

**Implementation of Open Source Information Systems for
Cost Effectiveness and Productivity Enhancement by
Knowledge Sharing among SME's in the Food Processing Industry
in Penang, Malaysia**

A thesis submitted to the Faculty of Management
in partial fulfillment of the requirements for the degree
Master of Science (Management)
Universiti Utara Malaysia

By

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**College of Business
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2008**

Declaration

I declare that all the work described in this dissertation was undertaken by myself (unless otherwise acknowledged in the text) and that none of the work has been previously submitted for any academic degree. All sources of quoted information have been acknowledged through references.

Ahmed Ibrahim Ali
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ABSTRACT

This study was to find out whether there is relationship between utilization frequency, management and development, knowledge sharing and organizational performance. This study examined the relationship of organizational performance of SME's in Penang, Malaysia.

This study is designed to provide the benefit for practitioners, especially for employees and management position in SME's in Penang. The study found that there are positive direct significant relationship between utilization frequency, management and development, knowledge sharing and organizational performance of SME's in Penang, Malaysia..

Keywords: Open Source Software, Utilization Frequency, Management and Development, Knowledge Sharing, SMS's Performance.

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CHAPTER 1

OVERVIEW OF THE RESEARCH

1.1 Introduction

In recent years, the concept of information system and its properly management has been a central in the strategic management field for the large as well as small firm's are concerned with competitive priorities in their strategies and planning. This refers to the big challenges and opportunities. The challenge of the 21st century for SME-s is global competitiveness. This means that customers need to be provided with constant and reliable products and services of a recognized quality, while the market environment is characterized by global competition.

Global competition creates a new threat for SMEs because they required competing with every single enterprise within and outside of the country. The new working environment creates opportunities and obstacles as well. This field of study is brand new. It had existed in the late 80's when globalization showed its power. It emerged everywhere on the world, regardless country, nation, territory, or geographical location. The main reason to study open source information system is that it can provide relatively low cost for SME while its usefulness is distinctly high. There is a basic assumption by Lee (2001) uses these words:

The contents of
the thesis is for
internal user
only

The findings then, are not necessarily generalizable to the whole industry and care should be taken in any generalization since only three independent variables were examined to explore the organizational performance. Further research to examine the generalizability is required to enhance a better view of using the open source software in organization.

5.4 Recommendations

The research confirmed the relationship between utilization frequency, management and development and knowledge sharing of using open source software through SME's performance. Further research is needed to verify and refine the rules that are listed here.

REFERENCES

- Alam, I. (2002), "An exploratory investigation of user involvement in new service development", *Journal of the Academy of Marketing Science*, Vol. 30 No. 3, pp. 250-61.
- Alam, I. and Perry, C. (2002), "A customer-oriented new service development process", *Journal of Services Marketing*, Vol. 16 No. 6, pp. 515-34
- Alexander, J. & Shaosong, W. (2001). An institutional perspective on developing and implementing intranet- and internet based information systems", *Info Systems Journal*, Vol. 13, pp. 209-31.
- Alsop, S. (1999), "Have I told you lately that I hate Windows?", *Fortune*, Vol. 5, July, pp. 177-8.
- Apte, L., Walker, A. & Ellis, H. (1997). Technology transfer: strategy, management, process and inhibiting factors: a study relating to the technology transfer of intelligent systems", *International Journal of Innovation Management*, Vol. 4 No. 1, pp. 97-122.
- Atreyi, K., Bernard C.Y.T., 2004. A review of metrics for knowledge management systems and knowledge management initiatives. In: *Proceedings of the 37th Annual Hawaii International Conference on System Sciences*, p. 80238a.
- Bitner, M.J., Brown, S.W. and Meuter, M.L. (2000), "Technology infusion in service encounters", *Journal of the Academy of Marketing Science*, Vol. 28 No. 1, pp. 138-49.
- Boehm et al., (1976). *Problems and Perspectives in Management*", *Problems and Perspectives in Management*, Vol. 3, pp. 170-80.
- Bolton, J. (1971), *Small Firms – Report Of The Committee Of Inquiry On Small Firms*, HMSO, London, Cmnd 4811.
- Bradbury, T (2006). The impact of e-commerce on entry-mode strategies of service firms: a conceptual framework and research propositions", *Journal of International Marketing*, Vol. 12 No. 4, pp. 46-70.
- Byrd, C & Turner, J. (2001). Distributed engineering of manufacturing machines", *Proceedings of the Institution of Mechanical Engineers*, Vol. 215, pp. 217-31, Part B.

- Chen, W. (1996). Strategic human resource management for twenty-first-century China", *Research in Personnel and Human Resources Management*, JAI Press Inc, Greenwich, CT, pp. 353-66.
- Cheong, P. (2003), "Malaysia expects RM11.4 billion (\$3billion) from global outsourcing", available at: www.pwcglobal.com (accessed 5 October 2003).
- Colin, F. (2003). Competing through innovation in network markets: strategies for challengers", *Academy of Management Review*, Vol. 29 No. 3, pp. 359-77.
- Corman & Lussier. (2005). *Small Business Management, a planning approach*
- Corso and Corso et al. (2003). The impact of e-commerce on entry-mode strategies of service firms: a conceptual framework and research propositions", *Journal of International Marketing*, Vol. 12 No. 4, pp. 46-70. James, W.M. (2002), "Best HR practices
- Curran, J.M., Meuter, M.M. and Surprenant, C.F. (2003), "Intentions to use self-service technologies: a confluence of multiple attitudes", *Journal of Service Research*, Vol. 5 No. 3, pp. 209-24.
- Dalle, C & Jullien, T. (2001). Scale-free networks. *Scientific America* 288 (5), 50-59.
- Davenport, H.T., Prusak, L., 2000. *Working Knowledge. How Organizations Manage What They Know*. Harvard Business School Press, pp. 81-83.
- DiBona, L, Ockman, S, & Stone, J. (1994). A critical look at open source. *Computer* 37 (7), 92-94.
- Flint, D.J. (2002), "Compressing new product success-to-success cycle time: deep customer value understanding and idea generation", *Industrial Marketing Management*, Vol. 31 No. 4, pp. 305-15.
- Gorton, L & Liu, C. (2002) Automating the Measurement of Open Source Projects, In: *ICSE '03 Workshop on Open Source Software Engineering*, Portland, Oregon, May 3-10.
- Gray, B.J., Matear, S. and Matheson, P.K. (2002), "Improving service firm performance", *Journal of Services Marketing*, Vol. 16 No. 3, pp. 186-200.
- Gray, C. (2003), "Managing the impact of broadband on microfirms and their networks", *The European Journal of Teleworking*, Vol. 9 No. 1, pp. 4-16.

- Gray, S. (1998). Visualization of communication patterns in collaborative innovation networks analysis of some W3C working groups. Presented at ACM CKIM International Conference on Information and Knowledge Management, New Orleans, November 3–8, Knowledge Management Session 1, pp. 56– 60.
- Gray, T. (2004). Discussion of a large-scale open source data collection methodology. In: Proceedings of the 38th Hawaii International Conference on System Sciences (IEEE, HICSS '05-Track 7), January 03–06, Big Island, Hawaii, p. 197b.
- Grey, V. (2006). On the Pareto distribution of Sourceforge projects. In: Proceedings of Open Source Software Development Workshop, Newcastle, UK, pp. 122–129.
- Herbsleb, R & Grinter, A. (1999). Profiling an open source project ecology and its programmers. *Electronic Markets* 14 (2), 77–88.
- Kasim, H. (2004). Effort, cooperation and coordination in an open source software project: Gnome. *Information Systems Journal* 12 (1), 27–42.
- Kasim, S. (2003), "Workable outsourcing plan", *Computimes, New Straits Times*, 6 October.
- Kelly, D. and Storey, C. (2000), "New service development: initiation strategies", *International Journal of Services Industry Management*, Vol. 11 No. 1, pp. 45-62.
- Ken, J & Coare, S. (2005). Community, joining, and specialisation in open source software innovation: a case study. *Research Policy* 32, 1217–1241.
- Koh, J., Kim, Y.. (2004). Knowledge sharing in virtual communities: an e-business perspective. *Expert Systems with Applications* 26, 155– 166.
- Krogh, G., Spaeth, S., Lakhani, K., 2003. Community, joining, and specialisation in open source software innovation: a case study. *Research Policy* 32, 1217–1241.
- Lacity, C., & Willcocks, J. (2001). The Knowledge Ecology of Opensource Software Projects, European Group of Organizational Studies (EGOS Colloquium), Copenhagen.
- Lacity, K. & Hirschheim, E. (1995). How open source software works: "free" user-to-user assistance. *Research Policy* 32, 923–943.
- Lanzara, B & Morner, C. 2003 How long is the coast of Britain? Statistical selfsimilarity and fractional dimension. *Science* 156, 636–638.

- Laudon, C & Laudon, J. 2003 Managing volunteer activity in free software projects. In: Proceedings of the 2004 USENIX Annual Technical Conference, Freenix Track, pp. 93–102.
- Lee, W. (2001) Two case studies of open source software development: Apache and Mozilla. *ACM Transactions on Software Engineering and Methodology* 11 (3), 1–38.
- Lerner, H & Tirole, G. (2001) The usability of open source software. *Firstmonday* 8 (1).
- Magnusson, P., Matthing, J. and Kristensson, P. (2003), “Managing user involvement in service innovation: experiments with innovating end-users”, *Journal of Service Research*, Vol. 6 No. 2, pp. 111-24.
- Manecksha, T. 2003 Understanding Free/Open Source Software Development processes. *Software Process Improvement and Practice* 11 (2), 95–105.
- Menor, L.J., Tatikonda, M.V. and Sampson, S.E. (2002), “New service development: areas for exploitation and exploration”, *Journal of Operations Management*, Vol. 20 No. 2, pp. 135-57.
- Michlmayr, M., 2004. Managing volunteer activity in free software projects. In: Proceedings of the 2004 USENIX Annual Technical Conference, Freenix Track, pp. 93–102.
- Mindel, S. 2002 Participation in F/OSS communities. An empirical study of community members’ perceptions. In: Damiani, E., Fitzgerald, B., Scacchi, W., Scott, M., Succi, G. (Eds.), . In: *Open Source Systems*. International Federation for Information Processing, vol. 203. Springer, Boston, pp. 221–231.
- Moody, R. (2001). Free-open source learning community and web-based technologies. *IEEE Learning Technology Newsletter* 6 (1), 26–29.
- Mourdoukoutas. S. & Papadimitriou, K.(1998). Clustering and dependencies in Free/Open Source Software Development: methodology and tools. Available: http://www.firstmonday.dk/issues/issue8_4/ghosh/, Accessed; 12/08/2008
- Nonaka, I., Takeuchi, H., 1995. *The Knowledge Creating Company*. Oxford University Press.
- Olson, E.L. and Bakke, G. (2001), “Implementing the lead user method in a high technology firm: a longitudinal study of intentions versus actions”, *Journal of Product Innovation Management*, Vol. 18 No. 6, pp. 388-95.

- Perens, L. 1999 Using Repository of Repositories (RoRs) to study the growth of F/OSS projects: a meta-analysis research approach. In: Proceedings of the Third International Conference on Open Source Systems, June 11–14 1999, Limerick, Ireland.
- Porter, M. (1980). Competitive advantage –creating and sustaining superior Performance.
- Raymond, S. (1999). Studying software engineers: data collection techniques for software field studies. *Empirical Software Engineering* 10, 311–342.
- Roberts, J.H. (2000), “Developing new rules for new markets”, *Journal of the Academy of Marketing Science*, Vol. 28 No. 1, pp. 31-44.
- Sakran, U. (2001) Knowledge reuse in open source software: an exploratory study of 15 open source projects. In: Proceedings of the 38th Hawaii International Conference on System Sciences, (IEEE, HICSS '05-Track 7), January 03–06, Big Island, Hawaii, p. 198b.
- Schofield, A., Cooper, G.S., 2006. Participation in F/OSS communities. An empirical study of community members' perceptions. In: Damiani, E., Fitzgerald, B., Scacchi, W., Scott, M., Succi, G. (Eds.), . In: *Open Source Systems*. International Federation for Information Processing, vol. 203. Springer, Boston, pp. 221–231.
- Sowe, S.K., Karoulis, A., Stamelos, I., (2005). A constructivist view of knowledge management in open source virtual communities. In: Figueiredo, D.A., Paula, A. (Eds.), *Managing Learning in Virtual Settings: The Role of Context*. Idea Group Inc., pp. 290–308.
- Sowe, S.K., Stamelos, I., Angelis, L. (2007). Understanding knowledge sharing activities in free/open source software projects: An empirical study. *The Journal of Systems and Software*.
- Sowe, S.K., Stamelos, I., Angelis, L., 2006. Identifying knowledge brokers that yield software engineering knowledge in OSS projects. *Information and Software Technology* 48, 1025–1033.
- Suhaimi, A., Hussin, M & Mustaffa, J. (2004) Seeking empirical evidence for self-organized criticality in open source software evolution. Available: <http://www.cs.uwaterloo.ca/research/tr/2006/CS-2006-14.pdf>, last accessed 02/09/2008.
- Thomke, S. (2003), “R&D comes to services: bank of America’s path breaking experiments”, *Harvard Business Review*, Vol. 81, April, pp. 71-9.

- Thomson, C., Barahona, J., Robles, G., Perez, M., Merino, L., Olivera, V., Barbero, E., Quiros, P., 2001. Analysing the anatomy of GNU/Linux distributions: methodology and case studies (Red Hat and Debian). In: Koch, S. (Ed.), *Free/Open Source Software Development*. Idea Group Inc., pp. 27–58.
- Thomson, T. & Gray, F. 1999; Beyond low-hanging fruit: seeking the next generation in FLOSS data mining. In: Damiani, E., Fitzgerald, B., Scacchi, W., Scott, M., Succi, G. (Eds.), *Open Source Systems*. International Federation for Information Processing, vol. 203. Springer, Boston, p. 48.
- Timothy et al., 2005 Automating the Measurement of Open Source Projects, In: ICSE '03 Workshop on Open Source Software Engineering, Portland, Oregon, May 3–10.
- Vixie, P. (1999). *Software Engineering in Open Sources: Voices from the Open Source Revolution*, C. DiBona, S. Ockman, and M. Stone, Eds. Sebastopol, CA: O'Reilly.
- Wymbs, C. (2000), "How e-commerce is transforming and internationalizing service industries", *Journal of Services Marketing*, Vol. 14 Nos 6/7, pp. 449-63.
- Ye, Y., Kishida, K. (2003). Towards an Understanding of the motivation of open source software developers. In: *Proceedings of the 25th International Conference on Software Engineering*, Portland, Oregon, May 3–10, pp. 419–429.
- Ye, Y., Yamamoto, Y., Kishida, K. (2004). Dynamic community: a new conceptual framework for supporting knowledge collaboration in software development. In: *Proceedings of the Asia Pacific Software Engineering Conference*, pp. 472–481.
- Young, Y. 2000 Creating a knowledge sharing culture. *Knowledge Management Magazine* 2 (5), 213–238.
- Zack, H.M., 1998. Developing a knowledge strategy. *Sloan Management Review* 41 (3), 125–145.

Websites:

Gartner, www.gartner.com

Malaysia SME information, Bank Negara Malaysia. <http://www.smeinfo.com.my>

Open Source Initiative (OSI), <http://www.opensource.org/>

SAP. www.sap.com

Small and Medium Industries Development Corporation. <http://www.smidec.gov.my>

SME definition by European Commission.

http://ec.europa.eu/enterprise/enterprise_policy/sme_definition/index_en.htm