base information systems*. Retrieved May 29, 2010 from <http://www.ra.ethz.ch/CDstore/www6/Technical/Paper245/PAPER245.html>

Vaishnavi, V., & Kuechler, W. (2007). In *Design Research in Information Systems*. Retrieved May 19, 2010 from <http://www.desrist.org/design-research-in-information-systems/>

Vanjak, Z., Mornar, V., & Magdalenic, I. (2008, Jun 16-17). Deployment of e-invoice in Croatia. In Gotovac, Z. (ED.), *International Conference on Software and Data Technologies (ICSOFT): Global Software Development: Proceedings of the Third International Conference on Software and Data Technologies held on 5-8 Jul, 2008* (pp. 348-354). Porto, Portugal: Springer.

Wang, Q., Quan, L., & Ying, F. (2004). Online testing of web-based application. In Margaria, T. (ED.), *International Computer Software and Applications Conference: Proceedings of the 28th Annual International Computer Software and Applications Conference held on 28-30 Sep, 2004* (pp. 166-169). Hong Kong, China: IEEE Computer Society.

Welsh, N., & Gurnell, D. (2007). Experience Report: Scheme in Commercial Web Application Development. Retrieved May 20, 2010 from <http://portal.acm.org/citation.cfm?id=1291175>

Witten, I., & Frank, E (2005). *Data Mining: Practical Machine Learning Tools And Techniques* (2nd ed.). New York, USA: Elsevier Inc.

Zaenen, A., & Crouch, D. (2009, Feb 9). *OBLs hobble computations*. Paper presented at the Lexical Functional Grammar Conference, Cambridge, UK.