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An Exploratory Study of the Implementation of an Energy Management Information System using an Adapted Adaptive Structuration Theory Model

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AN EXPLORATORY STUDY OF THE IMPLEMENTATION OF AN ENERGY MANAGEMENT INFORMATION SYSTEM USING AN ADAPTED ADAPTIVE STRUCTURATION THEORY MODEL

Une étude exploratoire de l'implantation d'un système d'information de gestion de l'énergie recourant à la théorie de la structuration adaptative

Research-in-Progress Paper

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Abstract

Oil prices globally have risen 500% since 1999. Ireland will have to pay €1.45bn in penalties next year and up to €4.3bn by 2012, as CO2 emissions are currently 23% over the agreed Kyoto allowances. Over the next 25 years, population and economic growth will cause global energy needs to increase by approximately 50%. Consequently, Energy Efficiency (EE) has become an essential part of most organisations. This paper reports on research-in-progress which explores the implementation of an Information System (IS), which is used to manage and monitor energy usage and implement energy efficiencies within several organisations.

Adaptive Structuration Theory (AST) provides the conceptual model that helps to capture the longitudinal change process. There is currently no published research in the area of IS implementation investigating an energy management system using AST. Preliminary results show that stricter imperatives to adopt the IS will not necessarily lead to a successful system

Keywords: Case study, IS implementation, Adaptive Structuration theory, energy efficiency, success factors, research in progress.

Résumé

Le prix de l'essence a globalement augmenté de 500% depuis 1999. L'Irlande devra payer 1,5 Md€ de pénalités l'an prochain et jusqu'à 4,3 Md€ en 2012 du fait des émissions de CO2 qui dépassent de 23% les autorisations accordées par Kyoto. En conséquence l'Efficience Energétique (EE) est devenue essentielle pour les organisations. Ce papier rapporte une recherche en cours qui explore l'implémentation d'un Système d'information qui est utilisé pour gérer et contrôler l'utilisation d'énergie et mettre en œuvre les pratiques efficientes à l'intérieur de plusieurs organisations.

INTRODUCTION

Energy-related research shows that the most fundamental indicators: energy consumption, fossil fuel dependence, import dependency, CO_2 emissions, and energy prices are moving in the wrong direction (Forfás, 2006), and as a result from an economic, environmental and competitiveness viewpoint, there is a need within organisations to manage energy usage. This is occurring on an Irish, a European Union (EU) and a global level. Before energy usage can be managed, it must first be controlled, measured and monitored. One of the ways that this can be achieved is with the use of an Information System (IS). The components that comprise the IS are the Building Management System (BMS) and the commercially available Monitoring and Targeting (M&T) software packages that integrate with the BMS. Savings of between 5% and 20% from the annual energy bill have been realized as a direct result of the purchase, correct appropriation and implementation of this software (Lowry, 2002).

The BMS is the basic control system that is contained in a building, managing the heating, cooling, lighting, ventilation and most other energy needs that an organisation has on an everyday basis. This is the source of the data for the IS and it is uploaded from each separate metering point at regular intervals. M&T is a structured approach to energy management that provides a powerful technique for identifying inefficient performance and eliminating waste. The software processes the data providing robust information regarding energy usage. Energy efficiency (EE) is essentially about achieving the same result with less energy, and the information from the energy management IS empowers an organisation to take the required measures to save energy.

Despite considerable empirical research, results on the relationships among constructs related to IS success, as well as the determinants of IS success, are often inconsistent (Sabherwal et al, 2006). DeLone & McLean (2002) state that not enough IS field study research attempts to measure the influence of the IS effort on organisational performance. Nor have investigators of implementation processes usually described organisational impacts. Clearly, we need more studies that take a broader view of organisational impacts by describing how and why systems were implemented. This research will aim to do just this, and also add to the existing body of IS implementation knowledge by utilizing Adaptive Structuration Theory (AST) to analyze the implementation of the IS specifically looking at the imperatives for adoption, the factors that may cause the implementation to be successful, and finally measuring the success of the IS post-implementation. For the purpose of this paper, the researcher will focus on the factors that may cause success and the proposed adapted AST model. The researcher is looking at IS implementation from an energy management perspective.

This paper begins by describing IS implementation and the success factors. It then outlines the proposed conceptual research framework, highlights the approach taken and finally reports on some preliminary results identified thus far and describes the next stage of the research.

IS IMPLEMENTATION

IS implementation has been a research topic of interest for the past three decades and remains a high priority due to the level of investment in, and reliance upon these systems by the organisations (DeLone & McLean, 1992; DeLone & McLean, 2002; Rai et al., 2002; Sabherwal et al, 2006). As IS' become increasingly intertwined in the operations, products, strategies, and infrastructure of corporations, it is critical that the implementation be successful (Alavi & Joachimsthaler, 1992). The organisational complexity of large IS implementation brings the problem of how to conceptualise the relationship between, on the one hand, IS development, and on the other hand, ultimate system use and associated organisational change (Alvarez, 2003; Sabherwal et al, 2006). Changes in organisational structure,

job design, communication patterns, and interorganisational relationships must be anticipated and managed as part of the implementation process.

Markus (1983) concluded that it is pointless to try to understand the impacts of a system without also understanding its development history, including the implementation process. Markus also concluded that technology alone is insufficient to explain impacts, and that the design objectives for a system and the existing organisational structures must also be understood.

FACTORS INFLUENCING A SUCCESSFUL IS IMPLEMENTATION PROCESS

This section looks at the factors that, if adequately tended, will significantly improve the chances for a successful implementation of an IS if they are present before and during the process. These are *not* the factors used to measure success or indicate post-implementation success as prescribed in the Delone & McLean IS Success Model (Delone & McLean, 1992). System success is a multidimensional trait and cannot be described as a single measure, so clearly the success of any IS implementation is founded on addressing a broad spectrum of both technical and organisational issues (DeLone & McLean, 2002; Dhillon, 2004).

Currently, most managers of implementation efforts attend to these factors in an intuitive and ad hoc fashion, as they attempt to manage and allocate their time and resources across a number of conflicting demands (Pinto & Millet, 1999). These managers need to realise that there are positive associations between the factors and potential system success.

Extant research has shown that the following factors may influence a successful implementation process; management support, a project champion, task scope, IS sophistication, organisational support, cross disciplinary teams, user involvement, commitment, organisational environment, managerial behaviour, end-user training and vendor partnerships. These factors are summarised in Table 1 below.

It is clear to the researcher that across a broad spectrum of IS implementations, each factor will ultimately play a different role depending on the genre of IS, the type of organisation involved, the level of information needed etc. The researcher seeks a judicious understanding of which factors are important within this context, which is the implementation of an energy management information system. This is not an industry specific IS; it will be implemented across all sectors as EE becomes a necessity to every organisation. So while the literature has studied extensively the critical success factors (CSFs) of IS implementation on the one hand, and building energy management systems on the other, so far the two have not come together in a single study until now.

PROPOSED CONCEPTUAL FRAMEWORK

A building energy management system is a complex system from the perspective of both the firm and the technology, and as such the chosen investigative framework will have to encompass each perspective. The chosen framework is AST which provides a theoretical framework that further investigates and explains the IS implementation process, using several organisations at different stages of implementing the same system. The framework is presented in Figure 1, and has been adapted from the framework that was proposed by DeSanctis & Poole (1994), who stated that "A major strength of AST is that it expounds the nature of social structures within advanced information technologies and the key processes that figure in their use. We can attain a better understanding of how to implement technologies." This research builds upon DeSanctis & Poole's work by adapting the framework that they proposed to an energy management information system environment. The researcher is effectively adapting adaptive structuration theory. This is the second iteration of the model as the research progresses.

Adaptive structuration theory helps to capture the longitudinal change process (Schwieger et al, 2004), and also helps to describe the interplay between advanced information technologies, social structures and human interaction. It also extends current structuration models of technology-triggered change to consider the mutual influence of technology and social pressures (DeSanctis & Poole, 1994). To look more closely at how AST can provide a deeper insight into IS implementations; the following section examines each part of the proposed framework separately, and outlines the research propositions from the model.

Success Factor	IS Literature	Contribution to knowledge
Management Support	Liang et al (2007) Markus (1983) Sharma & Yetton (2003) Walsham (1992) Zmud & Cox (1979)	Critical factor Less resistance if support evident Investment
Project Champion	Chakrabarti (1974) Howell (2005) Jenssen & Jorgensen (2004)	Positive effect Reduce uncertainty Bring IS to fruition
Task Scope	Markus (1983) Nichols (1981)	Effect on potential users Tasks will change with new IS Task interdependence
IS Sophistication	Attewell (1992) Robey et al (2002)	Structure of the technology Level of complexity directly affects level of success
Organisational Support	Dhillon (2004) Keen (1981) Markus (1983) Willcocks & Mark (1989)	Role of power Accountability Responsibility Investment
Cross Disciplinary Teams	Zmud & Cox (1979)	Accountability Ownership
User Involvement	Alavi & Joachimsthaler (1992) Ginzberg (1981) Ginzberg & Schultz (1987) Ives & Olsen (1984) Nichols (1981) Sharma & Yetton (2003) Srinivasan & Davis (1987) Willcocks & Mark (1989)	Unrealistic expectations System acceptance System quality Ease of use
Commitment	Ginzberg (1981) Markus (1981) Newman & Sabherwal (1996)	Investment Essential throughout Management
Organisational Environment	Coakes & Elliman (1999) Keen (1981) Walsham (1992)	Scope Goals Mission statement Politics Conflict management Stakeholders Organisational learning Investment
Managerial Behaviour	Coakes & Elliman (1999) Keen (1981) Markus (1983)	Enhance managerial decision making power
End-User Training	Bostrom et al (1990) Bronsema & Keen (1985) Compeau et al (1995) Sharma & Yetton (2007)	It is a critical intervention Usually a substantial investment Formal training programs
Vendor Partnership	Plant & Willcocks (2007)	Can add to overall project if geographically dispersed

Table 1. Factors that may influence a successful IS implementation.

External imperatives for energy management:

The researcher has extended the "other sources of structure" aspect of the original framework. As outlined below, the researcher will now also be able to discover what effect the external imperatives for adoption have had on the choice of the technology and on the process of appropriation of the technology. Will one implementation be more successful than another that is occurring due to much stricter imperatives? The framework will also take the nature of the task into consideration. The researcher will look at what exactly the organisation is trying to achieve, determine if the chosen technology fits the intended task, and its impact on the overall process, if any.

P1: The type of technology that is chosen will be determined by the task, the organisational environment and the associated dominant adoption imperative.

P2: The task, organisational environment and the imperatives to adopt will give rise to different forms of social interaction within the implementation process.

This section of the framework will incorporate the following success factors: Organisational environment and task scope.

Structure of Technology:

This part of the model takes into account the actual structural features, the specific types of rules and resources, or capabilities, offered by the system (DeSanctis & Poole, 1994). The features can be classified in terms of restrictiveness, level of sophistication and comprehensiveness. It is possible to scale the different structural features by consulting user manuals, reviewing the statements of the designers, or noting the comments of people who use the technology. The level of complexity of the IS is taken into account here and incorporates the IS sophistication success factor from Table 1.

P3: The structure of the technology in terms of its features and spirit will give rise to different forms of social interaction within the implementation process.

Social Interaction:

This is the actual process of implementation of the IS into the organisation. The act of bringing the rules and resources from an advanced information technology or other structural source into action is termed structuration (DeSanctis & Poole, 1994). Giddens (1979) uses the term "structuration" to describe how structure enters into social action. Appropriation is the manner in which structures are adapted by the systems users for their own use through the process of structuration (Gopal et al, 1992). A measure of faithfulness is how the user is utilizing the system compared to the systems actual aims and objectives. Will successful appropriation of the system lead to a successful implementation and subsequent effective use of the system?

The researcher will investigate each aspect of the social interaction that will occur throughout the implementation process. The remainder of the success factors from Table 1 will be investigated during this part of the framework.

Emergent sources of structure:

P4: New sources of structure emerge as the technology, task, organisational environment and the external adoption imperatives are applied during the course of social interaction.

Outcomes:

A clear implication from the above propositions is that clear-cut predictions about how technological structures will be appropriated, or what the ultimate outcomes of that appropriation will be, are difficult to formulate. The decision outcomes and the emergent sources of structure will become evident as the research progresses and also after the research has been completed.

P5: Given the technology, task, organisational environment, external imperatives and ideal appropriation processes, the implementation will produce desired use of the IS.

Taking the complexity of the system and the complexity of the organisation into consideration, AST (as described above), is a suitable framework in which to investigate the implementation as it incorporates both aspects.

This research aims to add to the current body of AST knowledge by applying it in the context of energy management IS, as there is no current research which focuses on this aspect. As DeSanctis and Poole (1994) point out "A critical challenge is to systematize the research so that technologies and interaction processes can be

meaningfully assessed and comparative analysis is possible" (Chin et al, 1997). The difficulty associated with achieving this aim is that it tends to be directly related to the complexity of the IS, which is comprised of both technical and organisational aspects.

Galliers (1991) states that if one takes a sociotechnical perspective of IS, it can be argued that IS are as much concerned with human activity and the organisation as they are with technology - if not more so. If this argument is accepted, it follows that IS strategy should contain not only Information Technology (IT) strategy, but also such organisational issues as change management and a human resource strategy. The proposed adaptive structuration theory model incorporates both of these aspects. How this research will be undertaken is proposed in the following section.

The parts of the model that are adapted and changed are shown in bold to differentiate from the original AST model. This is to incorporate the specific adoption triggers for an energy management IS, and also the factors that may influence a successful system.

This is an iterative process and the specifics of the adapted AST model may change again before the research is completed. This was proposed by DeSanctis & Poole (1994, p.143) as the next logical progression for AST: "We presented major concepts for the study of technology-induced change and stated seven propositions regarding relationships among these concepts. Refinement of these concepts and articulation of specific research hypotheses is the next step. Our research strategy could be specified in more detail and tested for its usefulness across a range of advanced information technologies and organisational contexts."

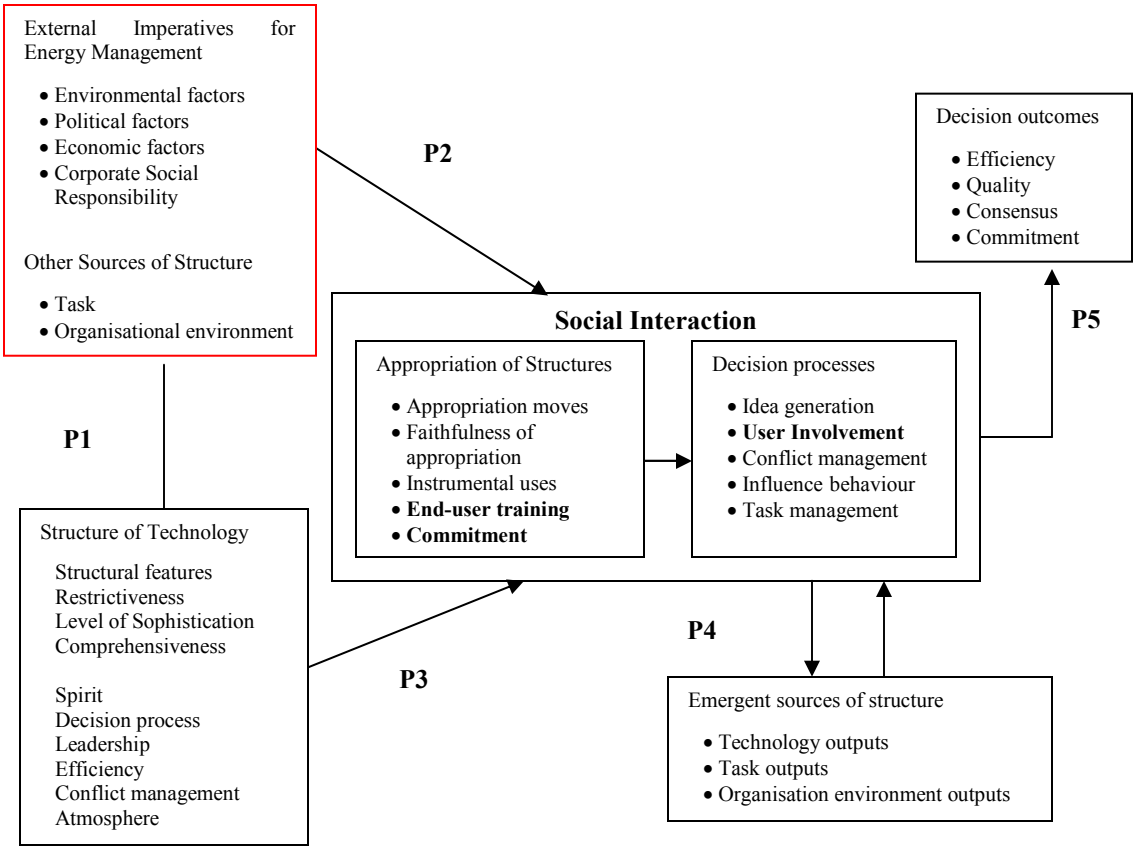

Figure 1: Summary of the major constructs and propositions of the proposed AST model, a research framework adapted from DeSanctis & Poole (1994). ***2nd iteration of the model.***

RESEARCH APPROACH

After carefully examining all possibilities for the research topic, the researcher decided that a case study would be the most apposite due to the nature of the research area *and also because the research is concerned with theory building not theory testing and so is inductive in nature.* In making this decision, the researcher took into account the qualitative nature of the research, the extent of available resources, the type of information required and the suitability of each research methodology. The area under research, energy management IS implementation, is a relatively new area of study, and it has been argued that the use of case-based research is appropriate where the phenomenon is dynamic and not yet mature or settled (Benbasat et al, 1987; Darke et al, 1998). When viewed from the emerging legislative and environmental context in which the study is occurring, and the complexities involved in the adoption process, case-based research is a suitable approach.

The researcher has full access to the following case studies:

Case Study #1: A private hospital in the West of Ireland. The hospital is two years old and has a building management system installed. There is currently no monitoring and targeting software installed and the hospital is currently trying to justify further spending on energy related matters.

Case Study #2: A large third-level educational institution in the West of Ireland. There is a building management system installed, and monitoring and targeting software is currently being installed. This is a large scale installation as 28 buildings will be integrated as part of the new system. There is a facilities manager employed. This is a new position within the university in response to growing challenges within the energy sector.

Case Study #3: A private pharmaceutical company in Dublin. The organisation has an energy team in place and is currently in the process of implementing a building energy management system. The cross-disciplinary energy team meet once a month and the IS is due to be in place by autumn 2008.

As can be seen above, the researcher has chosen a pre-implementation case, and two that are in the process of implementing the system. These companies were chosen because of the varying degrees of integration of the energy management systems, and also because of their willingness to participate in the research. The researcher has *full access* to each of these organisations, and is onsite once a month for interviews and observation. The researcher is also conducting short interviews with approximately 20 organisations, covering both the public and private sectors, as the imperatives to adopt may be quite different across the sectors. This data will help to define the problem space further and the researcher would like to investigate the effect that the reasons for adopting energy management has had on the appropriation of the system. For example, what is the degree to which the imperatives influence the outcomes of the implementation?

Data collection commenced in October 2006 and will continue until December 2008, and data analysis is ongoing. Data collection methods include interviews, questionnaires, observation and company documentation.

PRELIMINARY RESULTS

The researcher is using the qualitative data analysis software package NVIVO to analyze the data. Data analysis is in its infancy, but some early emerging codes are as follows: importance of the tendering and vendor selection process; accountability and ultimate control of the system; accessibility to infrastructure; personnel and availability of organisational resources.

Another interesting strand to recently emerge is the fact that even when an organisation is seen to adopt every correct measure during the implementation process, it may not necessarily lead to a successful system. One of the case studies that seem to be implementing their system in a textbook manner has yet to make ANY energy cost savings as a result. A second case study has already saved enough in energy spending this year to pay for the purchase of a 1MW combined heat and power (CHP) unit that is due to be installed next year. This will become evident as the IS Success Model is applied and tested within each organisation to verify if indeed, the system is successful or not.

CONCLUSION AND NEXT STEPS

There are many factors that may help to address a successful IS implementation but will the IS be successful after the implementation? The next step in this research process following this paper is to analyze and quantify the success of the system in terms of the criteria set out in the DeLone & McLean (1992) IS Success Model. For the purpose of this research, the DeLone & McLean (1992) IS Success Model will be used to measure the success of these case studies as between 1992 and 2002, nearly 300 articles in refereed journals have referred to, and made use of, this IS success model (DeLone & McLean, 2002). The researcher will have access to post-implementation data from the case studies.

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References

Alavi, M. & Joachimsthaler, E. (1992). Revisiting DSS Implementation research: A Meta-Analysis of the Literature and Suggestions for Researchers. MIS Quarterly, March 1992, pages 95-116.

Alvarez, A., (2003). Towards an interpretive integrative framework to conceptualise social; processes in large information systems implementations. Information Technology for Development, Volume 10, pages 233-247.

Attewell, P., (1992). Technology Diffusion and Organisational Learning. Organisational Science, Volume 3, Issue 1, pages 1-19.

Benbasat, I., Goldstein, D., & Mead, M., (1987). The case research strategy in studies of Information Systems. MIS Quarterly, September 1987, pages 368-386.

Bostrom, R.P., Olfman, L., Sein, M., (1990). The Importance of Learning Style in End-user Training. MIS Quarterly, Issue 14, Number 1, pages 101-119.

Bronsema, G.S., & Keen, P., (1985). Educational Intervention and Implementation in MIS. Sloan Management Review, Issue 24, Number 4, pages 35-43.

Coakes, E., & Elliman, T., (1999). The Role of Stakeholders in Managing Change. Communications of the ACM, Volume 2, Article 4.

Chakrabarti, A. K., (1974). The Role of Champion in Product Innovation. Sloan Management Review. Volume 17, Issue 2, pages 58-62.

Chin, W., Gopal, A. & Salisbury, W., (1997). Advancing the Theory of adaptive Structuration: The Development of a Scale to Measure Faithfulness of Appropriation. Information Systems Research, Volume 8, number 4, pages 342-376.

Compeau, D., Olfman, L., Sein, M., & Webster J., (1995). End-user Training and Learning. Communications of the ACM, Volume 38, Issue 7, pages 24-26.

Darke, P., Shanks, G. & Broadbent, M., (1998). Successfully Completing Case Study Research: Combining Rigour, Relevance and Pragmatism. Information Systems Journal, Issue 8, pages 273-289.

Delone, W.H. & McLean, E.R. (1992). Information Systems Success: The Quest for the Dependent Variable. Information Systems Research, Issue 3, Number 1, pages 60-95.

Delone, W.H. & McLean, E.R. (2002). The Delone and McLean Model of Information Systems Success: A Ten-Year Update. Journal of Management Information Systems, Volume 19, Number 4, pages 9-30.

DeSanctis, G. & Poole, M. (1994). Capturing the Complexity in Advanced Technology Use: Adaptive Structuration theory. Organisational Science, May, Volume 2, Number 5.

Dhillon, G., (2004). Dimensions of Power and IS Implementation. Information & Management, Issue 41, pages 635-644.

Forfás (2006). A Baseline Assessment of Ireland's Oil Dependence: Key Policy Considerations. April 2006.

Galliers, R., (1991). Strategic Information Systems Planning: Myths, Reality and Guidelines for Successful Implementation. European Journal of Information Systems, Volume 1, Issue 1, pages 55-64.

Giddens, A., (1979). Central problems in social theory. Action, Structure and Contradiction in Social Analysis. The Macmillan Press Ltd.

Ginzberg, M., (1981). Key Recurrent Issues in the MIS Implementation Process. MIS Quarterly, June, pages 47-59.

Ginzberg, M., & Schultz, R., (1987). The Practical Side of Implementation Research. Interfaces, Issue 17, Number 3, pages 1-5.

Gopal, A., Bostrom, R., & Chin, W. (1992). Applying Adaptive Structuration Theory to Investigate the Process of Group Support System Use. Journal of Management Information systems, Volume 9, Number 3, pages 45-69.

Howell, J., (2005). The right stuff: Identifying and developing effective champions of innovation. Academy of Management Review, Volume 19, Number 2, pages 108-119.

Ives, B., & Olson, M., (1984). User involvement and MIS success: A review of research. Management Science, Volume 30, Number 5, pages 586-603.

Jenssen, J., & Jorgensen, G., (2004). How to corporate champions promote innovations? International Journal of Innovation Management, Volume 8, Number 1, pages 63-86.

Keen, P. (1981). Information Systems and Organisational Change. Communications of the ACM, Volume 24, Number 1, pages 24-33.

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. MIS Quarterly, Volume 31, Number 1, pages 59-87.

Lowry, G (2002). Factors affecting the success of building management system installations. Building Services Engineering Research and Technology, Volume 23, Issue 1, pages 57-66.

Markus, M., (1981). Implementation Politics: Top management Support and User Involvement. Systems, Objectives, Solutions, Issue 1, pages 203-215.

Markus, M., (1983). Power, Politics and MIS Implementation. Communications of the ACM, Volume 26, Number 6, pages 430-444.

Newman, M., & Sabherwal, R., (1996). Determinants of Commitment to Information Systems Development: A Longitudinal Investigation. MIS Quarterly, Volume 20, pages 23-54.

Nichols, M., (1981). A behavioural analysis for planning MIS implementations. MIS Quarterly, March 1991, pages 57-66.

Pinto, J., & Millet, I., (1999). Successful Information System Implementation: The human side. Project Management Institute.

Plant, R., & Willcocks, L., (2007). Critical Success Factors in International ERP Implementations: A Case Research Approach. Journal of Computer Information Systems, spring 2007, pages 60-70.

Rai, A., Lang, S., & Welker, R., (2002). Assessing the Validity of IS Success Models: An Empirical Test and Theoretical Analysis. Information Systems Research, Volume 13, Number 1, pages 50-69.

Robey, D., Ross, J. W., & Boudreau, M.C., (2002). Learning to Implement Enterprise Systems: An Exploratory Study of the Dialectics of Change. Journal of Management Information Systems, Volume 19, Issue 1, pages 17-46.

Sabherwal, R., Jeyaraj, A., & Chowa, C., (2006). Information System Success: Individual and Organisational Determinants. Management Science, Volume 52, Number 10, pages 1849-1864.

Schwieger, D., Melcher, A., & Wen, H., (2004). Appropriating electronic billing systems: Adaptive structuration theory analysis. Human Systems Management, Volume 23, pages 235-243.

Sharma, R., & Yetton, P., (2003). The contingent effects of management support and task interdependence on successful information systems implementation. MIS Quarterly, Volume 27, Number 4, pages 533-555.

Sharma, R., & Yetton, P., (2007). The contingent effects of training, technical complexity, and task interdependence on successful information systems implementation. MIS Quarterly, Volume 31, Number 2, pages 219-238.

Srinivasan, A., & Davis, J., (1987). A Reassessment of Implementation Process Models. Interfaces, Issue 17, Number 3, pages 64-71.

Walsham, G., (1992). Management Science and Organisational Change: A Framework for Analysis. International Journal of Management Science, Volume 20, Number 1, pages 1-9.

Willcocks, L., & Mark, A., (1989). IT Systems Implementation: Research Findings from the Public Sector. Journal of Information Technology, Issue 4, Number 2, pages 92-103.

Zmud, R., & Cox, J., (1979). The Implementation Process: A Change Approach. MIS Quarterly, June 1979.