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A FRAMEWORK FOR ANALYSIS ON THE PROCESS OF INFORMATION SYSTEM EVALUATION AND INVESTMENT DECISION

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Abstract

Information System (IS) investment evaluation has long been an issue in the IS research. Traditional positivistic research dealt with cost-benefit rationale regarding why and how to evaluate. Afterwards, social and political views added issues to this stream by embedding the organizational context that makes evaluation more fraught with difficulties. The purpose of this paper is to provide a theoretical foundation and justification of the various organizational aspects of IS evaluation and decision process. By reviewing recent research that adopts institutional theory perspective on this issue and we develop a two-staged evaluation process model constructed by the interaction among stakeholders and their roles. Participants of the process are two groups: IS evaluator group who evaluate the benefit of investment, and decision makers who examine suggestions of the evaluator group and finally determine to invest or not. We argue that, during this interaction process, the organization's institutional context influences the extent of the formality of evaluation criteria and the procedural rationality. From this dynamic process perspective, we propose a multidimensional analysis framework that constitutes four types of evaluation orientation: Mixed, Positive, Negative, and Control Evaluation Orientation. With this framework we discuss how stakeholders behave and affect investment decision under each evaluation orientation. Likewise, we also discuss how financially justified IS investments can be sometimes rejected or otherwise accepted in the politically situated evaluation process. We believe that this framework expands our understanding of IS evaluation and decision process and therefore contributes to IS research in this field. Also to practitioners, this study provides several implications regarding how to maintain the formal/rational evaluation procedure and how to acquire organizational consensus under a socially complex organizational environment.

Keywords: IS evaluation, IS investment decision, Institutional Theory, rationality, organizational context

Introduction

In order for an organization to achieve a success in information system (IS) accompanied by a substantive amount of financial capital and human resources, thorough planning and management of IS investment are needed. This process is becoming more important nowadays as a competitive economic environment has forced organizations to cut costs significantly. As the beginning process of the IS investment management, evaluation of benefit against cost and subsequent decision of certain IS investment are usually exercised. Besides, the IS investment evaluation and decision usually consists of a series of portfolio-based managerial processes regardless of private or public organizations. They have to choose some of the multiple investment alternatives after considerations of various aspects of cost and benefit of each alternative. Therefore, it can be the key issues whether decision makers have complied with the rationally justified evaluation criteria and the decision procedure based on consensus among investment proposers.

In this context, the study of IS investment evaluation and decision has carried out various forms of feasibility studies or investment appraisals, typically, using traditional cost-benefit analysis [2] [58]. This paradigm considers IS decision makers as rationalists who would choose one of the IS investments if it has the highest score of cost-benefit analysis.

However, the increasing complexity in the IS context challenges the traditional technical economic approaches. It is because IS evaluation is a socially embedded process in which formal assessments intertwine with the informal assessments by which actors make sense of their situation. Thus, they cannot explain the uncertainties and contextual dependencies concerning the value of IS investments. Therefore, analyzing and understanding their role, interactions, under organizational context should be the main concern of this research issue [17] [49].

Meanwhile, like many authors have argued, 'interpretive' research perspective would provide some ways to explain this complex issue rather than a positivistic perspective [17] [19] [51] [55]. To our knowledge, however, this research stream had not been much studied in the IS evaluation area, which especially focuses on the organization context and

social aspects during is investment priority selection.

Accordingly, this article aims to provide a theoretical foundation which structurize the IS investment evaluation and decision process and encompass the various organizational aspects of the process.

The following section summarizes and examine previous research on IS evaluation and outline some of the assumptions made. Afterwards we suggest a conceptual framework which provide rationale to explain how evaluation diverge during the process participated by decision makers and related stakeholders.

Literature Review

Rational Behavior Approach

In the rational model approach, human behavior is assumed to be logical and consistent. Organization also pursues profitability and maximize utility[31]. Rationality in the organizational choice means one can identify all possible alternatives, and evaluate expected outcome from each alternative, finally select one of the alternatives which maximizes or optimizes the organization's performance [6] [9] [28] [38].

This somewhat omniscience view of human ability applies to the early research in IS evaluation and investment decision [5] [17]. This conception sees evaluation as an external judgment of an IS which is treated as if it existed in isolation from its human and organizational components and effects. And technical and economic criteria were used to carry out project-driven, cost-focused evaluation [49].

In the same way, econometric analysis was used in the public sector. Following McFadden(1975,1976), bureaucracy comply economic principle with the Cost-Benefit Analysis(CBA), set investment priority by the result of the analysis which calculate the economic net benefits. The difference from private sector is that economic net benefits means more than financial, that is, social utility in macro level [34] [35].

Transaction cost theory supports this rational approach in a way that transaction costs can be measured, monitored and separated. Thus, the evaluation criteria for IS investment are organized to minimize transaction costs [57].

Contingency theory, although it focuses more on environmental uncertainty, has similar assumption to the rational model. While contingency theorists argue that there is no one best 'fit', they do posit that managers of organizations are able to rationally recognize the changing environment and then align their organizations to

match the environment. It is also hypothesized that achieving fit leads to improved efficiency and performance. IS investments and its overall governance system would be implemented to achieve 'fit' [27] [54]

Agency theory and related research expand and extend the rational model theory. This theory emphasizes the problem in organization by adopting the concept of goal incongruence and information asymmetry between the principal and the agents. Agency theory provide useful implication to IS investment decision process with an idea that principle(decision maker) and some other internal stakeholders(agents) might have different interests during the decision process. However, it still assumes motivations are financial, thus still confines itself in the rational behavior theory [13].

To the extent that the traditional accountancy framework laid foundation of IS investment decision criteria, it still faces complicated issue on how to measure and evaluate the intangible and non-financial benefits. Therefore, this approach has been challenged for its problem of internal validity and external generalizability from social research [29]. One notable criticism is the argument that not every motivation is financial. We can observe many organizations have progressed from elementary cost-benefit analysis towards a more entrepreneurial approach which seeks to deliver long-term benefit while considering the intangible aspects and elements of risk and uncertainty [8] [56].

Also there are some criticisms about the limitation of the cognitive psychology of the rational model. Lamb & King(2003) argue the rational model describes an atomic individual with well-articulated preferences and the ability to exercise discretion in the ICT choice and use, within certain cognitive limits. Even though some extended rational models also describe how information from objects, the environment interacts with other atomic individuals, it is cognitively processed as feedback to fine-tune the preferences that influence discretion. Within this model, however, information is highly decontextualized [26].

From the social research perspective, which is the main interest in this paper, they criticize the rational model neglects the dynamic social influences that exist inside or outside the organizations. As per this view, the actions of individuals are embedded in concrete, ongoing systems of social relations [15]. Sociologists theorized this system as *social structure*, which describes the foundational structures of social institutions in terms of domination, legitimation, and signification [14]. Following section discuss

the sociological approaches to the organizational process of IS.

Political Behavior Approach

In the political behavior approach, organizational decision is assumed to be a political, social process [1] [11] [12] [44]. It defines political behavior as socially influencing behavior in order for individual or organization to protect or increase self interests [1].

Political approaches have following some characteristics regarding organizational decision. First, political behavior is focused on gaining organizationally sanctioned ends through non-sanctioned means or obtaining ends not sanctioned by the organization [33]. Second, while political activities are self-serving, leading to desired outcomes for the individual, perhaps at the expense of others and the organization, the real motivations behind the behaviors are often hidden from others. Third, in the political process, conflicts of interest and unequal power among members are assumed to be the rationale for political behavior [11]. Therefore, organizational actors try to exercise their power to achieve partisan goals rather than the organizational goal [46]. Finally political behaviors tend to occur in the competitive environments with unclear rules about how resources and outcomes are allocated [24].

Also to the IS field, researchers have long recognized the important role of power and politics [22] [32] [47]. Generally to the relationship between IS and organization, power determines the capability of an organizational unit and has to influence the behavior of other units and the organizational decision process [30]. Therefore, power activated during the IS decision process needs to be approached by multidimensional perspectives. Sillince and Mouakket(1997) provided five perspectives about power : zero sum, processual, organizational, structurally constrained, socially shaped(constructed) power [50]. While their concepts of structurally constrained or socially shaped power are more sophisticated way of dealing with power than earlier functionalistic approach, such disciplinary diversity rather makes it difficult to generate continued discussion and to accumulate a foundational body of research.

Institutional Theory Approach

In the diversified and complex IS investment evaluation and decision process, rational approach has difficulties to explain why and how rationally justified investments sometimes are rejected at the final decision stage. On the contrary, political/power approach, if we could ever parsimoniously simplify its core concept, failed to

clearly explain rationally justified investments are still held in the high priority under politically conflicted situation. To colligate these two approaches from both extreme ends, we suggest Institutional theory as a baseline for comprehensive framework.

The Institutional theory is essentially concerned with how organizations are influenced by wider cultural and social environments and how organizational processes by which structures, including schemas, rules, norms, and routines, become established as authoritative guidelines for social behavior. Therefore it is capable of explaining factors that circumscribe individual and organizational behavior by various interactions between external environment and internal structure [39].

Institution are highly resilient social structures that have attained a high degree of resilience, which are composed of the cultural-cognitive, normative, and regulative elements that, together with associated activities and resources, provide stability and meaning to social life [48]. In the Institutional theory approach, organizations do not adopt organizational structures, instead adopt societally rationalized (institutionalized) structures to achieve legitimacy, regardless of the impact on efficiency [37].

DiMaggio and Powell(1983), focusing on the environmental institution, posited three forms of institutional isomorphism – coercive, mimetic and normative. Coercive isomorphism comes from legal pressures, political pressures or the kind of intense pressure of which powerful organizations are able to exert on less-powerful, dependent organizations. Mimetic isomorphism – the tendency to mimic other organizations, is posited as a response to uncertainty; in the uncertain environments organizations will mimic those organizations seen to be successful. Finally, normative isomorphism is associated with the professionalism associated with formal education and professional networks [10]

Scott(2001) categorized the literature into three 'pillars' of institutional theory – regulative, normative and cultural-cognitive. These pillars broadly match DiMaggio and Powell(1983)'s isomorphic pressures, more focusing on the internal structures of legitimation. The regulative pillar has expedience as its basis of compliance. Legitimacy is legally sanctioned and indicated by the presence of rules, laws and sanctions. Under the normative pillar, compliance is a social obligation and the existence of certification and accreditation among organizational fields points to a morally governed legitimacy. Cultural-cognitive is based on a shared understanding. Common beliefs and shared logic lead to a recognizable and culturally supported

basis of legitimacy [14] [48].

IS Research with Institutional Theory Approach

It seems not much research work has been done on IS investment decision from Institutional Theory perspective, study of Teo et al.(2003) and Miranda & Kim(2006) are considered distinguishable works on this perspective. Teo et. al(2003)'s work provided some empirical support for institutional-based variables as predictors of adoption intention of IS. In the article, institutional theory posits that mimetic, coercive, and normative pressures existing in an institutionalized environment could influence organizational predisposition toward an inter-organizational information linkage system, specifically, FEDI(Financial Electronic Data Interchange) [53]. Although he introduced Institutional variables into a theoretical framework of IS investment decision, its focusing on the external institutional pressure has some limitation of deterministic view to IS investment decision

In a different but advanced way, Miranda & Kim(2006) suggested more dynamic view considering how the appropriation of the logic of transaction cost economics is contingent on decision makers' institutional context. They contextually interpreted Scott(2001)'s three institutional pillar and dichotomized into two institutional contexts - professional versus political contexts.

In professional contexts, the cognitive structures of procedural knowledge are central to the coordinated action, Regulation in its conventional sense is unnecessary, as uniformity is effected through consensus on the values of procedural rationality, Normative structures reference the procedural rationality and focus on its diffusion, *In political* contexts, regulation via political authority is key to the coordinated action. Unlike the ideologically homogenized professional contexts, interests and values can be diverse in political contexts. Cognitive structures play a weak role in these institutional contexts since shared meaning is not essential to ordered activity and is difficult to attain in the presence of varied interests and values. Normative structures legitimate the exercise of authority by those vested with it. While a level of the procedural rationality may still appear in such political contexts, it is not legitimated and its incidence is minimized with the increased incidence of the political behavior [42]

The work of Miranda & Kim(2006) provides significant hint to our research question. The dichotomous approach to professional/political context enables flexible explanation which was insufficient in either rational or political theory approach. Along with this contextual basis,

following two exploratory studies may further develop our research idea.

A case study of Serafeimidis & Smithson(2003) used institutionalization as a new way to explain social interaction process while an organization initiates IS evaluation and its diffusion. The study divides IS evaluation related stakeholders into two groups – the strategist and the evaluator.

The 'strategist for evaluation' is involved in the creation, implementation and institutionalization of evaluation norms, principles, structures and methods. The tasks of a strategist, in general terms, include the analysis of the situation, the production and reproduction of normative values, and the maintenance and change of power relations. In a more unconventional way, a strategist can encourage and facilitate others to question conventional wisdom and increase awareness. The organizational status and power of the strategist should provide the authority to question traditions and to make commitments for change [49].

'Evaluators', on the other hand, receive the 'evaluation strategy', including the evaluation methods, tools and techniques, from the strategists and enact the strategy according to their interpretations. Every stakeholder from the evaluation party can act as a evaluator and evaluators cannot be considered as isolated from the evaluation action. They are recipients of the changes they initiate and, therefore, either beneficiaries or victims themselves [16]. The evaluator can be viewed and interpreted by his audience in various ways. In the case of a formal/rational evaluation exercise based on technical and economic criteria, the role of a formal evaluator includes not only the quantitative assessments, but also a ritual element of demonstrating management competence [49] [55].

Next, based on the two groups' perception of objectives of the IS investment and impact on organization, four types of organizational institution are identified – Control, Sense-making, Social learning, Exploratory. *Control evaluation* refers to the cases where the expected outcomes of the investment, usually quantitative, are fairly certain and there is an organizational consensus around them. In cases where the objectives of the investment are not clear or predictable (e.g. a decision support system, a groupware system), a *sense-making evaluation* would form the basis of attempts to reach consensus. When expected objectives are usually clear, but there is uncertainty of their achievement, *Social learning* evaluation contributes to decreasing uncertainty of strategic changes. *Exploratory evaluation* is needed when the social learning faces a lack of consensus in terms of the objectives and/or the sense-making

cannot deal with the strategic nature of the change and its uncertainty (e.g. major outsourcing decisions, just-in-time manufacturing systems) ([49], pp 257~258) If we see four types of evaluation orientation from the dichotomy view of formal/informal evaluation, three other types of evaluation except control evaluation deal with unpredictable evaluation results depending upon how strategists and evaluators informally interact with each other.

The concept of role division and distinctive evaluation orientation from Serafeimidis & Smithson(2003) is noticeable considering both the final approval authority and those with pre-decision involvements such as the initiation and development of IT investment proposals [60].

Overall, our study focuses on the informal process based on the taxonomy of institutional context from the study of Miranda & Kim(2006) and justification types from Irani(2002). We also hold the evaluation role concept of Serafeimidis & Smithson(2003) as well. In the next section, we propose new framework which encompass each distinctive form of IS evaluation and decision making process among stakeholders.

Analysis Framework

Based on the implication of previous research we developed a new analysis framework to analyze information systems investment evaluation process. The framework shows that when certain IS investment proposals are evaluated, four type of evaluation orientation are expected to be observed according to the evaluation role and the institutional decision context. These four types of evaluation changes are shown in the Figure 1

Decision Context	Political Context	Professional Context
Justification Type	Mixed Evaluation - Positive when interests united - Negative when interests conflict	Negative Evaluation
Concept Justification		
Financial Justification	Positive Evaluation	Control Evaluation

< Figure 1 - Research Framework >

Staged Evaluation Process

In the first step of the analysis, we are to premise that IS investment evaluation process passed through the staged process. We also assume that during the staged process, particular forms of Institutional structure are generated by the participant's social interaction until final decision is made. In general, following Mintzberg et al(1973)

IS investment evaluation process has three step of procedure: Initiation, Development, Decision [40] [41]

At the initiation stage, the investment objects(Information system development, hardware and software procurement, etc) are recognized by the organization necessity or strategic directions. Development stage seems to be the starting point to identify information system's characteristic and functionality through defining detailed contents. At this stage, one can speculate stakeholders interpret the cost and benefit of the investment contents with their diversified organizational interest. At the last step, decision stage, based on the way of communication formed in former stage, investment is decided to be approved or not.

Justification Type

Irani(2002)'s work emphasized the role of stakeholders, whose benefit consideration is incongruent according to the organizational position. Depending on where the stakeholders posit in senior manager, middle manager, or even lower operational level, they might focus on different attribute of the cost and benefit.

Therefore, within the corporate policy and strategy, IT/IS benefits can be classified into strategic, tactical and operational benefits, with financial or non-financial and intangible natures. Financial benefit justification is the traditional appraisal procedures including the setting of project costs (direct) against quantifiable savings and benefits predicted to be achievable. Because this traditional view usually discourages long-term strategically important projects that typically offer intangible and non-financial benefits, he argues the practice of Concept Justification. Concept justification requires a softer, more persuasive approach, and is one that is predominantly interpretive in nature. This approach is likely to be sought by those with executive responsibilities, and is one of aligning the projects' proposal with the medium/long-term strategic and financial business plan(s) of the company [20].

Although he concluded the search for an integrated generic technique impossible because of a wide variety of interacting social and technical factors, he provided some insightful implication; first we need to note that investment justification is subjective in nature rather than objective. Second, we need to focus on the interaction among stakeholders and various aspects of organizational context in order to see how the subjective interpretation occurs.

Evaluator Group

At each stage of IS evaluation process, we may

consider there are certain types of stakeholders' roles who might outline institutional schema. Accordingly, we define the roles of two groups - *Evaluator group*, *Decision making group*. The following details the role of each group.

- Evaluator group evaluate the benefit of investment at the development stage.
- Decision making group examine the investment proposal evaluated by evaluator group.
- At the decision stage, Evaluator group and Decision making group proceed sense-making communication and reach mutual agreement on whether to invest or not.

Next, we further categorize evaluator group into two subgroups following the classification of evaluation role from Serafeimidis & Smithson(2003): strategist for evaluation and evaluator.

The role separation mechanism is generally found in both private and public sector. For example, enterprise-wide IS investment board is constituted and their assessment is used to make an overall decision. During the group discussion process, whether role of the leader is prominent or not, some participants may take the initiative role. At this time, participants who take the initiative execute strategist's role, whereas others execute evaluator's role. In this process, depending on the property of an IS cost and benefits and organizational context, IS investment proposals follow respectively different justification type. We use the concept justification and the financial justification dichotomy which are suggested by Irani(2002).

From these two justification types, our assertion is that Evaluator Group, as a socially collective identity, have disposition to choose one of the justification type. This orientation is formulated under communication and interaction of each member of the evaluator group, in accordance with the way they interpret IS tangible and intangible benefit, based on each personal background

Decision Making Group

Final decision making group is constituted by high-ranking officials (e.g., CEO, CIO, and Board of directors) who have authority to approve investment. Decision making group interpret evaluation result and its context reported by evaluator group and at the same time meditate on another context that they are encountered.

These contexts are classified by the political context and the professional context, and it seems more dominant in public sector[42]. We assumed that within each context, final decision making result is shown as an approval or disapproval of the IS investment proposal, or change of the priority of suggested investment proposal set by evaluator group beforehand.

Evaluation Orientation

Because the four evaluation orientations of Serafeimidis & Smithson(2003) extend over the entire process from the IS adoption to the post-implementation evaluation, we need to adjust their perception into focused area of the initial evaluation.

Under certain circumstance, positive results of evaluation of IS investment could lead to the approval or its priority rise. Negative results of evaluation, on the other hand, could lead to the rejection of investment or drop in priority. We propose the evaluation results of certain IS investments are expected to have distinct directions under the circumstance between justification type of evaluation group and decision context of decision making group. Then we propose four types of IS evaluation orientations: Mixed, Positive, Negative, and Control Evaluation.

(1) Under political context, Evaluator group and Decision making groups are subjected to take complex judgments about the investment proposal which has been through the concept justification. Because of the nature of the political context, mutual consensus between Evaluator Group and Decision Making Group are hard to be predicted. If strategic and politic propensities of the investment proposal align with each groups' interest, then positive evaluation is expected and it leads to execution of investment, on the contrary case negative evaluation devalue its value. The followings are related research proposition.

P1-1: Concept justification will face positive evaluation under political context when interests united

P1-2: Concept justification will face negative evaluation under political context when interests conflict

(2) Even Under political context, it is hard to turn down the proposal which has been officially and objectively evaluated from Financial Justification. Decision making group, therefore, will accept or estimate the evaluation result affirmatively and tries to align expected benefit of the IS investment with their political interest. The

following is related research proposition

P2: Financial justification will face positive evaluation under political context of evaluation process

(3) Under professional context, IS investment proposal which has been through concept justification has high chances to have a negative evaluation. Both Evaluator Group and Decision Making Group have no clearly agreeable evidence of the value of the investment, the proposal is easily to be devaluated. The following is related research proposition.

P3: Concept justification will face negative evaluation under professional context of evaluation process

(4) Under professional context, lastly, IS investment proposal which has been through financial justification will have a sophistication process together with positive evaluation. It is exactly same with the control evaluation suggested by Sefafeimidis & Smithson(2003) .

In this case, to enhance the feasibility of successful implementation of the information system and to spread the information system over the organization easily, business goals have to be set up first. Moreover, in order to accomplish the goal this process further relates to concretize the investment plan and schedule, as well as to prepare the various methods to treat the expected issues. The following is related research proposition.

P4: Financial justification will face control evaluation under professional context of evaluation process

Research Method

Because the conceptual model is introduced with deductive reasoning, empirical data needed to support the analysis framework and propositions. The multiple case study [61] is designed and we are in the process of collecting data from public sector. The unit of analysis is each investment proposal and we will examine about more than 50 of IS investment evaluation results performed by public agency for the past two years.

Base on the content analysis of data from the evaluation sheet (e.g., internal/external evaluation report) and the interview sheets with the stakeholders, we will trace each proposal regarding how evaluator group evaluated and how it goes through a phase of final decision process. And the next we will categorize each case by four evaluation orientation proposed at our analysis

framework. Then we could verify whether each justification type is related to justification type and decision context.

Summary

In summary, this paper proposes a theoretical model for studying IS investment evaluation and decision process. The framework articulates two-staged evaluation process and its institutional orientation constructed by the interactions among stakeholders and their roles. Some of the expected contributions of the research are to be mentioned.

In terms of theoretical contribution, our research may provide starting point of future research that attempts to theorize this undiscovered area. So far, mostly from the rational research, much of the studies have mainly discussed the technical and utility issues on IS evaluation. Thus limitation exists when trying to explain irrational-looking IS decision process. On the other side, political research focuses on the nature of power in organization and the way of power being organized, just leading more unpredictable and unexplainable research issue. We try to address this issue focusing on IS evaluation process itself, and the integrated approach of the institutional theory would provide new way of understanding of the process.

Also, there are several implications to practitioners. First, proposers or planners who take the role to justify the necessity of certain IS investment to the decision making group could achieve their goal effectively through a proper consideration of our framework. That is, in order to get a final approval of investment, the justification type (concept justification/ financial justification) have to be considered as a persuasion strategy, and the decision context (political context/ professional context) among members of decision making group have to be identified as well.

Second, to the final decision makers, if an approved investment is from the concept justification under the political context, he or she needs to elicit a consensus to the investment from other organizational member (e.g., user, middle manager). It is because although information systems are invested under the necessity of strategic importance, it has still some risks to fail because of no use of system by organization's member [59].

Finally we suggest some possible research issues from our framework. When an organization frequently performs IS investment decision under the circumstances closely related with strategic and political judgment, consideration of whether to establish more formal process and institutionalization is needed. With this issue, the

optimal point of configuration of IT Governance can be arguable research agenda. Next, further multiple-case study of private sectors compared to public sector cases might help raise the generalization level of the hypothetical theory. Thereafter, quantitative analyses can clearly recognize difference between reality and ideal norm with regard to IS evaluation process.

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