

2008

Implicit Enterprise Risk Management: An IT Healthcare Adoption Case Study

Say Yen Teoh

School of Business Information Technology RMIT University, Melbourne, Australia, sayyen.teoh@rmit.edu.au

Christopher Cheong

School of Business Information Technology RMIT University, Melbourne, Australia, christopher.cheong@rmit.edu.au

Follow this and additional works at: <http://aisel.aisnet.org/acis2008>

Recommended Citation

Teoh, Say Yen and Cheong, Christopher, "Implicit Enterprise Risk Management: An IT Healthcare Adoption Case Study" (2008).
ACIS 2008 Proceedings. 8.

<http://aisel.aisnet.org/acis2008/8>

This material is brought to you by the Australasian (ACIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in ACIS 2008 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

Implicit Enterprise Risk Management: An IT Healthcare Adoption Case Study

Say Yen Teoh
Christopher Cheong
School of Business Information Technology
RMIT University,
Melbourne, Australia

Email: sayyen.teoh@rmit.edu.au; christopher.cheong@rmit.edu.au

Abstract

The unusually slow adoption of information technologies in healthcare is mainly attributed to the overwhelming risks involved in the implementation process embedded in that particular industry. The issue of timing and approach in employing risk management to mitigate risks in healthcare still remains a challenge. In this paper, we report our work in which the objective was to explore the employment of risk management practices from a Singapore-based hospital which is re-designing its medical informatics and premises to provide patient-centric quality healthcare. A total of 19 face-to-face interviews were conducted. The findings highlight that although this organization did not explicitly set out to use an Enterprise Risk Management approach, it has inadvertently done so. The questions of when and where to employ ERM can be difficult to determine, especially in the healthcare industry, hence, we conclude that practitioners should review their existing risk management practices and identify the embedded ERM activities so as to leverage on them in facilitating the managerial guidelines to accomplish the task.

Keywords

Enterprise Risk Management (ERM), Medical Informatics, Case Study.

INTRODUCTION

Unlike other industries, the migration and use of information technologies in healthcare is as much as 10 to 15 years behind time in general (Economist 2003). Since the late 1960s, the US government has invested billions of dollars in various efforts to automate medical informatics but to no avail until 2004 (Thompson 2004). Similarly, the process of healthcare IT migration from traditional to medical informatics in Asia has been fairly slow. Such an unusually slow medical informatics take-off in the healthcare industry is mainly due to the uncertainty and risks involved. Mainly, hospitals have a duty of care to service their customers (patients, visitors and staff) and stakeholders (Okoroh et al. 2002). Such a duty of care involves improving and delivering service quality care with reliable and valid data (Ghali et. al. 2001) as well as the avoidance of clinical failures (Okoroh et al. 2002) that would render core public services subject to great risk and uncertainty. Thus, the challenge is how to best promote the adoption of medical informatics with minimal possible risks (Goldschmidt 2005).

With the need of change in the healthcare industry (Burke et al. 2002) along with a host of promising new platform technologies confronting forward-looking hospitals, it can be difficult to decide which technologies to adopt, when to adopt them and how to manage the implementation process (Fichman 2004). In fact, very little is known about hospitals' adoption of IT (Burke et al. 2002). Considering the much of uncertainties in the healthcare technology adoption, it is vital to explore the existence of risk management practices associated with the system adoption. Hence, the objective of this work is to explore the existence of risk management practices associated with the healthcare industry.

Risk management is a systematic process of identifying or making a realistic evaluation of business risk levels and then developing strategies to manage these risks. Specifically, this is achieved through the process of risk identification, risk policy, risk definition, risk sharing, risk allocation, risk analysis, risk evaluation, and, finally, risk response, risk planning and risk minimization (Kangari 1988). In view of the diverse varieties in risk management studies, in this paper we explore risk management practices in a healthcare organization. The remainder of the paper is as follows. We firstly discuss the existing ERM literature, lessons learned from other researchers in the area. Next, we describe our research approach followed by a description of the case study used to analyze the challenges and risks involved in the process of adopting the medical informatics in the hospital. We then conclude by highlighting the implications of our findings for both research and practice purposes.

LITERATURE REVIEW

Risk management is an important part of operating an enterprise as all enterprises face risks. This is particularly important in the healthcare industry as mismanagement of risks may result dire consequences (e.g. fatalities). To put things into perspective, in 1999, the Institute of Medicine's "To Err Is Human" report (Kohn et al. 1999) stated that medical errors result in as many as 98,000 deaths per year. Physicians face astounding odds against medical errors as they are required to be knowledgeable about approximately 10,000 diseases and syndromes, 3,000 medications, and need to be constantly up-to-date about newly published medical literature (Davenport 2002). Thus, risk management has become a policy priority in many health systems around the world (McDonald et al. 2005).

In traditional risk management, the only expected financial outcome from risk is the probability of loss (Ching 1997). The approach to traditional risk management is through mitigating the risks by using various strategies, including aggressive control of loss, safety, clinical risk management, and training (Ching 1997). In instances where the losses cannot be controlled, the risks are transferred through the use of insurance (Ching 1997).

In traditional enterprises, departments are disintegrated and managed independently (Brannan and Taylor 2006; Liebenberg and Hoyt 2003). Traditional risk management assumes that successful risk management results from independent departments managing risk successfully (Brannan and Taylor 2006). However, such an approach may result in inefficient or inaccurate risk management as each department may have different definitions and treatments of risk. For example, a particular department may identify and manage IT related issues differently by unknowingly transferring the risks to others or, perhaps, it may be more effective to manage a group of relevant IT issues and risks rather than handling them separately. Having different perceptions and treatments of risk during the process of adopting IT can be further problematic, especially in industries such as healthcare, in which research has shown that poor management of such issues can lead to undesirable outcomes (Lorenzi et al. 1997). All in all, traditional risk management does not provide a holistic view of risks for the entire enterprise, is unable to deal with emergent or combinatorial risk (Shaw 2005), and cannot measure the financial or operational effectiveness of the risk management (Ching 1997).

Enterprise Risk Management (ERM) builds upon traditional risk management (Ching 1997) with a different approach (Steinberg et al. 2004) as it does not assume that risks exist in isolated departments of an enterprise (Hoyt and Hall 2003). In general, ERM proposes a holistic approach of how an enterprise risk portfolio is created and managed. Understanding this can enable organizations to better plan and manage IT adoption. It is also pre-emptive in that risks are proactively handled: rather than reacting to problems, risks are anticipated and managed before the problems occur (O'Donnell 2005). ERM, is defined by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) as (Steinberg et al. 2004):

"a process, effected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives"

Based on the ERM framework, risk can be defined as an observable event(s) or action(s) that can have material impact on the organization's financial or operational performance. Risks do not exist in isolation; in fact, they may exist across different domains, such as operational risk, financial risk, human capital, strategic, legal and regulatory, and technology (Ching 1997). With such a framework, it offers a fundamentally proactive approach for organizations to identify, manage, and exploit risks (Ching 1997) and leads to better operational and strategic decision-making in IT adoption which results in sustainable competitive advantage (Ching 1997; Hoyt and Hall 2003).

In light of its strengths, many organizations have started adopting ERM at various stages of IT implementation (Beasley et al. 2005; Liebenberg and Hoyt 2003), including those in the healthcare industry (Brannan and Taylor 2006; Ching 1997; Ching 2001; Hoyt and Hall 2003). However, a common problem throughout various industries, especially in healthcare, is to understand and determine when to implement ERM (Ching 1997). In fact, not much is known about stages of ERM deployment or factors that affect the uptake of ERM in an enterprise (Beasley et al. 2005) and it can even be difficult to determine which enterprises are using ERM (Liebenberg and Hoyt 2003) in the process of adopting IT. However, some recent research has identified a few determinants which signal the use of ERM (Liebenberg and Hoyt 2003) and factors which affect ERM implementation and deployment (Beasley et al. 2005). These factors include enterprise characteristics such as size, auditor type, industry, and country of domicile (Beasley et al. 2005). Of critical importance is the leadership of the board and senior management (Beasley et al. 2005). Furthermore, the existences of a chief risk officer, board independence, and support from the CEO and CFO would also have a positive effect on ERM implementation (Beasley et al. 2005), which could influence the process of IT adoption.

Brannan and Taylor (2006) advise that there are three broad steps in implementing an ERM program in an enterprise. These are: analyze risk from a broader prospective, define roles and responsibilities, and create a strategy matrix to deal with specific ERM elements. As Brannan and Taylor's (2006) steps are relatively general, we further explore the lack of study in the Asian healthcare industry, by relating to Shaw's (2005) seven steps of implementing an effective ERM program, which are more specific: (1) assemble and educate a cross-functional team representing each significant functional area of the enterprise, (2) identify risks and opportunities the enterprise faces, (3) determine the enterprise's risk appetite, (4) identify correlations between the risks and opportunities the enterprise faces, (5) prioritize risks and opportunities, (6) determine appropriate actions for mitigation of risks and exploitation of opportunities, and (7) implement an enterprise risk management system to continually monitor and respond to events and trends. Building on these recent studies, we explore our case study in light of these findings.

METHODOLOGY

The methodology adopted in conducting this research is an exploratory, in-depth case study. This is a method that specializes in exploring contemporary phenomena with empirical inquiry research on "how" and "why" questions (Yin 2003). This method is especially suitable to explore phenomena with a scarcity of existing research (Benbasat et al. 1987). The advantage of this method is it allows researchers to enter the research field with an open concept, without any pre-structured research questions. By doing so, it allows researchers to gather more unswerving and insightful information from informants, with rich depictions of the social context of the studied phenomena (Yin 1994).

In line with our research area, we invited the Alexandra Hospital (AH) - one of the most dynamic Singaporean hospitals, to participate in this study. The case study was conducted over a period of six months from May to November 2006 with a total of 19 face-to-face interviews being carried out from nine distinct interviewees. Each interview session lasted between 1.5 to 3 hours, with informants ranging from nurses, IT specialists, doctors and top management with an average work experience of 3 years. We adopted a practical way of understanding textual data that is suggested by Myer (1997) via personal visits, email and phone contacts to bridge the relationships among researchers and key informants. By doing so, it enabled us to understand the meaning expressed by informants (Hirschheim et al. 1991) and discover the core case information that is necessary for comprehending the case study (Klein and Myers 1999). The structure of the case study is written based on Klein and Myers's (1999) principle of contextualization to reflect on the AH social and historical background so that readers can understand the need for the system redesign. The case study write-up is structured in accordance with the chronological order of the system re-design process; headings are used to better illustrate the context. To ensure the quality of data collected, we triangulated data with other resources including empirical observations, follow-up email clarifications, and other secondary data. Data was analyzed mainly based on Klein and Myers's (1999) principle of abstraction and generalization by relating the collected data through the application of ERM theory to make sense and describe the nature of human understanding and social action taken place throughout the system redesigning process to underpinning our result.

CASE STUDY

The methodology adopted in conducting this research is an exploratory, in-depth case study. This is a method that specializes in exploring contemporary phenomena with empirical inquiry research on "how" and "why" questions (Yin 2003). This method is especially suitable to explore phenomena with a scarcity of existing research (Benbasat et al. 1987). The advantage of this method is it allows researchers to enter the research field with an open concept, without any pre-structured research questions. By doing so, it allows researchers to gather more unswerving and insightful information from informants, with rich depictions of the social context of the studied phenomena (Yin 1994).

Background

A Singapore-based hospital has recently undergone a major restructuring exercise, preparing to move to its new premises in 2009. Taking advantage of being able to redesign its new premises and medical informatics, the AH top management launched a series of aggressive activities to study and manage its enterprise risk before IT adoption.

Establishing Goals

Since the establishment of the hospital, the AH's patients and staff have experienced various forms of "hassles" owing to the inherent nature of procedures in traditional hospital settings. To address these issues, the CEO of the AH suggested the following goal:

“We want to improve health and reduce illness through patient-centric quality healthcare that information and resources are always accessible, comprehensive, appropriate, and most importantly cost-effective”

Assessing the Need to Change

With a clear goal in mind, an operation team comprising a group of doctors and IT consultants began to scrutinize their daily work processes to identify risk and bottlenecks, review the existing patient care processes as well as reassess ways to enhance patient services from the copious technologies.

From the study, the operation team has targeted the priority of reducing patient waiting and administrative processing times. According to the Director of Operations:

“It is an undeniable risk associated with the fact that patients might have to bear with long waiting time in hospital, be it for Emergency Ward, eye-nose-and-ear or others... the sooner we could diagnose, the lower the risk for our patients...the same happens for our administrative process. The sooner we could source out the relevant patients’ records for doctors the lesser the risk involved”.

Weekly reviews are conducted with open invitations to all staff and patients to share their concerns, suggestions or even compliments to the changes made.

Considering the People and Technology Challenges

Healthcare is not only an information-driven business but it is also a labour-intensive business. The cost and value-added in healthcare may be more challenging as IT solutions do not adequately address this need to improve the clinical workflow. Therefore, the change in the AH has brought up two interesting challenges: a drive to break down tasks and re-engineer them more efficiently. According to the CEO, who draws from Brooks (2006):

“IT solutions do not adequately address this need to improve the clinical workflow. Hardware and cost are the least of our problems. It is changing culture, habits and workflow in a large organization like a hospital that is tough”

With that concern in mind, top management has been actively encouraging staff to contribute ideas that may help to improve the systems and workflows, as well as supporting the implementation of their ideas. According to the Assistant Director of Operations:

“It is fairly easy to spot members of the top management walking the ground to get first insight of the problems”

Doctors and nurses do contribute to improve and implement the clinical workflow by sharing their knowledge and providing ideas. A project specialist stated:

“We worked together with doctors, and we gained a lot of ideas and support from the Head of department of emergency medicine. Because he is very IT-savvy, we didn’t have any difficulty in discussion... straight away we looked at the same thing”

In addition, doctors and nurses displayed their willingness and ability to adapt to the new healthcare informatics and workflow. A senior doctor asserted:

“These are new toys, toys to the boys and girls. We enjoy it and we want more”

Discovering Potential Constraints

To redesign and implement its healthcare informatics is not an easy task for the AH as it is well aware that it is bound by limited resources. Being small and yet aiming to move faster, the only possible way is to engage external experts to work together with the operations team. In addition, being the smallest hospital in terms of size, another challenge for the operations team is to maximize the available floor space and yet ensure that the floor design is still “synchronized” with the natural flow of patients.

AH also faces a monetary constraint risk. Its challenge to not overspend on projects is meant only to improve the existing hospital premises when they are in fact moving to new premises in 2009. With the possible risks, the Director of Projects in Operations stated:

“...because you are rich, you use money to buy. If you don’t have, then that’s when you should start talking about innovation...out of necessity, we become creative, we invent new ways of doing things to compensate for our lack of resources...”

Two memorandums of intent were signed with two system and software providers to continue to support the development as well as to bring in new ideas and solutions. For that, a mutually beneficial situation was created. The AH obtained the professional support in developing a customized systems and workflow, while the system and software providers obtained a real-life testing ground for their products' suitability and reliability. Eventually a new system was developed and has successfully resolved the key issue – the average patient waiting time was decreased from 40 minutes to 20 minutes, a 50% reduction.

ANALYSIS

Many are interested to know the influence and relevance of the ERM approach in the field of the healthcare industry. Holding on to the same interest, a set of interesting findings were unveiled in the exploration of risk management practices based on the AH IT adoption case study. From this case study, we found that the AH management has unknowingly practiced the ERM approach during the course of redesigning its medical informatics processes. Based on the analysis of the data, it is apparent that the AH has used an ERM-like approach on six of Shaw's (2005) seven steps for ERM implementation. The remainder of this section explains how the AH management used six of Shaw's (2005) seven ERM implementation steps and also discusses the benefits of implementing the last step.

As elaborated in the case, the AH first began assessing and reviewing its daily work processes, identifying risks and bottlenecks, and exploring ways to enhance patient services by forming an operation team of doctors, nurses, and IT consultants. Such grouping of multiple stakeholders corresponds with Shaw's (2005) first two steps of ERM implementation. That is, identifying risks and opportunities through forming a cross-functional team based on each significant functional area. In this case study, the project specialist claimed: "we worked together with doctors, we gained a lot of ideas and support from the head of department of emergency medicine..." Clearly, such involvement of different stakeholders across functional departments with different specialties and interests could not only highlight many issues of concerns but also offer the operation team with a holistic view of risks and opportunities in redesigning the business process to reduce patient waiting time.

Subsequent to the first two of Shaw's (2005) ERM implementation steps, our data showed that the operation team began to prioritize issues according to their importance. Considering the focus of this project is to improve the patient services, people and culture which were identified as the most critical and challenging issues to be dealt with by the CEO. According to him: "... hardware and cost are the least of our problems.. It is the changing of culture, habits and workflow in a large organization...that is tough." Such a claim coincides with Shaw's (2005) fifth ERM implementation step: prioritizing risks and opportunities. Such prioritization allows management to have a clearer understanding of risks and opportunities, and their relationships to each other. It also allows management to address each in a priority order which they believe is most effective or necessary.

After prioritizing risks and opportunities, the AH acknowledges that being a small organization with a dream to move faster, they have to take chances to solicit collaboration from professional system developers with the offer of using parts of the hospital unit as a real-life testing ground. According to the Director of Operations: "... If you don't have money to buy a system ... you should start talking about innovation ...". Knowing the amount of risk that it is willing to absorb for the returns the AH expects to gain is inline with Shaw's (2005) third step of ERM implementation: determining the organization's risk appetite. The acknowledgement of risk appetite in an organization can be achieved through the process of assessing risk. As shown in the data, these two steps go hand-in-hand. Missing one of these steps could lead to mismanagement of risk. Thus, it is important for organizations to be aware of the impact of the correlation between risks and opportunities; Shaw's (2005) fourth step of ERM implementation should be considered.

A lot of effort was invested by the operation team in ensuring appropriate issues were being highlighted, prioritized before and after the implementation. Suggestions from patients, doctors and nurses, including different organizations, were discussed in detail as they may provide opportunities to improve its business processes. Such an operation style corresponds with Shaw's (2005) sixth step: determine appropriate actions for risk mitigation or exploit opportunities. The work of the AH operation team was facilitated through the collection of suggestions from different perspectives contributed by multiple stakeholders. This allowed the operation team to consider risks and exploit opportunities in developing improved medical informatics with the ability to reduce the patient waiting time by 50%.

Based on the case, there is no evidence that Shaw's (2005) last step of ERM implementation, the use of an ERM system to continually monitor and respond to events and trends, was put to use by the AH. However, as the AH has not yet completed its medical informatics process redesign, it has not had the opportunity to apply Shaw's (2005) last step of ERM implementation. A positive indication that the AH might implement this last step is that the operation team organized weekly reviews to monitor and assess the risk and performance of the organization during the implementation process. Hopefully such a method will remain in use after implementation as it could assist in monitoring, managing and preventing possible risk.

Although the AH did not explicitly set out to use ERM, in this case study, our data shows clear evidence of ERM usage in managing the change at the AH. Such findings reflect the other side of the story; perhaps many existing healthcare organizations might have used parts of ERM unknowingly. Thus, knowing when and where to employ ERM may not be as important as determining the existing, if any, implementation of ERM in organizations and providing guidance to cultivate and implement the ERM steps into its processes. ERM concepts and approaches cannot be implemented overnight but can be cultivated into the culture of the organization over time. The implementation of ERM is not as straightforward as the implementation of IT systems. Thus, to implement ERM one has to first unveil the existing embedded ERM characteristics from the organization culture and practices and introduce the concept of ERM skilfully.

CONCLUSION

In this paper we have examined the major restructuring exercise of a Singaporean hospital in redeveloping its business processes and medical informatics as an example of a risk management study. Based on an empirical case study of the healthcare organization, we have focused on the activities involved in managing the change while the identified data have interestingly corresponded to the use of ERM as suggested by Shaw (2005). Findings of this study contribute to the emerging stream of research on ERM adoption. Unlike earlier studies, we have argued that the use of ERM might have existed and already put into practice by management unknowingly as it is difficult to completely isolate risks in organizations that deal with a high level of risks in its daily operations (Nosse et al. 2005). Therefore the challenge for this study is not about when and where to employ ERM in healthcare organizations but, rather, how to identify the existing embedded ERM activities so as to explicitly manage ERM. This can be achieved by using Shaw's (2005) ERM implementation steps in a different manner than what was originally intended. That is, to compare the organization's existing risk management practices to Shaw's steps to determine existing embedded ERM activities before implementing ERM. In addition, as shown in the discussion, the sequence of the ERM steps identified from the case differs from those proposed by Shaw's (2005). This suggests that it may be possible to employ ERM by loosely following Shaw's (2005) seven steps as a guide to systematically manage the risks involved in the organization.

The analysis highlights a number of managerial lessons that can be usefully applied to other healthcare organizations. Based on our analysis, we propose four guidelines for managers to unveil and support ERM-related activities before considering implementing an ERM approach. Firstly, explore the risk management-related activities from the organizational culture and practices in handling change. Secondly, relate common activity patterns of handling risk and change to the ERM approach. Thirdly, gain consensus and support from top management on the existing embedded ERM practices and on the importance of endorsing ERM. Fourthly, provide continual support in cultivating the ERM practices.

As part of future work, these proposed guidelines should be tested and revised as necessary. Furthermore, in this research, we have determined that AH has implicitly put into practice a number of Shaw's (2005) seven steps of ERM implementation in its healthcare systems adoption process. Another area of future work is to explore the extent to which ERM has been used implicitly in other organizations.

REFERENCES

- Beasley, M. S., Clune, R. and Hermanson, D. R. (2005), Enterprise risk management: An empirical analysis of factors associated with the extent of implementation, *Journal of Accounting and Public Policy*, 24, 521-531.
- Benbasat, I., Goldstein, D.K. and Mead, M. (1987), The Case Research Strategy in Studies of Information Systems, *MIS Quarterly*, 11, 3, 369-386.
- Burke, D. E., Wang, B.B.L., Wan, T.T.H., and Diana, M.L. (2002), Exploring Hospitals' Adoption of Information Technology, *Journal of Medical Systems*, 26, 4, 349-355.
- Brannan, W. L. and Taylor, J. R. (2006), A Model for Enterprise Risk Management Within a Healthcare Organization, Proceedings of the 2006 ASSE Professional Development Conference. (Accessed on 17 Jan, 2008) (www.asse.org/practicespecialties/riskmanagement/pdc_proceedings.php).
- Brannan, W. L., and Taylor, J. R. (2006), A Model for Enterprise Risk Management Within a Healthcare Organization, PDC Proceedings of Risk Management/Insurance-Sponsored Sessions, (Accessed on 17 Jan, 2008) (www.asse.org/practicespecialties/riskmanagement/pdc_proceedings.php).
- Brooks, E. (2006), Work Culture & IT systems at Alexandra Hospital, *Public Sector Technology & management*, 20-21.
- Ching, W. R. H. (1997), Enterprise Risk Management: Laying a Broader Framework for Health Care Risk Management in *The Risk Management Handbook for Health Care Organizations*, eds R. Carroll, (5th edn), John Wiley & Sons Inc., 3-13.

- Ching, W. R. H. (2001), Enterprise Risk Management: Emerging Concepts and Applications in Health Care in The Risk Management Handbook for Health Care Organizations, eds R. Carroll, John Wiley & Sons Inc., 159-168.
- Davenport, T. H. and Glaser, J. (2002), Just-in-Time Delivery and Knowledge Management, Harvard Business Review, 80, 7, 107-201.
- Fichman, R. G. (2004), Real Options and IT Platform Adoption: Implications for Theory and Practice, Information Systems Research, 15, 2, 132-154.
- Ghali, W. A., Quan, H., Brant, R. (2001), Risk adjustment using administration data: impact of a diagnosis-type indicator, Journal of General Internal Medicine, 16, 519-524.
- Goldschmidt, P. G., (2005), HIT and MIS: Implications of health information technology and medical information systems, Communications of the ACM, 48, 10, 69-74.
- Hirschheim, R., Klein, H. K. and Newman, M. (1991), Information Systems Development as Social Action: Theoretical Perspective and Practice, OMEGA; International Journal of Management Science, 19, 6, 587-608.
- Hoyt, R. E., and Hall, E. B. (2003), Evidence Shows Changing Roles of Health Care Risk Managers, Journal of Health Care Risk Management, 23, 2, 7-11.
- Economist. (2003), "Is IT the cure?" (May 8, 2003).
- Kangari, R. (1988), Construction risk management, Civil Engineering Systems, 5, 114-120.
- Klein, H. K. and Myers, M. D. (1999), A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems, MIS Quarterly, 23,1, 67-94.
- Kohn, L. T., Corrigan, J. M., Donaldson, M.S. et al. (1999), To Err Is Human: Building a Safer Health Care System, Institute of Medicine, published by National Academy of Sciences.
- Liebenberg, A. and Hoyt, R. E. (2003), The Determinants of Enterprise Risk Management: Evidence from the Appointment of Chief Risk Officers, Risk Management and Insurance Review, 6, 1, 37-52.
- Lorenzi, N.M., Riley, R.T., Blyth, A.J.C., Southon, G., and Dixon, B.J. (1997), Antecedents of the people and organizational aspects of medical informatics: Review of the literature, Journal of American Medicine Information Association, 4, 2, 79-93.
- McDonald, R., Waring, J., and Harrison, S. (2005), Balancing risk, that is my life': The politics of risk in a hospital operating theatre department. Health, Risk & Society, 7, 4, 397-411.
- Myers, M. D. (1997), Qualitative Research in Information Systems, MIS Quarterly, 21, 2, 241-242.
- Nosse, L.J., Deborah, G., Friberg, P. R., Kovacek, (2005), Managing Risk. In Managerial and supervisory principles for physical therapists, (2nd edn), Lippincott Williams & Wilkins, Baltimore.
- O'Donell, E. (2005), Enterprise Risk Management: A Systems-Thinking Framework for the Event Identification Phase, International Journal of Accounting Information Systems, 6, 177-195.
- Okoroh, M. I., Gombera, P. P. and Ilozor, B. D. (2002), Managing FM (support services): Business risk in the healthcare sector, Facilities, 20, ½, 41-51.
- Shaw, J. (2005), Managing All of Your Enterprise's Risks, Risk Management Magazine, 34-38.
- Steinberg, R. M., Everson, M. E. A., Martens, F. J. and Nottingham, L. E. (2004), Enterprise Risk Management - Integrated Framework, COSO, New York.
- Thompson, T. and Brailer, D. Health IT strategic framework, DHHS, Washington, DC, 2004.
- Yin, R. K. (1994), Case Study Research Design and Methods, (2nd Edn), SAGE Publication, International Educational and Professional Publisher, London.
- Yin, R.K. (2003). Case Study Research Design and Methods, (3rd Ed.), Thousand Oaks, CA, Sage Publications.

ACKNOWLEDGMENTS

We gratefully acknowledge the assistance of the members of staff of the Alexandra Hospital and Dr Paul Wong, who have made their time and experience available, and have provided useful comments to the benefit of this work.

COPYRIGHT

Say Yen Teoh and Christopher Cheong © 2008. The authors assign to ACIS and educational and non-profit institutions a non-exclusive licence to use this document for personal use and in courses of instruction provided that the article is used in full and this copyright statement is reproduced. The authors also grant a non-exclusive licence to ACIS to publish this document in full in the Conference Papers and Proceedings. Those documents may be published on the World Wide Web, CD-ROM, in printed form, and on mirror sites on the World Wide Web. Any other usage is prohibited without the express permission of the authors.