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# Controls for Managing Risks Across Different Stages of ERP Projects

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## Controls for managing risks across different stages of ERP projects

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### Abstract

*Enterprise Resource Planning (ERP) implementations can be highly risky, posing numerous challenges to companies that implement them. Prior research has mainly focussed on identifying and assessing risks in ERP projects. Still little is known on mitigating risks by means of managerial control. Thus, this ongoing research aims to address these gaps by exploring how organisations exercise control in regards to identified risks during different stages of an ERP project. By using a case study approach this study particularly seeks to answer if and why control choices for risks change across different project stages. The preliminary results indicate that there is support for both, the need to collate the learnt experiences of ERP participants for these risks and their relative controls to be evaluated at all stages of the ERP project as the importance of risks and controls differ for each phase of the implementation project.*

### Keywords

ERP implementation, control, risk

### INTRODUCTION

Enterprise Resource Planning (ERP) systems represent the concept of an integrated system designed to increase efficiency by integrating business processes and sharing common resources across an organisation (Hanseth et al. 2001; Jones et al. 2006; Markus and Tanis 2000). As such, projects associated with the implementation of ERP systems are complex, time-consuming and costly (Klaus et al. 2000; Robey et al. 2002), posing numerous risks to companies that implement them. Prior studies have examined many different factors noted as attributing to ERP implementation failure including the implications of inappropriate modifications (Brehm et al. 2001), negative end user reactions (Shepherd et al. 2009), wrong cost estimation (Daneva and Wieringa 2008), poor financial performance, and lack of risk identification (Hunton et al. 2004; Sumner 2000). Despite the large number of risks associated with ERPs, demand for these systems continues to increase. The revenue from ERP projects reportedly grew to \$28.8 billion in 2006 and is projected to be in excess of \$47 billion by 2011 (Longinidis and Gotzamani 2009). While there has been a dramatic decrease in the percentage of failures (down to 33% in 2004), businesses are still losing billions of dollars annually in the implementation of software designed to reduce costs and increase profitability (Zhang et al. 2005).

This paper is adopting the concept of IT-related risk to ERP implementations (Markus 2000). Here risk is defined as a problem that has not yet happened but is the likelihood that an organization will experience a significant negative effect (e.g., technical, financial, human, operational, or business loss) in the course of the implementation of an ERP system either internally or externally. As such the concept of risk is closely related to the concept of critical success factors (CSF), which has already reached significant importance in the field of ERP research (e.g., Kuang 2001; Somers and Nelson 2004; Sumner 1999). However, the use of CSF as a prescriptive means of avoiding risks is limited. Indeed, this fragmented view on risks has been noted as a missed opportunity and an area of pressing business need (Markus 2000). In addition, prior research addressing risks in ERP projects has been mainly focussing around risk identification and assessment and lacks prescriptive means on the actual mitigation of these risks.

One powerful approach for mitigating risks is exercising control (Du et al. 2007); where control refers to any attempt to motivate individuals to behave in a manner consistent with organizational objectives (Ouchi 1978). With this in mind, risk and control have been likened to the two sides of a coin and analysis of one without the other fails to fully address risk mitigation within ERP projects. Indeed the purpose of controls is to mitigate and

reduce risks so that they are within acceptable limits (Albadri and Jordan 2003; Gallivan 2001). So far, research addressing risks and controls has focussed on IS development teams (Henderson and Lee 1992) and individual software development projects (Choudhury and Sabherwal 2003; Ropponen and Lyytinen 2000). All of these studies identified a common link between risk assessment, control of those risks and the effects on organisational performance. However, there is little on risk and control within the context of ERP projects with its specific characteristics as outlined above. Investigating risk controls is further complicated by the fact that during IT projects risks do not remain static, but change as a function of prior decisions and behaviour (Markus 2000). The dynamic nature of risks also doesn't easily lead to a stable risk pattern, as in particular second-order consequences of human problem-solving behaviour might lead people to misdiagnose the causes of problems and apply attempted (control) solutions that actually make the situation worse (Markus and Tanis 2000).

To summarize, while prior research addressing risks in ERP projects has gained significant importance, so far research has mainly focussed on risk identification and assessment, leaving large gaps in mitigation risks by means of control. Furthermore, there is still little known on control in response to risks identified during different stages of ERP implementation projects. Thus, this paper tries to address these gaps by exploring how control is exercised in ERP projects in regards to identified risks. By using a case study approach this study particularly seeks to answer if and why control choices for risks change across different project stages.

## THEORETICAL BACKGROUND

### Risks in ERP implementations

Extending the definition of risk provided in the introduction, risk is seen from a behavioural perspective, where risk is not treated as rational choice and probability concept, but associated with the threat of a bad outcome. It suggests that decision makers tend to act in a loss-averse manner instead of a rational one (Lyytinen et al. 1998). Risk is a necessity for continuous business improvement and the purpose of risk management is not to eliminate all risks but to help managers make sense of their situations, by identifying the risk, assess its impact, exclude bad choices and intervene to reduce, or avoid the risks (Bancroft et al. 1998; Lyytinen et al. 1998).

Table 1: Risk factors in ERP projects according to Sumner (2000)

Risk category	Risk factor	Unique to ERP
Organizational fit	• Failure to redesign business processes	Yes
	• Failure to follow an enterprise-wide design which supports data integration	Yes
Skill mix	• Insufficient training and re-skilling	Yes
	• Insufficient internal expertise	Yes
	• Lack of business analysts with business and technology knowledge	Yes
	• Failure to mix internal and external expertise effectively	Yes
	• Lack of ability to recruit and retain qualified ERP systems developers	
Management structure and strategy	• Lack of senior management support	
	• Lack of proper management control structure	
	• Lack of a champion	
	• Ineffective communications	
Software systems design	• Failure to adhere to standardized specifications which the software supports	Yes
	• Lack of integration	Yes
User involvement and training	• Insufficient training of end-users	
	• Ineffective communications	
	• Lack of full-time commitment of customers to project management and project activities	
	• Lack of sensitivity to user resistance	
	• Failure to emphasize reporting	
Technology planning/integration	• Inability to avoid technological bottlenecks	Yes
	• Attempting to build bridges to legacy applications	

Risk management comprises an attention shaping component, including risk identification and analysis and an intervention planning component, including interventions and risk resolution techniques (Lyytinen et al. 1998).

Identified risks are then linked to potential managerial interventions with the help of heuristics (see fig. 1). All of these components have been addressed at different levels and in a number of different ways within research pertaining to ERP implementation. Based on a comprehensive literature review and an empirical investigation of multiple case studies Sumner (2000) identified risk factors, associated to ERP projects (Table 1), thus refining the general concept of IT-related risks towards ERP-related risks. These include factors associated to organisational fit, skill mix, management structure and strategy, software systems design, user involvement and training, technology planning, project management and social commitment. These risk factors can also be broadly mapped to different core implementation stages (see below). As indicated in the introduction, IT related risks are highly dynamic in the sense that they vary throughout a project as a function of prior decisions and behaviour, which might lead to unintended behaviour and consequences (Markus, 2000). In particular in ERP implementations residual risk might increase over time (contrary to conventional IT projects) as ERP systems tend to be continuously enhanced and further integrated with other systems, increasing complexity, which in turn increases their failure-proneness (Markus 2000).

### **Risks across the stages of ERP implementation**

The process view of ERP implementation sees implementation as a sequence of stages where the outcome of each stage can be examined, as well as the cumulative outcome across all of the stages (Markus and Tanis 2000) (Somers and Nelson 2004). Many different models of ERP implementation have been created (see Parr and Shanks (2000)). This research is using the enterprise systems experience cycle by Markus and Tanis (2000), which includes a planning phase as well as a post-implementation phase (see Figure 1). The purpose of this framework was to explain ERP success, which would make it also very useful in trying to understand actions and effects related to ERP failure and associated risks in each stage.

*Project Chartering:* This stage details the activities performed prior to project approval. Typical risk factors comprise the lack of top management support and championship and the lack of a proper management structure for the project (Sumner 2000). This is also confirmed by Nah and Delgado (2006) and Parr and Shanks (2000), who found that top management support and championship was the most important activity during this phase.

*The Project (Configure and Rollout):* This stage is focused with getting the system and end users up and running (Markus and Tanis 2000). Parr and Shanks (2000) found that it was crucial to have a balanced project team and the best people available in this phase. This stage is marked by its focus on the hard, technical tasks of installing the system rather than softer social tasks such as change management. Typical risk factors to be addressed are failure to redesign business processes, failure to follow an enterprise-wide data design, lack of business analysts, failure to adhere to standardized specifications and the lack of data integration (Sumner 2000).

*Shakedown:* The shakedown phase includes all those activities associated to the system going live in an organisation until all initial problems have been resolved. It ends when normal operations resume and control is passed from the project team to the respective operational managers (Markus and Tanis 2000). In this phase any control issues unresolved from earlier phases would appear, typically taking the form of performance issues and disruptions in productivity (Muscatello and Parente 2006). Typical risk factors include insufficient training and re-skilling of the IT workforce in new technology, insufficient internal expertise and failure to mix internal and external expertise effectively (Sumner 2000).

*Onwards and upwards:* This has been identified as the phase in which the benefits of an ERP system implementation will be felt within an organisation. This phase takes the organisation from the commencement of normal operations to eventual replacement – be that with an upgrade or different product. Typical activities during this phase include continuous business improvement, additional user skill building and assessments of the post implementation benefits.

### **Control in ERP projects**

Similar to risks a behavioural view of control is adopted. This view implies that when a controller exercises control over a contree, the controller is taking some action in order to regulate or adjust the behaviour of the contree (Kirsch 1996). The behavioural view further presumes that the controller uses certain control mechanisms to exercise four modes of control, which may broadly be divided into formal and informal controls (Kirsch 1997). Each control mode can itself be implemented through multiple control mechanisms and combined into a portfolio of control. Please note that the same general control mechanism can support more than one control mode (Table 2). Formal controls are comprised of two modes, output and behavioural based controls. Output controls are mechanisms in place that define appropriate output targets (e.g. sales targets) and are concerned with what has been done as opposed to how it is done. Behavioural controls are different in that the outcome is of secondary importance to the method in which it was achieved and details an approach or set of instructions which are designed to result in a standard set of outcomes (e.g. procedures and instructions)

(Choudhury and Sabherwal 2003; Eisenhardt 1985; Elofson 1994). Informal controls consist of clan and self control. Clan control is likened to the cohesive practices of a group and is typified by the degree to which all members of a group are committed to achieving group goals. Self control is solely reliant on an individual's ability to monitor and control their own behaviours, with appropriate rewards and sanctions as required (Albadri and Jordan 2003; Harris et al. 2009).

The concept of control is an established area of research and has featured in a number of studies examining outsourcing and software development (e.g., Choudhury and Sabherwal 2003; Dibbern et al. 2008; Eisenhardt 1985; Harris et al. 2009; Liu et al. 2008). However, methods of resolving identified risks in ERP projects by exercising control is still in the formative stages with studies having concentrated on either risk mitigation at the strategic level or risk identification and prioritisation thus far (Sumner 2000). Within risk management, control has been described as a stage following risk assessment (Du et al. 2007). In general, the types of control potentially useful in managing IT-related risk are as varied as the risks themselves (Markus 2000). This is further complicated by the fact that control attempts are not invariably successful as they vary greatly according to the context, what type and to what extent control has been used. Nevertheless, perceived control should be seen as powerful factor influencing both risk perception and decision-making (Du et al. 2007).

Table 2: Control mechanisms (adapted from Kirsch (1997) and Choudhury and Sabherwal (2003))

<i>Control mode</i>	<i>Control mechanism</i>	<i>Examples of control mechanism</i>
Outcome control	<ul style="list-style-type: none"> <li>• Mechanisms to explicitly specify desired outcomes that were assessed later</li> <li>• Mechanisms (including IS) to evaluate the quality and timing of outputs delivered by the vendor</li> </ul>	<ul style="list-style-type: none"> <li>• Development methodology</li> <li>• Job description</li> <li>• Supervisor-subordinate hierarchy</li> <li>• Work assignment</li> <li>• Rules &amp; procedures</li> </ul>
Behavior control	<ul style="list-style-type: none"> <li>• Mechanisms by which the controller explicitly specified rules, procedures, or processes for the contreee to follow</li> <li>• Mechanisms to facilitate direct observation of the contreees behaviour</li> <li>• IS designed to help the controller monitor behaviour of the contreee</li> </ul>	<ul style="list-style-type: none"> <li>• Defined target implementation date and/or budget</li> <li>• Expected level of performance</li> <li>• Defined project milestones</li> </ul>
Clan control	<ul style="list-style-type: none"> <li>• To promote shared goals</li> <li>• To promote and assess adherence to shared beliefs and values</li> </ul>	<ul style="list-style-type: none"> <li>• Coalitions of individuals with shared ideologies</li> <li>• Socialization</li> <li>• Hiring &amp; training practices</li> <li>• Implemented rituals and ceremonies</li> </ul>
Self control	<ul style="list-style-type: none"> <li>• To encourage or motivate the contreee to exercise greater self-control</li> </ul>	<ul style="list-style-type: none"> <li>• Individual empowerment</li> <li>• Self-management</li> <li>• Work autonomy (who / how)</li> <li>• Self-set goals, self monitoring, and self rewarding</li> </ul>

While there is a gap in identifying and selecting control modes for mitigating risks within ERP projects, prior literature on control in IS development, such as Choudhury and Sabherwal (2003) and Elofson (1994) can assist in selecting appropriate controls. While these individual control modes have specific characteristics with regards to the properties of the risks they address, the use of multiple controls or portfolio of controls has been identified as an important concept (Kirsch 1997). Control portfolios are the use of multiple controls at the same time to control risks, and can include the use of formal and informal control mechanisms simultaneously (Gopal and Gosain 2009). Furthermore, Kirsch (2004) explored the dynamics of control during large IS projects and found that control is exercised differently for each phase following certain patterns, such as “collective sense making”, “technical winnowing” and “collaborative coordinating”. More importantly, some factors trigger changes in control choices from one project phase to another and emerging issues in one phase trigger changes to controls in other phases. Even though this research was based on custom-developed applications these finding may also have important implications for this research, in particular with regard to similarities in terms of the scope of large IS projects and as some of these factors, such as performance problems are often perceived as risks.

## Summary

The literature review on risk, control and ERP implementation projects shows that in each single field there is already a significant amount of work, which could frame the underlying research question of this study and help explaining the findings. In particular, Markus and Tanis (2000) Enterprise System Experience Cycle could be

used to frame the investigation of risk controls according to different phases and changes across phases, the conceptualization of risk management by Lyytinen (1998), the comprehensive list of risk factors compiled by Sumner (2000) together with the identified control modes (including the concept of portfolios of control) by Kirsch (1997) can be used to examine pre-identified risk control constructs, and finally the theory of control dynamics (Kirsch 2004) could be used to further explain how risk control is exercised in each phase, and why control changes across phases.

## RESEARCH DESIGN AND METHODOLOGY

From the literature review the following model has been developed to describe the constructs of ERP implementation stages, their associated risks and means of controlling/resolving that risk (Figure 1). This model combines stage transition and iteration when examining risks and controls in relation to the stages of an ERP implementation. The stage transitions are illustrated in the progressive steps going from phase 1 “project chartering” through to phase 4 “onwards and upwards” and include unidentified risks. Iteration is used to step through risk identification at each of the different ERP implementation stages and when a risk is discovered, either an appropriate control measure is found to counter this risk or in certain circumstances it is left uncontrolled and is addressed at a later stage. The inclusion of unidentified and uncontrolled risks in stage transition is based on Sumner (2000) where it was found that unidentified or unaddressed risks had a cumulative effect on successive stages in an ERP installation.

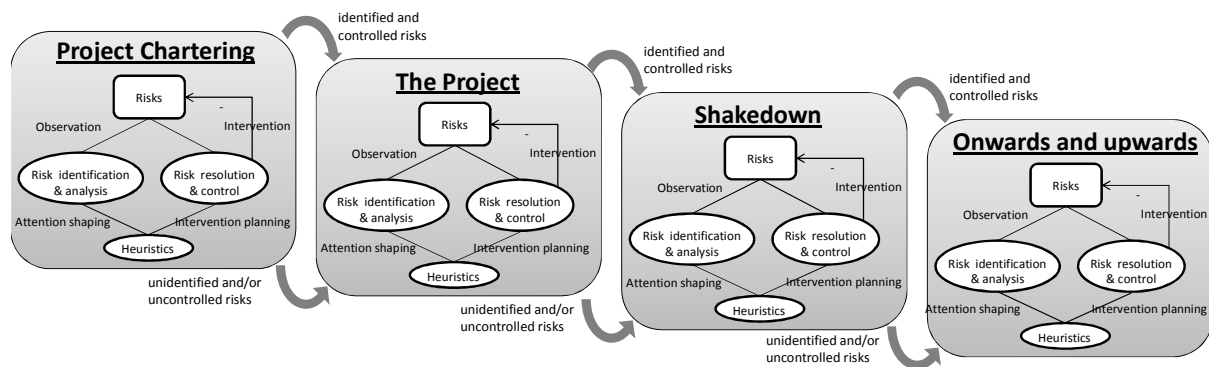


Figure 1: Proposed research model

A qualitative research design is applied by answering questions about how and why organisations exercise control in regards to identified risks during different stages of an ERP project. This approach is in line with previous research in this area (Kirsch 2004; Sumner 2000) and will draw upon the processes described in Eisenhardt (1989). In line with Kirsch (2004) this approach can be characterized as “soft positivism” described 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*” (pp. 378). As this research is designed to investigate pre-existing phenomena drawing from risk and control theory whilst retaining the ability to explore additional constructs, this approach was deemed the most appropriate. The research will be conducted in two stages. First, an exploratory pilot study comprising four single interviews with senior staff members of ERP projects and the analysis of relevant project documentation aims at clarifying the set of research questions and refining the scope of our research. The second stage is building on these results and is conducting two single in-depth case studies, guided by the principles proposed by Langley (1999) and Yin (1994). Currently, the pilot study has been completed and the first case study has started.

## CASE STUDY

This case follows an ERP implementation and resource amalgamation of three satellite offices of a multi-national company in the building industry, Building Supplies Ltd [not real name]. Although there was a business need to consolidate SAP resources between different offices, the impetus to proceed was created by the acquisition of one of these Companies from a competitor. With the acquisition comes the loss of access to existing SAP resources and hence the need to implement an ERP solution to accommodate their current needs and to align it with the rest of Building Supplies Ltd. All offices are currently using SAP and are configured and supported in the following manner. Company A is located in New Zealand and is fully owned by Building Supplies Ltd but have their SAP resources hosted by Company B. Company B is located in Australia, are majority owned by Building Supplies Ltd and in addition to hosting Company A, also host their own SAP resources. Company C are the new addition to the Building Supplies Ltd brand and are fully owned by Building Supplies Ltd. While they currently have their SAP resources hosted by their previous owners externally, it will

change in the near future as intellectual rights to that environment are lost (Figure 2). While the core ERP implementation is set to be completed on Company C, the proposed solution is to integrate all three companies into a data centre located in Australia as shown in figure 1 “Desired Outcome”. This will include finding an existing data centre to host their hardware, moving SAP resources for Companies A and B into that Data centre and recreating an SAP environment for Company C. SAP personnel will be sourced from Company B to administer the environment with business processes examined and redesigned over the three companies to enable systems integration.

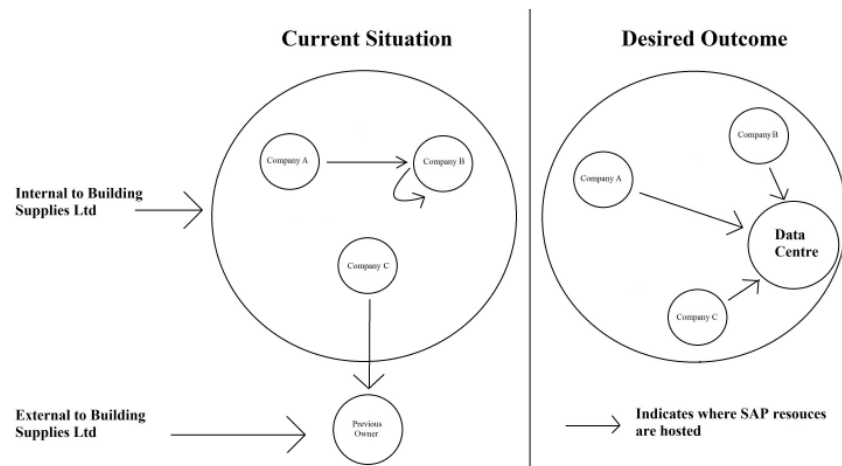


Figure 2: Current Situation and Desired Outcome of the analysed ERP implementation.

The default implementation model used is the Bancroft Model (1996) and is the Building Supplies Ltd standard for ERP implementations. The project is currently in the transition between planning (project chartering) and the As Is analysis (project) phase and has included input from the steering committee, CIO advisory team and the Board of Directors from all three companies involved. The project is scheduled to be completed late 2011 with the first stage encompassing the data centre setup and migration scheduled to cut over mid 2011. While this is the optimal outcome the eventual solution is still under negotiation and is set to be finalised late 2010.

### Data collection

The main sources of data collection are in-depth face-to-face interviews, brainstorming and a review of published and internal documentation, such as meeting protocols, process documentation and risk mitigation plans. Although the project manager may remain on the project over a number of stages, the four different stages involve separate groups of stakeholders as control is passed from one stage to the next (Markus & Tanis, 2000). The aim is to interview stakeholders from all ERP stages. This would also cover multiple perspectives (controller and controlee). Audio recordings will be made, which are then transcribed and uploaded into NVIVO8 in preparation for coding. In parallel, memos are written to capture important thoughts and ideas, which evolve during the interviews. The first part of the interview is devoted to gaining an in-depth understanding of the implementation process. The next set of questions will focus on the key issues associated with risks and controls in each of the project phases. Specific attention is paid to conditions and interactions clarifying the relationship between risks and control in different project stages. Using the predefined constructs of control, ERP stages and identified risks topic and analytical coding is used to confirm already established constructs but also to identify new codes and concepts.

## PRELIMINARY CASE FINDINGS

As this is ongoing research it is only possible to report from interviewing the ERP project manager of the first case study according to the project chartering and the project phase. Coding the first set of interviews has resulted in a number of identified risks and their proposed solutions, which had been mapped to the risk categories and risk factors identified by Sumner (2000).

### Lack of executive commitment of Company B to the project

Company B is the only company not fully owned by Building Supplies Ltd. While Building Supplies Ltd owns a majority share, agreement to the expenditure required for ERP consolidation requires a unanimous vote. Resistance to commit to the project has been noted as a major risk to the scope of the project. “...they have to have a unanimous agreement in order to sign these sorts of propositions...” As the implications of their decision will affect and potentially increase risks in other areas, agreement is being pursued aggressively in two ways. An

incentive has been given in that the new implementation will involve the current SAP and hardware resources resulting in a centralised sharing of resource and minimal capital outlay with increased disaster protection. *"...the big cherry is if they come in it's not going to cost them anything operationally, because it's all tied up in the budget of the project..."*

As an added incentive they have highlighted possible risks Company B will be exposed to if they do not join and the potential ramifications. *"...you are going to lose that [management fee] we pay you... so you... are going to have to sort out your budget and you're going to...lose some of your staff because you won't need as many anymore, so it's a big risk for you and ... you really should come and join us."*

The risk of Company B deciding to delay their decision to join at a later date has been explored and consequently eliminated by Building Supplies Ltd as a feasible option. To dissuade this they have explained that this decision would result in high levels of expenditure as hardware and skilled personal would have to be initially found, resulting in eventual double ups of resources. Any resources found would be retained and will result in skilled SAP personnel at Company B no longer being needed. *"...it's no good them coming along in a year or two's time and saying, "Yeah, we're in now" and we're going, "Well, guess what boys, we got all these SAP people now and you're got all these SAP people. If we bring you in play, guess what, there are a whole lot of redundancies and it ain't going to be in here."* To mitigate this Building Supplies Ltd have a proposed deadline for agreement. If no agreement is reached then Company B will be excluded from this project.

### **Lack of Project Champion**

A lack of project champion at Company B has been identified as a major risk, and is one that is dealt with using existing procedures. If no project champion is found on an ERP project then it will be put on hold for a short period of time or terminated. *"If we can't name who the person's going to be, who is the champion, we don't go ahead... we need someone because they are the one who has to sign off to say that's what they want"*. Currently they are working through this issue and if not resolved, may cause the project to be delayed or cancelled. The specified deadline will determine whether the project proceeds or is cancelled.

### **Lack of access to intellectual property associated with system design**

Company C was bought from another company and as part of that agreement will lose their rights to the SAP infrastructure currently in place. An additional risk is that the SAP environment used to run the business cannot be recreated from backups or copies of the system as that is included in the intellectual property agreement of the original company. *"...they are trying to recreate the environment from what's in people's heads and what's on their notes to match what... needs to be [known]..."*

The risks associated with this are high because if the system is recreated incorrectly, this could result in a system that is either incompatible with current processes or potentially unusable. The mitigation plan is based on a combination of company standards (with regards to ERP implementations), existing documentation and personal familiarity with the current system. The company stance with ERP implementations is to adhere to a number of best practices, namely sufficient levels of business process redesign and minimal customisation. *"... so now we have to integrate them and we've got to work out their business process and our business process and does it make sense and which ones are we going to use going forward."*

Measures have been put in place to facilitate this process. In particular addressing the issue by introducing business analysts at an early stage of the project to determine where business process redesign needs to occur, and by how much *"...because ... it could be a critical path... [and]... reporting always seems to take the longest ... they are saying, "Let's get it in early"..."*

Additionally a development site is to be established so the new system can be created and tested in parallel with the current production system in place. The intention is to swap the development site and the production site at go-live. *"...the systems they are changing are the dev test systems and then when they have tested it all and [have] user acceptance and everything else they will probably... change roles."*

### **Lack of technical expertise**

One of the potential problems identified if Company B decides not to participate is that they currently house all available technical support for the products involved and this may result in the need to source additional skills. *"...if they are not in the picture we have to resource a whole lot of SAP consultants... the market over there is really, really tight and they...will have no expertise about ... [our] standards ..."* As this project has yet to be signed off, the current plan is to wait and see what happens.



### Incompatibility of hardware and operating systems

While the company standard is IBM, Company B currently uses HP machines. The risk is that adhering to the standard could introduce unknown errors into a working system so a decision to stay with the current configuration has been made to avoid having to trouble shoot issues relating to operating systems at a later stage. *“Forget the standard, let’s just get what we have got - use that and keep the system as it is and then we don’t have to go back and test to see if some of the bugs were getting in. So that’s minimising risk and one of those things is you just cut out all of those things that we don’t need to do”.*

Table 3: Identified risks and associated control mechanisms in the case study

<i>Risk category</i>	<i>Risks</i>	<i>Corresponding control mechanisms</i>
Managerial structure and strategy	Lack of executive commitment of Company B to the project  Lack of Project Champion	Clan control – all members of the board are bought together or socialised to establish and ensure that there is no incongruence between individuals.  Output control – if no commitment is registered by the cut-off date then Company B will be excluded from the project.  Output control – if no project champion is found by the cut-off date then the project will be on hold until a champion is found.  Clan control – All members of the steering committee are aware of the need for a project champion and there is an expectation that one of them will take the lead
Software System Design	Lack of access to intellectual property associated with system design	Output control – business analysts have been introduced early into the project to map out the processes currently used, and from this to determine the required outputs.  Output control – creation of a development site to test and ensure all SAP resources and required database structures are in place.  Behavioural control – Internal project management procedures are being followed detailing the steps taken in an ERP installation to ensure that everything is covered.
Technology planning	Possible lack of technical expertise  Incompatible hardware and operating systems	Although this risk has been identified no control measures will be implemented until the next stage as this will involve sourcing and employing additional staff, an unnecessary step if Company B agree to participate. Additionally these staff will not be required in the short term so timeframes allow for this to happen at a later stage if needed.  Output control – although the company standard is to use IBM, HP is currently being used and tests have confirmed its suitability so will be used instead.

### Summary

When examining the types of controls used, previous literature is suggesting that clan control is a control type synonymous with operational level staff and administered by a controller as a means of achieving goal congruence though the identification and alignment of business goals (Harris et al. 2009). Although a number of different methods exist, one of the identified methods of encouraging clan type behaviour exhibited in this case is through socialisation where individuals are bought together to eliminate “...goal incongruence between individuals” (Ouchi 1979). What has been observed in this organisation is that clan control is a typical form of control used at the executive level with the project team being bought together with an expectation that all members participate in both the formulation and observation of the project goals. The implications within this case are that the controller and controlee of clan controls can in fact be the same people, and indeed this process is deemed highly important as the timeframes involved with an ERP implementation mean that success is reliant on all members of the team observing and striving to achieve the defined goals.

### CONCLUSION AND NEXT STEPS

So far, the preliminary results indicate that identified risks and exercised controls are tied together and may have an important impact on ERP implementation success. Further analysis should identify how these risk controls further influence risk mitigation and the ‘residual risk’ (Markus 2000) in the remaining project phases, in particular how these risk controls ‘flow’ across the different project phases, and how heuristics combine risk factors and risk resolution techniques (Lyytinen et al. 1998). The preliminary results also demonstrate the usefulness of our theoretical framework, including Sumner’s risk factors and categories as well as Kirsch’s classification of controls. Further, the preliminary results indicate some interesting findings, for example that in the first case clan control might also plays an important role at the executive level. Further interviews with other stakeholders, in particular controllees will further investigate this proposition and other control mechanisms might emerge. The next steps for this research are to complete the remaining interviews of the first case study as the project moves along, proceeding in a similar way for data collection and analysis as presented above. In

parallel, it is intended to conduct a second case study in order to strengthen the empirical basis for developing theory.

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