

12-31-1995

An Empirical Analysis of Information Systems Changes

Jon Heales

The University of Queensland

Follow this and additional works at: <http://aisel.aisnet.org/icis1995>

Recommended Citation

Heales, Jon, "An Empirical Analysis of Information Systems Changes" (1995). *ICIS 1995 Proceedings*. 36.
<http://aisel.aisnet.org/icis1995/36>

This material is brought to you by the International Conference on Information Systems (ICIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in ICIS 1995 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

AN EMPIRICAL ANALYSIS OF INFORMATION SYSTEMS CHANGES

Jonathan Heales
The University of Queensland

Abstract

The return on investment for Information Systems Development projects takes place during the period of stability following the system's implementation. This return on investment can be leveraged by extending the period of stability or reducing the ongoing costs of maintenance and enhancement. Since the usefulness of information systems is dependent on their alignment with the organization's goals and objectives, the ability of a system to absorb change directly affects its life span. Given also the risk of failure associated with systems development projects (Gladden 1982; Turner 1982; Hammer 1990; Lyytinen 1990), risk averse organizations are keen to delay such risky expenditure by extending an information system's life span.

This research develops a theoretically based model of information systems change, after Olle et al. (1991; see also Lederer and Prasad 1992; Marche 1993) and is based on the premise that stable information systems can react to changes in business requirements. Three types of adaptive maintenance activities are identified (Swanson and Beath 1989) which affect the surface structure, the physical structure or the deep structure of the information system (after Bunge 1979; Chomsky 1965; Weber 1987; Wand and Weber 1990). Theory is used to justify changes in the activity mix during the maintenance phase. A bathtub shaped curve is derived which predicts that more effort will be spent on deep structure changes at the beginning and toward the end of a system's useful life. These are the periods when an information system is generally the most unstable.

After implementation, an information system is generally unstable due to the need to address business requirements overlooked during system design or those that have subsequently arisen during the construction phase. Toward the end of a system's life it can also become unstable due to the inability of the system to respond to business requirements efficiently and effectively. A system will be replaced if it is unable to restore its stability. Monitoring a system's stability during the maintenance phase can provide useful input to decisions relating to the undertaking of significant enhancement projects or system replacement.

A way to measure system stability is developed which is then subjected to empirical testing. A research method, incorporating a time series analysis, is designed to determine whether there is support for the shape of the bathtub curve. Some 4,000 user change requests have been collected and are currently being analyzed. Results from the analysis of this data will be presented.

The effects of covariates, identified from work done by Dekleva (1992), Willcocks (1992), and Willcocks and Lester (1992), such as the stability of organizational management, organizational considerations, system class and complexity, methodology used, semantic relativism (e.g., RDBMS systems), and semiotic representation (e.g., CASE) on the shape and length of the curve are subjected to empirical testing. These are factors that affect both the level of system maintenance required during the maintenance phase as well as the life span of a system.

A cross sectional analysis of systems exhibiting different characteristics is currently being performed to determine whether the covariates affect the stability measure of a system. Logistic regression is used to test the effects of the covariates and the results from this cross sectional analysis will also be presented.

BIBLIOGRAPHY

- Bunge, M. *Treatise on Basic Philosophy: Volume 4: Ontology II: A World of Systems*. Boston: Reidel, 1979.
- Chomsky, N. *Aspects of the Theory of Syntax*. Boston: MIT Press, 1965.

- Dekleva, S. M. "The Influence of the Information Systems Development Approach on Maintenance." *MIS Quarterly*, Volume 16, Number 3, September 1992, pp. 355-372.
- Gladden, G. R. "Stop the Life Cycle, I Want to Get Off." *ACM SIGSOFT Software Engineering Notes*, Volume 7, Number 2, 1982, pp. 35-39.
- Hammer, M. "Re-engineering Work: Don't Automate, Obliterate." *Harvard Business Review*, July 1990.
- Lederer, A. L., and Prasad, J. "Nine Management Guidelines for Better Cost Estimating." *Communications of the ACM*, Volume 35, Number 2, February 1992.
- Lyytinen, K. "Different Perspectives on Information Systems: Problems and Solutions." *Computing Surveys*, March 1987, pp. 5-46.
- Marche, S. "Measuring the Stability of Data Models." *European Journal of Information Systems*, Volume 2, Number 1, 1993, pp. 37-47.
- Olle, T. W., et al. *Information Systems Methodologies: A Framework for Understanding*, Second Edition. Reading, Massachusetts: Addison Wesley, 1991.
- Swanson, E. B., and Beath, C. M. *Maintaining Information Systems in Organizations*. New York: John Wiley and Sons, 1989.
- Turner, J. A. "Observations on the Use of Behavioral Models in Information Systems Research and Practice." *Information Management*, Volume 5, Number 3, 1982, pp. 207-213.
- Wand, Y., and Weber, R. "Toward a Theory of the Deep Structure of Information Systems." In J. I. DeGross, M. Alavi, and H. Oppelland (Editors), *Proceedings of the Eleventh International Conference on Information Systems*, Copenhagen, Denmark, 1990, pp. 61-71.
- Weber, R. "Toward a Theory of Artefacts: A Paradigmatic Base for Information Systems Research." *Journal of Information Systems*, Spring 1987.
- Willcocks, L. "IT Evaluation: Managing the Catch 22." *European Management Journal*, Volume 10, Number 2, June 1992.
- Willcocks, L., and Lester, S. "How do Organizations Evaluate and Control Information Systems Investments? Recent UK Survey Evidence." In D. Avison, J. E. Kendall and J. I. DeGross (Editors), *Human, Organizational, and Social Dimensions of Information Systems Development*. Amsterdam: North-Holland, 1993.