Risk-Taking Decisions with Major IS Investment: System Downsizing Case

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Abstract

In the cut-throat competitive environment of business, large-scale IS investment is becoming inevitable strategic necessity for gaining competitive advantage. However, it bears great deal of risk over all the associated processes so that the investment decisions need to be taken in a greatly careful manner. Nonetheless, Korean organizations are prominently showing risk taking behaviors regarding major IS investment, in terms of system downsizing. Although decision theory argues decision makers' rational choice of options through the assessment of risk and benefit, the notable trend toward system downsizing in Korea defies common understandings on IS project risk. Furthermore, it encourages us to investigate many impenetrable characteristics underlying organizational risk taking decisions with IS investment. We found out that there is significant effect of IS decision makers' risk propensity when they make system downsizing decisions. Moreover, we identified that IS decision makers do not get a strong pressure of cost savings and have tendencies to mimic competitor's decisions.

Keywords:
Risk-Taking Decision; IS Platform Decision;

Introduction

With growing complexity of general business environment, information systems are having a more central role in organizations. Large volume of batch transactions turned into distributed, real time transactions with the introduction of ERP and SCM applications. In advance, increasing needs for more flexible and inter-operable systems encourage organizations to consider innovation of fundamental IS platforms despite immense investment at initial stage. These large-scale IS investment can be inevitable strategic necessity for cut-throat competition on one hand. However, on the other hand, it bears great deal of risk over all the processes so that overall organizational business may get a serious blow by the failure of IS projects. Hence, the major IS investment decisions need to be taken in a greatly careful manner.

However, Korea is a market where risk taking behaviors with major IS investment is easily observed, especially in case of system downsizing decision. System downsizing is a migration of enterprise IS platform from mainframes to distributed mini computers (e.g. Unix or NT servers) and it has been one of the options for IS platform innovation. With merits and demerits of each platform, market share of mainframe also has been growing by 17% in global high-end server market since 2000 [8]. However, contrary to this trend, market share of mainframe in Korea has been continuously and prominently declined (-42% since 2000) with excessive trend of system downsizing. Rational decision making is a result of trade-offs between expected benefit and risk, moreover, with the increase of investment, risk aversion behaviors are formally assumed in the literature of decision theory [2]. However, the notable trend toward system downsizing in Korea defies the established belief on IS project risk. Hence, it provides us an ample opportunity to investigate the risk attitudes with large scale IS investment. With greatly high failure rate of major IS project, IS research has been focused on the identification of risk factors and success criteria for IS investment. Most of the studies were limited to the assessment of IS risk or management of IS risk. Hence, we failed to find the IS studies explaining the underlying decision factors of large-scale IS project which bears inherently high level of managerial and operational risks.

One possible theoretical explanation can be given by the studies on risk taking behaviors. Schwarzer [13] argued that distorted perception on risk can be caused by either the lack of proper estimation of risk or the motivation to undertake the risk. Hence, with the high uncertainty of results and difficulties of ex-ante appraisal of IS risk, we capture the possibility of biased perception of risk resulting in risk taking decisions by decision makers' propensity to take risk. In a risky decision context, Sitkin and Pablo [14] illuminated the main role of 'risk perception' and 'risk propensity' in their decision making model. Based on these studies, we found out that the investigation on decision maker's risky decision behavior can explain the impenetrable characteristics observed in system downsizing decisions. Hence we investigate how IS decision makers perceive the IS investment risk and how their 'motivation to take risk' is related to the decisions of major IS investment. For our investigation, we adopted system downsizing as our sample IS project for survey. System downsizing is a typical IS project with large-scale investment, observed in decisive manner in Korea. Compared to other IS project almost completed in the fields (e.g. ERP), it is still undertaken in many industries, especially in finance sector, hence we could easily gain the respondents' attention on

this study. Therefore, in this paper,

- we investigate the effect of decision makers' risk propensity on system downsizing decisions, which is identified as two principle elements of risk-taking decisions.
- we also identify the exogenous factors influencing decision makers' risk perception and risk propensity in system downsizing decisions.
- through our investigation on system downsizing, we conjecture the tradition of risk-taking behaviors in major IS decisions and provide managerial implications on IS decision making behaviors.

Theoretical Background

Studies on IS project Risk

First we review the studies on IS project risk, which works as a main huddle of new system adoption. IS project risk means the intrinsic uncertainty of project success and the potential deficiencies from project failure [12]. Hence, by definition, IS project risk involves both the project management failure [1, 12] and potential risks from new system execution [10]. The former stems from mainly three dimensions of project: project size, experience with technology and project structure [10]. Because risk increases with the size and complexity of project, as a representative large-scale project, IS platform migration to new, un-experienced system bears inherent risk in these thee dimensions. Furthermore, even in execution period, 75% of large scale information systems are reported to be as 'operational failures' because of mal-functionality or no usage of system [7]. Potential limitation of IS project risk management lies in the difficulties of risk assessment at the investment appraisal stage. There is no validated information available for IS decision makers so that various countermeasures can be taken [12]. For example, as a way of risk assessment with new IS investment, TCO framework has been widely adopted. However, this approach is so situation-specific that the costs which are relevant and significant to decision-makers vary by companies and even within companies [5]. These factors bring outs inevitable risks in IS investment decision.

Studies on Managerial Decision Making

Because risk assessment is a basic factor of decision making [2], scholars tried to identify the decision determinants in a risky context and illuminated 'risk perception' as a key principle element of risk-taking decision. In traditional decision theory, decision making is the result of expected benefit and risk, where risk is commonly assumed to be the variation in possible outcomes [2]. Although this theory expects that a decision maker takes rational choices among alternatives assessing trade-off between risk and return, it seems to be not easily applied in IS decisions. There is few quantified data on the probability or amount of IS risk because translation of multidimensional IS phenomenon into one number is almost impossible and which makes the assessment of IS risk more difficult.

In this context, March and Shapira [9] captured different conceptions of 'risk taking' between conventional decision theory and managerial perspective. They explained that, unlikely to the theoretical myth, decision maker's labeling of situation or probabilistic estimation of risky outcomes, namely risk perception [14] is not processed in a smart and logical manner as expected. Decision makers are not only insensitive to the real estimation of potential risk, but they also inclined to consider risk as a controllable target [9]. In this vein, March and Shapira [9] found that risk taking in organizations is sustained more by personal than organizational incentives. Finding 'risk propensity' as an important but hidden variable in risk-taking decisions, Sitkin and Pablo [14] resolved various contradictory argues on risk-taking decision model. They adopt both risk perception and risk propensity as two principle element of risk-taking decisions. Furthermore, by positing the effect of risk propensity on risk perception, they emphasized risk propensity as a dominant determinant of risk-taking behavior. Sitkin and Pablo's model [14] provide a useful starting point to our investigation. In their model, including risk propensity, several exogenous variables are proposed as determinants of risk perception and the predictors of risk propensity are also investigated. Through the review of IS studies in the ensuing section, we re-conceptualize the factors in Sitkin and Pablo's model with the factors of IS adoption so that specify our model in a system downsizing decision perspective.

Studies on IS Adoption

The studies investigated the factors that minimize associated risk and facilitate successful acquisition of new information systems in individual, organizational and environmental perspectives.

Fink's study [6] established variables which affect general IS introduction: external (internal) IT expertise, external (internal) resources, organizational culture, external environment, benefit of IT and so on. Although this study is focusing on the SME (Small and Medium Enterprise) case, their variables are commonly considered in the other empirical studies providing comprehensive understanding on general IS adoption.

Focusing on the open system adoption, Chau and Tam [3] considered various factors affecting adoption of new system and identified that organizational ability to adopt open system is more significant than the perceptions of the adoption benefits implying that insufficient organizational knowledge works as a main barrier for new system adoption by magnifying the related risk. As a fabulous modern system, the adoption of open source platform was examined by Dedrick and West [4]. With more innovation-focused view, they considered competitive advantage, compatibility, trialability as main technological factors. Beyond technical traits, centrality of IT, the effect of boundary spanners, in-house complementary skills and supports from external markets are also considered. Furthermore, institutional theory explains that organizations facing great pressure of competition with high level of environmental uncertainty could blindly mimic other organizations in the same field. Organizations seek to reduce uncertainty by recklessly copying other

organizations and some scholars adopted this theory in explaining organization's system downsizing practice as a fad [11].

Research Model and Hypotheses

First, Sitkin and Pablo's [14] identified two central factors influencing risk-taking decisions: risk perception and risk propensity. Hence, we examine whether the role of risk perception and propensity is also applied in system downsizing decision. Furthermore, the determinants of risk perception and risk propensity in their model is rephrased with the important factors in IS decision makings. First, for testing the effect of 'social influence' on risk perception, we adopted 'competitor downsizing' and 'external support for system downsizing'. 'Problem domain familiarity' is specified to 'internal readiness to system downsizing' and 'IS mission criticalness' is adopted for 'problem framing'. 'Organizational control systems' are specified to 'IS formalization' and 'cost controls'. For the predictors of 'risk propensity', they suggested 'risk preference' and 'outcome history'. These factors are decision maker's intrinsic characteristics in problem domain hence, we matched them to 'risk preference toward major IS Investment' and 'outcome history of major IS investment' in this paper.

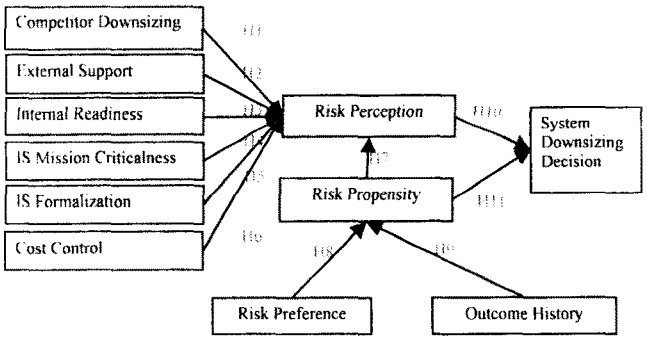

Figure1. Research Model

When there is high degree of uncertainty and the practical information is insufficient, decision makers become more insensitive to the perception of risk then have tendencies to copy the others' practices [11]. Decision makers perceive that system downsizing is safe things to be practiced when it seems to be fashionable and popular in their fields. Organizational pressure for strategic decision on information system induces IS decision makers to make the homogeneous decisions with competitors in their field because it reduces their perception of potential risk.

H1. Higher level of system downsizing by competitors will negatively affect decision maker's risk perception on system downsizing.

Studies on IS adoption show that the supports from external IS environments are the main driver of IS introduction [6]. When an organization has poor experience and knowledge with new system, the outside expertise has more influential effect on the adoption decision [6]. Therefore, when the outside environment is supportive to a firm's system downsizing, the decision makers perceive less risk.

H2. Higher level of external supports for system downsizing will negatively affect decision maker's risk perception on system downsizing.

Because domain familiarity increases decision makers' confidence on their controllability, it makes the decision makers overlook and under-estimate the potential risks [9]. Studies on IS adoption[6] identified that in-house experience and knowledge on the new system is an important driver of IS adoption. With higher internal readiness, the decision makers perceive less risk.

H3. Higher level of organizational readiness for system downsizing will negatively affect decision maker's risk perception on system downsizing.

Decision makers become more risk aversive in a positive situation because they over focus on the loss from risk taking. In the same context, we expect that when a decision problem is framed in a more critical manner, decision makers would not take the risks because the impact of failure is magnified with the increase of criticalness. IS mission criticalness means the importance of IS to organization's main business. It is clearly observed in Financial industry while it seems not in the other industry such as fast-food, where real time transaction via information systems is unnecessary. We hypothesize negative relationship between high level of IS mission criticalness and organizational risk perception with system downsizing decisions.

H4. Higher level of IS mission criticalness will negatively affect decision maker's risk perception on system downsizing.

We can consider organizational controls in two dimensions – formalized monitoring on IS development and management (IS Formalization) and evaluations on budget consumption (Cost Control). Zmud's study [16] showed that organizations under higher management control systems incur successful results in their IS adoption. The formalized control on the investment outcome makes decision makers take more careful investigation on the potential risks so that increases the probability of better outcome.

H5. Higher degree of formalization on IS development and management will positively affect decision maker's risk perception on system downsizing.

H6. Higher level of cost controls on the IS investment will positively affect decision maker's risk perception on system downsizing.

Risk propensity is defined to be decision maker's willingness to take risks [14]. By taking risks, decision makers could expect to drive sensational and innovative outcome in the organizations, hence risk-seeking decision makers overestimate positive side of decision results while underestimate negative returns. An IS decision maker who chases innovational changes through system downsizing would take the associated risk because his motivation causes biased perception to successful results overlooking underlying risks.

H7. Higher level of risk propensity will negatively affect decision maker's risk perception on system downsizing.

Individuals have inherent tendencies toward risk-takings in a specific domain and these are not easily changed. We think that it would not be exceptional in IS domain so that IS decision makers may have stable risk preferences toward major IS investment. IS decision makers' risk propensity in system downsizing decision would be greatly influenced by their intrinsic risk preference in this domain.

H8. Higher level of risk preference toward major IS investment will positively affect decision maker's risk propensity to system downsizing.

If decisions result in successful outcomes, risk-seeker would take increasingly risk-seeking attitude and risk-avoider would become risk aversive again because their self-assurance on ex-post reduction of risk comes from ex-ante experience [9]. Therefore, the results of past decisions reinforce decision makers' risk-seeking or avoiding tendencies.

H9. Higher level of past successes will positively affect decision maker's risk propensity to system downsizing.

Finally we hypothesize the central role of decision maker's risk perception and propensity on his/her final decision making behavior. The negative relation between risk perception and risk taking decision is traditionally argued in a theoretical vein and positive effect of risk propensity on the risk taking decision is also supported by other empirical studies .

H10. Higher level of decision maker's risk perception on system downsizing will negatively affect the likelihood of system downsizing decision.

H11. Higher level of decision maker's risk propensity on system downsizing will positively affect the likelihood of system downsizing decision.

Research Methodology

Data Collection and Measurement

Because system downsizing is organizational decision, we take each organization as our unit of analysis and measured risk perception and propensity reported by representative IS decision makers in organizations. We collected 80 responses. As a measure of 'risk-taking decision', we asked the degree of system downsizing from legacy to new platforms. System downsizing can be a process of multi-stages over several times of projects. In our responses, 52 percent of organizations adopted phased-out downsizing. In this case, for precise measure of the influences of explanatory variables on dependent variable, we requested the respondent to limit their answers to the first time of system downsizing in their organization.

All the respondents are top IS managers (63%) or CIOs (37%) who made the initial downsizing decision in organizations. We operationalized most constructs in our research model using the items from past research and developed one construct (competitor downsizing). Most questionnaires on risk perception and its antecedents are adapted from IS-adoption literature.

Results

We used PLS-Graph ver 3.0. For the validation of our measurement model, we first checked out convergent validity by examining composite reliability and average variance of measures. The result was demonstrated in Table 1.

Table 1. Results of Confirmatory Factor Analysis

Measures	Items	Composite Reliability	AVE*
Competitor Downsizing (CD)	3	0.945	0.872
External Support (ES)	4	0.891	0.675
Internal Readiness (IR)	3	0.835	0.627
IS Mission Criticalness (IMC)	3	0.882	0.713
IS Formalization (ISF)	3	0.976	0.931
Cost Control (COC)	3	0.812	0.593
Risk Perception (PER)	4	0.875	0.640
Risk Preference (PRE)	4	0.856	0.601
Outcome History (OCH)	4	0.921	0.745
Risk Propensity (PRO)	4	0.945	0.810
System Downsizing Decision (SDD)	3	0.983	0.951

All the composite reliability can be interpreted as Cronba's alpha and in our model, it is higher than 0.812, which satisfies the recommended value for a reliable construct, 0.7. All the AVE values range from 0.593 to 0.951, which also meets the acceptable value, 0.5 For the discriminant validity test, we investigated the square root of the AVE.

For the discriminant validity test, we investigated the square root of the AVE Discriminant validity implies how well the measures of one construct are loaded for it so that discriminate it with others. Table 2 shows that the variance between a construct and its own measures are higher than with other measures, and higher than the acceptance level, 0.5, as well.

Table 2. Correlation between Constructs

	CD	EN	IF	IMC	ISF	COC	RFR	IFR	OCR	IPO	RDD
CD	0.93										
EN	0.26	0.82									
IF	0.32	0.36	0.79								
IMC	-0.10	0.08	0.06	0.84							
ISF	0.08	0.38	0.22	0.13	0.96						
COC	0.06	0.16	0.07	0.36	0.27	0.77					
RFR	-0.20	-0.29	-0.48	0.10	0.07	0.08	0.80				
IFR	-0.03	0.12	0.23	0.02	0.23	-0.02	-0.08	0.77			
OCR	0.15	0.37	0.45	0.07	0.46	0.29	-0.35	0.44	0.86		
IPO	-0.03	0.06	0.21	-0.08	0.14	-0.01	-0.14	0.68	0.36	0.90	
RDD	0.28	0.09	0.20	0.01	0.23	0.01	0.22	0.17	0.20	0.22	0.95

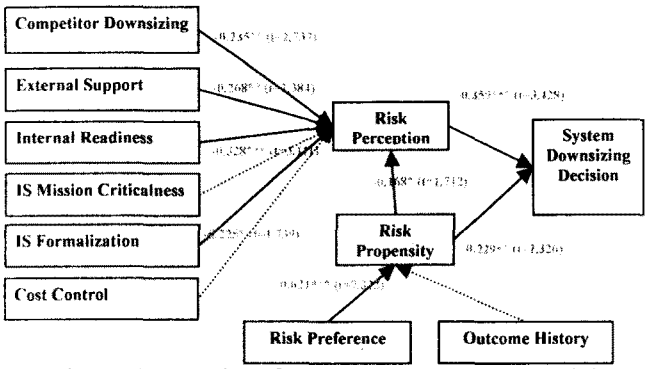

Figure 2. Results of Structural Equation Model

Discussions

The aim of this study is to investigate how the decision of system downsizing is made, in the risk-taking context, which has not been tested empirically to the best of our knowledge. In our survey, we specified the IS decision to downsizing of enterprise IS platform because it is a representative large-scale IS project easily observed in a fashionable mood in Korea.

1) *Biased risk perception by significant effect of risk propensity*

IS decision makers' individual propensity to risk taking significantly affects final decisions. The results of H7 and H11 show that there is larger direct effect of risk propensity on final decision than its indirect effect through risk perception. It implies that IS decision makers' individual characteristics related to the decision problem (e.g. IS background, education or experience of open system) bring about inevitable and significant effect on their willingness to take risk and their actual decisions. This effect seems to be exaggerated especially when decision makers have sufficient experiences on the same domain. In our survey, the mean of Unix/NT system experience before system downsizing was 1.71 and 0.39 years respectively for the decision makers who completed full downsizing of system and those are still maintaining mainframe. T-test ($t=1.132$, $p=0.0268$) result shows significant difference between the mean of two groups with significance level 0.05. Even though IS decision makers realize the potential risk, they can be motivated to daringly move to new IS platforms they have already experienced.

2) *Technically over-focused risk perception under useless evaluation system of IS investment outcome*

The significant factors on risk perception show that IS decision maker's risk assessment might be biased to the technical side. As Chau and Tam [3]'s argument, organizational expertise, knowledge and experience on new IS platform works as number one facilitator or barrier of system downsizing (H3). Moreover, the expected supports from outside instigate downsizing decision by reducing perception of potential risk (H2). These internal and external supports focus on the level of technical readiness for system downsizing. IS decision makers in our survey have 13.2 years of IS career and 2.5 years of non-IS career in average. Their comprehensive assessment on technical readiness by inside and outside can originate from decision makers' biased career as technicians with IS monarchy decision structure. It is observed again in their perception of control systems as constraints of their risk-taking decision. While formalized controls on technical process makes decision makers more conservative to the potential risk of new system adoption (H5), there is no effect of cost controls on their risk perception (H6).

The insignificance of cost control systems can be explained by the characteristics of evaluation systems. First, we observed that restraining influence by CFO was very low compared to the decision power of CIO. CIOs proposed the reduction of TCO with downsizing however, actual realization of it has been uncertain. Therefore, the insignificance of cost control systems implies the impracticalness of economic evaluation systems on decision outcomes. This kind of IS governance makes IS decision makers insensitive to their result of past decision so that the effect of outcome history also can be insignificant in Korean IS domain (H9).

3) *Mimetic isomorphism in critical IS decisions*

Another major finding is mimicry trend among organizations (H1). Competitor's decision has significant effect on organizations hesitating with the same problem. It makes the organization perceive less risk and expect more positive outcomes. We think that the insignificance of IS mission criticalness on risk perception (H4) is linked to this trend. We asked organizations about their perception on IS mission criticalness and the responses showed significantly different perceptions between manufacturing and finance sectors ($F=39.44$ with $p=0.00$). However, though they have the different perception on IS criticalness, there is no significant difference in their perception of risk between two groups ($F=0.52$ with $p=0.475$). Relative position of competition can be altered by the results of decisions so that, under the pressure on the strategic adoption of IS, we think that the inherent uncertainty in IS project encourages

homogenous decisions regardless of the IS failure criticalness. Our result shows that adoption of IS can be strategic necessity everybody takes in a similar way, rather than the driver of strategic competence under lack of precise risk appraisal and economic evaluation systems on outcomes.

Conclusion and Implications

We found out that IS decision maker's risk propensity has important role also in large-scale IS investment decision with lack of objective appraisals between alternatives. The insignificant effect of economic control systems on the risk perception is also observed. With low restraining influence by CFOs, CIOs can underestimate the over-budget risk or opportunity cost by daringly discarding legacy systems. Decision maker's outcome history of past decisions do not have significant effect on his/her current risk propensity, though our respondents have sufficient IS careers to experience other IS projects.

The contribution of our study can be summarized in two parts. First, in academic perspective, we made comprehensive empirical test of risk-taking decision model targeting the actual decision makers in IS domain. From the prior studies, we observed that higher degree of generalization of results could be obtained by taking general students or general administrator as subjects and by asking general questions unrelated to the actual managerial risk taking. Moreover, to the best of our knowledge, we cannot find other empirical studies testing risk-taking decision models with comprehensive exogenous variables, especially in IS domain. Second, in managerial perspective, our study gives helpful implications on the IS governance tradition in Korean organization. The results show that CIOs or Top IS managers have dominant influence on IS investment decisions so that decisions are significantly affected by not only their risk appraisal but also their risk propensity. Therefore, it is not certain that IS decision is made based on economic and managerial analysis or CIO's preconception in technical perspective induces decision makings and some economics analysis (e.g. TCO) is used simply for justification of the decisions. Lack of managerial risk analysis in capital budgeting decisions has been generally pointed in IS projects [15]. Hence, under-analysis of risk seems to be not atypical in major IS investment decisions. In other hands, sometimes risk taking is assumed to be essential factor of managerial success. However, when we consider that CIO's biased careers to IS area and prevalence of monarchical IS governance in Korean organizations, we conclude that more balanced governance structure and serious ex-post evaluation of IS investment is required with more economic and managerial viewpoints.

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