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7-1-2013

Understanding The Relationship Between Risks And Controls In Erp Implementations: You Can Choose Your Friends But Not Your Relatives

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RISK FACTORS IN ERP IMPLEMENTATIONS: HIERARCHICAL AND LINEAR RELATIONSHIPS

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Abstract

Enterprise Resource Planning (ERP) systems have been in existence for over 2 decades yet businesses are still losing billions of dollars annually due to the implementation of software designed to reduce costs and increase profitability. Risk Management is an area that contributes to these losses, specifically due to uncertain outcomes when dealing with an interconnected construct such as risk, and a research gap at the tactical and operational levels between risks and controls.

A comparative case study approach, encompassing 13 different ERP implementations, was adopted to explore emerging patterns at the project implementation level, and from this two contributions emerged. After observing risks behaving in a hierarchical fashion with predictable results, an exploratory Hierarchy of Risks model was constructed. Although this model is still in its formative stage, it may prove useful in furthering our understanding of the close inter-relationship of risks in ERP implementations and the implications of managerial choice when determining risk prioritisation. A second finding is that no direct linear relationship appears to exist between risks and controls. Rather, this counterintuitive finding suggests that it is impacts as a consequence of risk, rather than the risks which cause the impacts, which allows these constructs to be bridged.

Keywords: risk, control, impacts, heuristics, hierarchy of risk

1. Introduction

Enterprise Resource Planning (ERP) implementations are some of the most complex and risky Information Systems (IS) projects available as they involve the entire organisation in a protracted process of business change. While the main reason for implementing these systems is "...to enhance control over processes within an organisation" (Hanseth et al. 2001, pp. 35), additional technical and business reasons include improvements in efficiency (Jones et al. 2006) and increases in rationalisation (Hanseth et al. 2001). Although these systems appear to offer compelling advantages, the results are often less desirable and include high cost, long installation time-frames and high levels of failure. In 2011, projections of $47 billion of annual revenue yielded disappointing results: 61.1% of projects took longer than expected, 74.1% went over budget and 48% failed to realise at least 50% of the original desired benefits (Panorama Consulting Group, 2011).

The aim of this research is to examine the control of risks at the project implementation level, as this has been identified as an ongoing reason for ERP implementation failures (Aloini et al. 2007). This paper adopts the definition of risk as a problem that has not yet happened but may cause an organisation to experience significant negative impacts (e.g. technical, financial, human, operational, or business loss) in the course of implementing an ERP system (Aloini et al. 2007; Sumner, 2000). One powerful approach to risk mitigation is exercising control (Du et al. 2007); where 'control' refers to any attempt to motivate individuals to behave in a manner consistent with organisational objectives (Ouchi, 1978). Methods of controlling risks in ERP implementations are still in the formative stages with studies having concentrated on either risk mitigation at the strategic level (Finney and Corbett, 2007) or risk identification and prioritisation at the tactical and operational levels (Aloini et al. 2012; Sumner, 2000). Part of this can be attributed to the complex interconnected nature of ERP risk factors, where risks occurring early in an implementation have the potential to influence different risks later in that same implementation (Aloini et al. 2012). In addition, contrary findings about how risks can be controlled have contributed to the formative state of theory-based research examining the relationship between risks and controls at the project implementation level (Gopal and Gosain, 2009).

The following research questions arise:

- Is there a direct relationship between different risks in ERP implementations, and, if so, how?
- How can Project Managers (PMs) map risks to controls in ERP implementations at the tactical and operational levels?

In the next section we will define ERPs and review the literature examining risk, control and risk management models. This is followed by an explanation of the criteria used in the selection of organisations and personnel to interview, and the methods used in the collection and codification of data. The two research questions will then be examined, followed by conclusions drawn from these findings and the identification of areas requiring future research.

2. Theoretical Background

ERP systems are neither company nor technology-specific. Rather, ERP is a descriptor assigned to integrated computer software systems designed to connect multiple parts of the business together and enable data gathered in one area to be accessible to other business units, enabling finer degrees of analysis (Markus & Tanis, 2000). In essence, ERPs act as activity based control systems where input into the system will result in statistical outputs allowing control to be exercised. During the implementation of an ERP, this formal structure is not in place and therefore an activity view of control is neither appropriate nor possible at this time. Rather, a behavioural view of control is most appropriate (Soh et al. 2010). This implies that when a controller exercises control over a controllee, they are taking some action in order to regulate or adjust the behaviour of the controllee (Kirsch,

1996). The behavioural view further presumes that the controller uses certain control mechanisms to exercise control within given situations (e.g. implementation dates, procedures) (Soh et al. 2010).

Although the concept of control is established and has been used to examine outsourcing (Gopal and Gosain, 2009) and software development (Harris et al. 2009), methods of controlling risks in ERP implementations are still in the formative stages (Aloini, 2012; Sumner 2000). While control modes can be categorised as Formal (Behavioural and Output) and Informal (Clan and Self) (Kirsch, 2004), specific controls that are useful in managing IT-related risks are as varied as the risks themselves (Markus and Tanis, 2000). Aloini et al. (2012) and Lyytinen et al. (1998) examined a variety of risk management models and theories (e.g. PRINCE2, PMBOK, The Australian Standard, SAFE and Boehm's Software Risk Approach) and concluded that despite great variations and drastic differences, managerial risk strategies share a standardised format. These include "how to inquire and observe, how to organise and interpret observations, and how to subsequently launch managerial action" (Lyytinen et al. 1998, pp. 236). The Lyytinen et al. Risk Management Approaches Model (Figure 1) was constructed using this standardised format and is a control-centric model with the ability to foster decision-making in situations where complete information is not always available (1998). This model depicts one event or state (risk) and three ideas and principles (risk identification and analysis, heuristics and risk resolution and control) which collectively make up the risk control process:

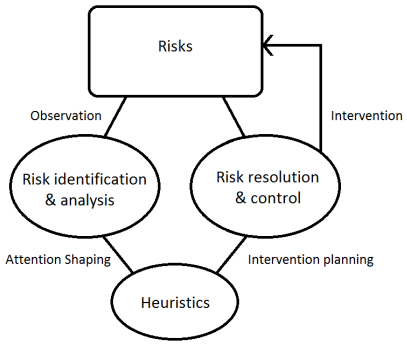

Figure 1: Risk Management Approaches Model (Lyytinen et al. 1998, pp. 236)

The first principle of risk identification and analysis in the Risk Management Approaches Model has received extensive coverage (Aloini et al. 2012). ERP implementations represent an excellent context for examining the interplay between different risk factors, because they cross departmental boundaries (Vandaie, 2008), and are prone to risks (Aloini et al. 2012). Sumner created a list of risk factors base on a combination of literature reviews and empirical findings, and is used to define risks factors in this research (Sumner, 2000). One alternative form of analysis draws on the interconnected nature of risks and proposes a hierarchy of risks, where a risk appearing early in an ERP implementation can have a direct effect on risks at later stages. The Hierarchy of Risks structure was tested against a single case and delivered promising results with further research proposed (Aloini et al. 2012).

Heuristics is introduced as the intervening principle because complex situations as experienced in ERP implementations will seldom provide all the necessary information (Lyytinen et al. 1998). Heuristics as a concept can roughly be defined as a 'rule of thumb' and the term denotes a solution to a situation where all required information may not be available. Where similarities to other resolved situations are discernible, aspects of that solution can be used instead of a logarithmic approach which requires all conditions to be met. Lyytinen et al. further describe the process as both objective and subjective (1998). Objective analysis describes the process of acting upon what can be seen (Wolf, 1978), and is the trigger mechanism in the idea or principle of observation. Subjective analysis is based on continuous learning and experience (Wolf, 1978), and describes the process of matching risks to risk resolution and control techniques using heuristics as a lens to focus personal experience or interpretation (Lyytinen et al. 1998). A review of risk management literature in ERP implementations by Aloini et al. compiled a list of types of project failures and noted an intermediary of 'effect' in the correlation between risks and why they fail (2012). 'Effect' is used as an identifier for factors which

could impact an implementation (e.g. budget exceeded) (Aloini et al. 2012), and is similar in definition to the Lyytinen et al. use of 'impact' (1998). These two terms are used interchangeably and denote a many-to-one relationship in which each risk may have many impacts on a business and these will lead to specific types of project failure (Aloini et al. 2012). Impact is also used in risk registries in the calculation of risk severity by the assignment of a numerical value (Patterson and Neailey, 2002). Impact was chosen in this study as a descriptor of the interceding construct to avoid ambiguity through consistent use, and because PMs were already familiar with it and had used this analysis in their implementations. While no connection is made between risks, impacts and controls, the use of heuristics as a lens is an area where further research may increase our understanding and bridge the gap between risk identification and risk control. It is for this reason that the concept of heuristics marries so well with risk management encompassing risk control (Lyytinen et al. 1998), and is the reason why this model was chosen to examine the relationship of risks and controls in this research.

3. Method

In examining the control of risks within ERP implementations, a qualitative research design in line with previous research examining large IS implementations was selected (Kirsch, 2004; Sumner, 2000) and will draw upon the processes described in Eisenhardt (1989). A commonality between the studies of Kirsch (2004) and Eisenhardt (1989) is the use of 'soft-positivism' as their epistemological framework. Soft-positivism was defined by Kirsch as a means of revealing both "pre-existing phenomena and relationships..." as well as the ability to "...surface other constructs..., in the manner of interpretivists or grounded theorists" (2004, pp. 378). As this research is designed to investigate pre-existing phenomena (e.g. ERP risks and controls) whilst retaining the ability to explore additional constructs (e.g. how risks and controls relate), this approach was deemed most appropriate. A comparative case study strategy, as used by Robey et al. was adopted because of the difficulty found with identifying the boundaries between ERPs and their implementation contexts, and the enhanced ability to examine phenomena across different cases (2002).

The main criteria used to identify suitable organisations and the applicable personnel was that the organisation had to have either completed (after 2007), or still be in the process of implementing a tier one or tier two ERP system, and the personnel had to have been involved in the risk control process at the tactical or operational levels. In total, 16 face-to-face interviews were conducted comprising 13 different personnel from 13 different organisations, and these interviews were divided into two groups. Three exploratory interviews were conducted in the development of the interview protocol and were used to clarify the research questions, refine the scope of the research and remove any disconnect between the many different academic definitions used and those used in practice. An example of this was the need to include more definitions (e.g. control and risk) and the preference of 'impact' as opposed to 'effect' when describing how risks can influence the business. The remaining 13 interviews were conducted with either the IT Managers or external consultants who had assumed the PM role during the implementation, and incorporated Sumner's risk categories (2000) and the Risk Management Approaches Model (Lyytinen et al. 1998). The developed protocol was used to gather data about the individual, the organisation, previous experiences and how risks were controlled in their last ERP implementation. Each interview averaged two hours in duration and together with the internal documentation and transcriptions, were imported into NVivo. Subsequent coding of risks, impacts, heuristics and controls was done and revealed a direct relationship between impacts and controls. Axial coding was then used to further refine the relationship between codes and concepts (Strauss and Corban, 1990), and the hierarchy of risks finding emerged.

4. The Preliminary Findings

As this is on-going research, these findings are derived from preliminary analysis of data gathered and compiled using the Lyytinen et al. Risk Management Approaches Model as a coding framework.

Let us answer the first research question:

- Is there a direct relationship between different risks in ERP implementations, and, if so, how?

While using the first idea or principle of the Lyytinen et al. Risk Management Approaches Model (risk identification and analysis) as an initial framework when performing axial coding on risks, it was found that certain risks appear to be interrelated, and formed a hierarchy of risks (Figure 1). This relationship was found in 11 of the 13 cases and consistently identified the flow-on effect to be the same risks. The importance of senior management support features prominently in ERP risk analysis (Aloini et al. 2007; Sumner, 2000), but no specific identifiable pattern was found in risk literature should senior management support be lacking. In 6 of the 11 cases, 'Lack of Senior Management Support' (Level 1) resulted in the manifestation of other risks later in the implementations, and reflected a direct relationship between risks as identified by Aloini et al. (2012). While the ERP implementation in one of the 11 cases was only in the initial planning stage, 'Lack of Senior Management Support' (Level 1) was identified as contributing to the manifestation of risks associated with negotiations to free staff for project activities, staff training, appointing a project champion, and determining how change would be managed (Level 2). 'Ineffective communication' (Level 2) was an additional by-product and resulted in high levels of misinformation (and lowered staff morale) regarding the organisations future structure and staffing level requirements. In two of the 11 cases, organisations experienced problems with their accounting departments which stemmed from the lack of project support from their senior accountant (a member of their senior management team). In one of those two companies, the continual effort required by the PM due to lack of senior management support was given as the reason why a third implementation within the business (after two successful implementations) failed. The effort required in the two successful implementations resulted in the PM burning-out and no longer being able to commit full time to the implementation. It was also found that when risks dealing with lack of full time commitment, insufficient training and ineffective communication were not addressed, user resistance increased (Level 3). Only two of 13 cases did not report experiencing any Level 2 risks, and felt strongly that they had achieved positive user acceptance (Level 3).

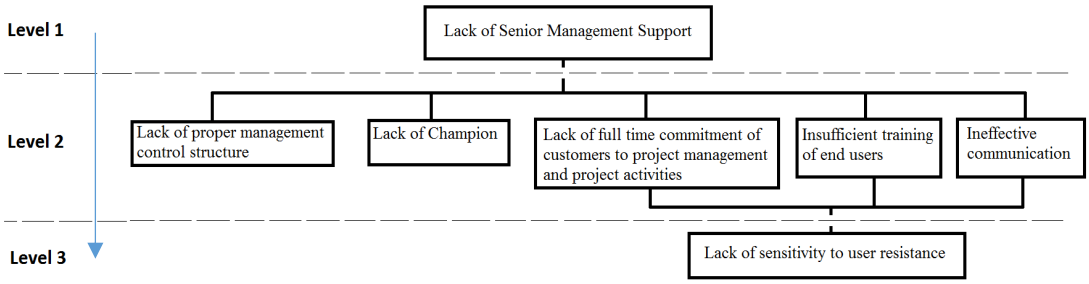

Figure 1: Hierarchy of Risks model

This preliminary analysis shows risks behaving hierarchically, where risks are able to influence other risks in lower nodes (flow-on effect) if not dealt with sufficiently.

Question two asks:

- How can PMs map risks to controls in ERP implementations at the tactical and operational levels?

From the findings there appears to be no direct, observable relationship between risks and controls. What has emerged is the successful use of impact analysis as an intermediary construct to bridge this gap. While impacts as a consequence of risk have been noted (Aloini et al. 2012), the connection between impacts and controls has not. All PMs were questioned about their use of impact analysis, and all stated that it was conducted in some form. Of the 13 cases, three did not record any details and 8 used this analysis as a numerical tool only, a practise in line with the literature review findings (Patterson and Neailey, 2002). The remaining two cases detailed impact analysis and successful

controls used, but this was only as an internal reference document for future internal implementations. The relationship between impacts and controls can be seen when examining the following excerpts from the compiled risk registries (Table 1). In this table we have three different risks, Risks One and Two identify risks associated with lack of full time commitment, and Risk Three identifying ineffective end-user communication. While Risks One and Two fall within the same risk factor, the impacts and subsequent applied controls are different. Risks Two and Three are different risk factors but have matching impacts, and subsequent matching applied controls.

Risk Factor	Risk	Impact	Control Applied
1. Lack of full-time commitment of "customers" to PM and project activities	Well-being of team members affected by workload	Team members leave rather than hang around to suffer Stress levels lead to incorrect configuration.	Realistic resource assessment performed prior to each phase to ensure that appropriate resource levels are put in place
			Have some fun
2. Lack of full-time commitment of "customers" to PM and project activities	Ongoing changes from within the business resulting in key team members being unavailable	New ERP system fails to enable world class performance objectives **Negative perception of the system** **Delays could occur**	Work closely to ensure effective communication between the business and the project.
			Document "easy wins" and positive feedback back into the business
			Ensure the project is seen to be "in the business"
3. Ineffective end-user communication	Ad hoc communication to customers whilst sorting the system out	**Negative perception of the system** **Delays could occur** Misinformation leading to a perception that the ERP implementation is a failure.	**Document "easy wins" and positive feedback back into the business**
			Ensure the project is seen to be "in the business"
			Project Champion, PM and Marketing Manager to discuss ongoing messages as events develop

Table 1: Sample data from compiled risk registries

When applying these findings to the Lyytinen et al. Risk Management Approaches Model, a link can be seen between impacts relating to negative perceptions and delays, and the imposition of controls requiring the project team to portray themselves as a positive part of the business. Heuristically, these controls could now be applied to an ERP implementation should the impact to the business comprise negative perceptions or delays.

5. Conclusion and next step

Thus far the preliminary results suggest that a hierarchical relationship exists between different risks in ERP implementations. Although further research into these phenomena is required, the initial findings empirically confirm the importance of managing specific risks such as 'Lack of Senior Management Support' as identified in existing literature. Additionally, while there appears to be no clear and direct relationship detectable between ERP risks and controls, impacts derived from risks have been identified as a means to bridge this gap. This finding suggests that controls can be linked back to risks heuristically when the selection is based on impacts to the business, rather than the risk factors which cause the impacts. The extent of the inter-relationship between impacts and risks and hierarchically between risks themselves is not yet fully known. Although this research is ERP-specific, the risks identified are not (Sumner, 2000). While the intention is to conduct further research using ERPs as the focus, it is hoped that these findings can be applied to a wider range of IS implementations in an effort to better understand the constructs and to strengthen the empirical basis for developing robust 'real-world' theory.

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