Web based E-voting system in UUM

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By

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Abstract

The twenty-first century have witnessed several major technological renaissances and many technological achievements as well, which led to a competition among many countries to adapt this trend. Malaysia had improved the infrastructure needed in the information and communication technology area, in order to provide the universities with the new technologies. Therefore the use of the technology becomes available inside the universities which make the idea of electronic voting achievable.

To develop e-voting web based system, the study will use the methodology for this study is based on the general methodology in research design, because it is have the logical phases that used to develop a prototype for e-voting web based system to make the election process in student council more efficient and accurate and helping to solve the problems or the difficulties in the traditional voting system (ballot box).

Finally, the system is tested and the result confirms that the proposed system is capable to record a successful completion of elections.

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CHPTER 1

INTRODUCTION

It was noted in the twenty-first century many achievements, which have had a significant impact on the evolution of people's life in different fields, such as democratic and political field. This evolution reflects the global interest of the democracy theory. And the necessity of applying the democracy concept in public life, thus democracy approaches becomes the main awareness for many government institutions, profit organizations, students association, and universities. One of university activities is the student's union elections, which is one of the most important activities that every student participate in order to choose their representatives in the university (Puthucheary & Othman, 2005).

Twenty-first century have witnessed several major technological renaissance. And many technological achievements as well, which led to a competition among many countries to adapt this trend. Malaysia had improved the infrastructure needed in the information and communication technology area, in order to provide the universities with the new technologies. Therefore the use of the technology becomes available inside the universities which make the idea of electronic voting achievable (Puthucheary & Othman, 2005).

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Reference

Aviel, D., & Rubin,K .(2001). Security Considerations for Remore Electronic Voting. *Communications of the ACM,* 45, 90-98.

Booch,G.(2001)."Through the Looking Glass," Software Development Magazine, July 2001, pp. 49-51.

Chen,Y.(2004). The design of a secure anonymous Internet voting system. *ELSEVIER computer & security* .23.330-337.

Collard. R. (1999). *Test Design. Stqemagazine: Software Testing & Quality* Engineering. Retrieved sep 29, 2007 from \\www. soft tesl.ordsif!.s/material/rosscollard I.pdf

Damgrad ,M.(2001). A generalization a simplification and some applications of paillier's probabilistic public-system. *proceeding of PKC*.119-136.

Dini,G.(2002) Asecur and available electronic voting services for a large-scal distributed system. *Future Generation computer system*, 19, 69-85.

Farmer,M.(2006). BITE e-Gov. *Journal of Interpersonal Violence* 15, Retrieved November 20, 2006

Hanselman, S .(2006*). Professional ASP.NET 2.0 Special Edition (Wrox Professional Guides)* (1st ed). Newwork :Geoffrey

Hevner, A., March, S., Park, J. and Ram, S. (2004). "Design Science in Information Systems Research." MIS Quarterly 28(1): 75-105.

Oovstreen, A (2004). *Meeting the challenges of e-voting*. Retrieved July 23, 2007, from Department of Social Sciences Netherlands Institute of Scientific Information Website http://istresults.cordis.lu/index.cfm/section/news/Tpl/article/BrowsingType/Short%20Feature/ID/62740

Gilmore, J. (2006).APA style essentials.Retrived. September 21,2006 ,from thestar website : http://thestar.com.my/news/story.asp?file=/2006/9/21/nation/20060921124336&sec=nation

Ibrahim,S.(2003). Secure E-voting with blind signature. *Telecommunication Technology*.193-197.

Juang,S.(1995).Asuesure anonymous voting by employing Diffee Hellman PKD concept. *IEEE international Carnahan Conference on Security Technology* .252-258

Juang,W.(2002).Averifiable multi-authority secret election allowing absent from voting . *computer Jurnal*.25.672-682.

Karlin,L.(2000). Electronic vote poses big security risk. *The Irish Times, 20,* 110-112. Retrieved October 18th, 2007.

Krawczyk, H. (2004) the order of encryption and authentication for protecting communications (or: How secure is SSL?). In J. Kilian, editor, *Advances in Cryptology – CRYPTO 2001*, volume 2139 of *Lecture Notes in Computer Science*, pages 310–331.Retrieved October 1st, 2007.

Ku, W. (2004).An e-voting schema against Bribe and coercion. International Conference on e-technology.113-116.

Lambrinoudakis, C., Gritzalis, D., Katsikas, S. (2002). Building a Reliable e-Voting System: Functional Requirements and Legal Constraints. *Department of Information and Communication Systems Engineering University of the Aegean* .Retrieved July 23, 2007,

Liaw,T.(2004). A secure electronic voting protocol for general election. *Computer & security*.23.107-119.

Lin,M.(2003). Security enhancement for anonymous secure e-voting our a network .*Computer standards & interfaces*.25.131-139.

Mercuri,R.(2006) *Electronic Vote Tabulation Checks and Balances*. PhD thesis, University of Pennsylvania, Philadelphia, PA, Retrieved Oct 1, 2007.

Mitchell,S. (2005). *ASP.NET Data Web Controls Kick Start* (2 nd ed). Boston: Bill and Srinivasa .

Nielsen's, J. (2006). *Quantitative Studies: How Many Users to Test?* Retrieved sep 20, 2007 from. http://www.useit.com/jakob/

Oovstreen, A (2004). *Meeting the challenges of e-voting.* Retrieved July 23, 2007, from Department of Social Sciences Netherlands Institute of Scientific Information Website http://istresults.cordis.lu/index.cfm/section/news/Tpl/article/BrowsingType/Short%20Feature/ID/62740

Puthucheary.O & Othman.N.(2005). Elections and Democracy in Malaysia,25,98-99. Retrieved October 1st, 2007.

Purao, S. (2002). "Design Research in the Technology of Information Systems: Truth or Dare." GSU Department of CIS Working Paper. Atlanta.

Rebecca, M. (2000). Sluggish Systems, Vanishing Votes. *Communications of the ACM*,15, 168-172.

Sdn ,M.(2005).E-voting Practiced For Student Council Elections In 2005. February 18, 2005 ,from University College Sedaya International (UCSI) website : http://doctorjob.com.my/undergrad_news/printerfriendly.asp?ID=2984

Suzan,O.(2001). Patterns Of Consumer Use. *Implications for the public sphere*, 4(1). Retrieved May 1, 2001, from . *http://www.models-research.ie/publications/art/01-5d.html.*

Tolbert, C. and R. McNeal (2001). "Does the Internet increase Voter Participation in Elections?" Paper
presented to the Annual Meeting of the American Political Science Association, San Francisco.

Vaishnavi & Kuechler (2004). Design Research in information system. Retrieved June 15, 2006, from
http://www.isworld.org/Researchdesign/drisISworld.htm

Walther,S(2005). *ASP.NET Unleashed* (1st ed). Boston: Allyn and Bacon.

Waston, K. (2005). *Beginning ASP .NET 2.0 E-Commerce in C# 2005* (1 st ed) Florida: Dari