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ABSTRACT

Programs are multiple related projects that are often grouped together to deliver a common goal. Information systems programs are often deployed to carry out strategic initiatives. This research examined the external oriented boundary spanning activities of IS programs and proposed that boundary spanning activities of IS programs impact program outcomes in distinct ways. The empirical analysis of 114 survey responses indicated that scouting activity had positive and significant effects on both ambassadorial activities and task coordination activity. Task coordination activity had a direct and significant impact on program performance and product quality. Most of ambassadorial activities related to molding and mapping had significant impacts on program outcomes through the mediating effect of task coordination but filtering only affected program performance in a in a direct and significant way.

Keywords

Information Systems Development (ISD) programs, External Communication, Boundary Spanning

1. INTRODUCTION

Today's turbulent business environment demands quick responses from organizations. . Information System (IS) projects are often employed as a form of implementing business strategies (Artto, Dietrich, & Nurminen, 2004). These IS projects are viewed as essential parts of organizational changes processes (Bygstad, Nielsen, & Munkvold, 2010). Because of inherent complexity and challenge of strategic changes carried out by IS project, organizations often deploy an additional lay of management, a program, to have a better organization and control of the multiple related projects. Program management is a framework of managing multiple related projects to achieve a set of benefits that cannot be realized by managing projects independently (Pellegrinelli, 1997).

Programs are more than simple extension of projects or the sum of the related projects (Lycett, Rassau, & Danson, 2004). Programs have essential difference from projects in terms of goals, structures, processes, life cycle and outcome evaluation (Pellegrinelli, 2004, 2011). A fundamental shift in program management is the focus of delivering business values through managing diverse stakeholders. Diverse stakeholders have vested interests in the activities and outcomes of programs. They identify strategic values and articulate benefits that programs deliver (Shao & Müller, 2011). Stakeholders with diverse aspirations represent an important part of program context (Lycett, et al., 2004; Pellegrinelli, 2002). Program context includes the program context within the parent organization such as top managers, business functions and other stakeholders, and the environment outside the parent organization such as competitors and customers (Shao & Müller, 2011). A good relationship between a program and the program's context represents a fit between the program's business values and the organizational business strategy. A misfit signals mis-alignment and failure to respond to organizational strategies. Programs must actively manage the program's context through external-oriented activities.

Boundary spanning is an aggregate team-level phenomenon (Ancona & Caldwell, 1992; Joshi, Pandey, & Han, 2009). A program is usually managed by a team consisting of program manager, project managers of related projects and key stakeholders. Program boundary spanning refers to interactions that are aimed at establishing relationships and interactions with external actors that enable the program to meet its overall goals (Ancona & Caldwell, 1992; Joshi, et al., 2009). Through program boundary spanning, program management team presents itself to external

constituents, gaining access to resources and support and scanning the environment for information and knowledge necessary to achieve program goals and business benefits. This study is intended to focus on information systems program's boundary spanning and explore how program boundary spanning activities relate to program outcomes. This paper is organized as follows. First, relevant prior literature is reviewed in next section. Then a research model is proposed based upon the theoretical development. Research methods and results are report in Section IV. The paper is concluded with the discussion of the theoretical and practical implications of the study results.

2. LITERATURE REVIEW

2.1 Program management literature

Related multiple projects that share common goals are grouped to form a program (Pellegrinelli, 1997). A program is a framework for grouping existing projects or defining new projects and for focusing all the activities required to achieve a set of major benefits Programs establish a bridge between projects and organization's strategy (Pellegrinelli, 2002). Programs can be categorized by management goals, by types of context and by different program structure setup (Artto, et al., 2004; Pellegrinelli, 1997, 2002). The working definitions of programs differ in organizations and industry (Shao & Müller, 2011; Shehu & Akintoye, 2010). Some organizations use cost threshold (e.g. over one million of dollars), the level of interdependence among multiple projects or expected business benefits to define a program.

Two fundamental goals for program management include providing projects with external activities for alignment between projects and organizational goals, and enhancing efficiency and effectiveness in management through an integrated approach (Lycett, et al., 2004). Business goals including coherent communication and alignment with business goals and strategies are external oriented whereas effectiveness and efficiency goals including improved coordination, dependency management, and resource utilizations are internal oriented.

Programs are effective forms of implementing an organizational business strategy (Artto, et al., 2004). Effective program management enhances the transition of strategic decisions to operational level decisions by translating strategic objectives into operational level objectives, serving as top management's vehicles to communication directions to lower levels, clarifying the responsibilities at all levels of the organization. Effective program management also pushes the quick decision making by enabling quick decisions at the various levels, enabling authorization and delegation and enhancing vertical and horizontal communication to support aligned organization-program goals. The effective program management solves inconsistencies. Appropriate and systematic communication mechanisms and systems for disseminating information are essential for a successful program management (Artto, et al., 2004). Programs performing this linking role conduct effective and strategically external communication with the larger organizational environment and external market.

Information systems programs often carry out strategic initiatives, which bring organizational changes or business process improvements to work by using technology tools. The nature of innovation and complexity of information system development demand a large amount of coordination and information exchange (Brusoni, Prencipe, & Pavitt, 2001; Gerwin & Moffat, 1997; Hoegl, Weinkauf, & Gemuenden, 2004; Kazanjian, Drazin, & Glynn, 2000). Both internal and external stakeholders should be identified, including top managers, functional managers, suppliers, employees and customers, etc. IS program management teams have to spend a large amount of time and effort to understand these stakeholders, interpret their needs and intentions and incorporate emergent needs into the program. IS program management team also needs to scan both business and technology environment. Socio-technical changes should be noted, interpreted, and passed to the right decision makers. Decisions have to be made and resources have to be mobilized to deal with the changes. Performance measures and outcome valuations should be negated with senior managers to set up appropriate expectations.

2.2 Boundary spanning literature

Boundary represents the interface between a focal entity and its environment. Boundary is a kind of protection mechanisms excluding environmental stress and a type of regulators of the flow of information and material between the entity and its environment (Leifer & Delbecq, 1978). Boundary spanning enables information of environmental contingencies reach organizational decision makers (Leifer & Delbecq, 1978). Boundary spanning activities are more prominent when environmental uncertainty is high. The sources of environmental uncertainty can market change, technological advances or diverse goals that have to be achieved simultaneously.

Boundary spanning research has crossed multiple levels and focused on several important boundaries (Joshi, et al., 2009; Marrone, 2010). The level of analysis has spanned organization level, inter-unit (department or branch level), , project level, team level and task level (Ancona & Caldwell, 1992; Joshi, et al., 2009; Leifer & Delbecq, 1978; Tushman & Katz, 1980). Traditional studies of boundary spanning literature have focuses on the interface between an organization and external environment, the boundary between two functional units such as marketing department and manufacturing department (Ancona & Caldwell, 1992; Fisk, Berente, & Lyytinen, 2010; Griffin & Hauser, 1992; Joshi, et al., 2009; Li, Jiang, & Klein, 2011; Marrone, 2010).

An individual person, a gatekeeper, may perform boundary spanning activity. This person should be well connected internally and externally and be technically competent in their unit and having personal characteristics to link their unit to external areas effectively (Tushman & Scanlan, 1981). Gatekeepers perform a linking role only for projects performing tasks that are locally oriented (Tushman & Scanlan, 1981). Gatekeepers appear to facilitate external communication of their more local project colleagues (Tushman & Katz, 1980). In their local organizational units, gatekeepers increase the information processing capability of their units by filtering unnecessary information for the unit and translating the important information to the languages that local members understand. However for the universal oriented tasks, gatekeeper roles limit the amount of information transmission between external environment and local unit. Direct contacts among team members make sense and facilitate a larger information exchange.

Program boundary spanning originates in the experiences, perceptions, attitudes, values and behaviors of program management team members (Joshi, et al., 2009).Program manager may link individual projects with business strategies and influence peer program managers, functional business managers and senior managers about IS program's value in the organization. Direct program members have expertise and backgrounds in performing universal oriented communication such as technical design and product review. Therefore program boundary spanning should be viewed as an aggregate team-level phenomenon.

Ancona and Caldwell (1992) classified a group's externally focused activities into several major types including ambassador activities, task coordination activities, scouting activity and guarding behaviors. Ambassador activities involve frequent communication with managers above the team in the organizational hierarchy because the team lobbies for resources and seeks protection and support. It contains the aspects of filtering, molding and mapping. Mapping refers to the communication activities that the unit conducts to construct a picture of the external environment including figuring out political supports, expectations from other units and predicting future troubles (Ancona & Caldwell, 1992). Molding activity involves the group's attempts to influence the external environment to suit its agenda by shaping the beliefs and behaviors of outsiders. Filtering consists of taking information from outsiders and delivering a smaller amount to the group (Ancona & Caldwell, 1992)."Task coordinator" activities are carried out to coordinate technical or design issues and are often conducted laterally across the organization. Scouting involves general scanning for ideas and information about the competition, the market, or the technology. Guarding activities are aimed at keeping information within the boundary to protect the team or present a specific image of the team to outsiders. Guarding activities are not well applied in this research since one of primary goals of program management is to increase transparency and let stakeholders know better of the programs. Therefore guarding activities are not included in this study.

The strategic nature of IS programs make it critical for the program to keep a positive interaction with the program's context. IS program needs to search for information and expertise to manage resource interdependence with the program's context. Program management team needs to best present the program's activities, processes and progresses to outside stakeholders to increase transparency. In addition to forming positive impression, IS program team targets at stakeholders who hold greater power than the program, persuading them of program's decisions, asking for resources and protecting the program. The needs for compatibility and connectedness of various information systems require IS programs to coordinate with other programs and business functions for technical details and system integration. Task coordination activity is performed at the operational level to get the detailed tasks and technology-related tasks done. Ambassadorial activities lead to supports from senior managers. The acquisition of supports, resources and collaboration across functions units positively drive the program success. Based upon this theoretical argument, this research model in Figure 1 has been proposed.
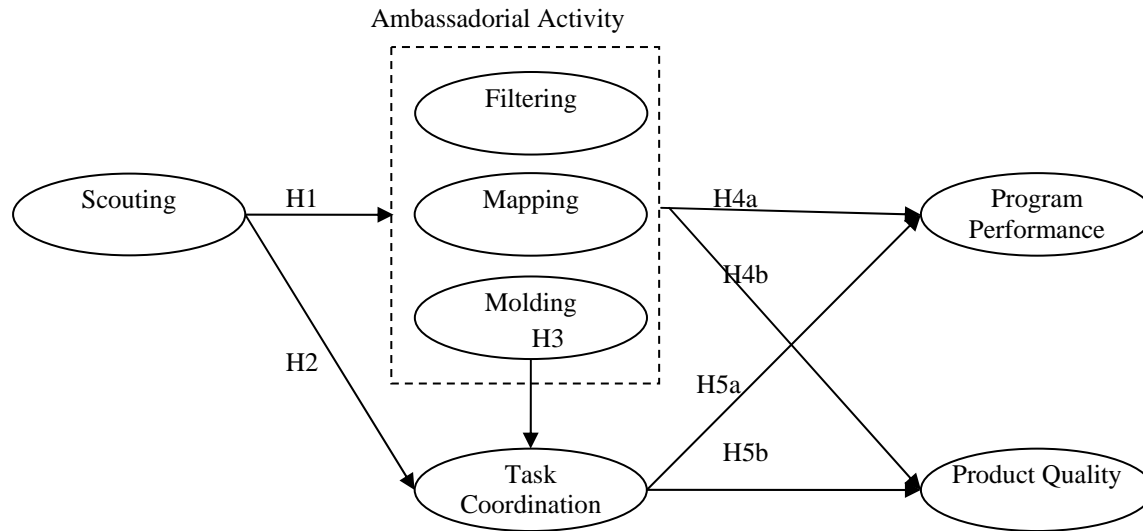
Figure 1 Proposed Model

3. HYPOTHESES DEVELOPMENT

Programs have been frequently deployed to carry out business strategies and enable quick, complex and enterprise-wide changes (Artto, et al., 2004; Pellegrinelli, 1997). Programs become the center of influences and conflicts from both parent organization and external market. Business changes in the larger context subsequently result in changes of user requirements. Facing a group of diverse stakeholders, program management teams have to actively perform the ambassadorial activities. Program management teams have to persuade the diverse stakeholders and influence them for more resources or clarification of what the changes mean to each stakeholder by ambassadorial activities. In addition to business changes, IS programs also need to closely monitor technological revolutions and its impacts on the program (Artto, et al., 2004; Lee & Xia, 2005; Nidumolu, 1995). Program management teams have to clarify how technological change will impact the program and negotiate with the organization for the program performance measures at the end. Therefore the following hypothesis is proposed.

H1. The extent of IS program's scouting activity is positively related to the extent of the program's ambassadorial activities.

Because of resource interdependence with traditional business functions and other programs, an IS program need to actively look for informaiton and expertise in parent organization and in the market (Li, et al., 2011). A large amount of horizontal coordination is required for the program and the related entities to figure out how to incorporate the changes. The coordination may involve resolving the issues of technical designs and solving the conflicts of interdependent schedules, etc. The more changes that have to be incorporated in the process, the more task coordination have to be done. Therefore the following hypotheses is proposed.

H2. The extent of IS program's scouting activity is positively related to the extent of the program's task coordination activities.

As an additional layer of management, programs take an integrative view and play a critical role of aligning program goals with organizational goals (Artto, et al., 2004). For the changes from business and technological environment, program management teams filter the unnecessary noise, and translate the strategic changes into operational level objectives. The ambassadorial activities of the program clarify the roles and responsibilities of the program and the related business units. Other business functions have the motivation to cooperate with the program and improve effectiveness and efficiency of task coordination activities. Since ambassadorial activity includes the perspectives of filtering, molding and mapping, molding and mapping are expected to have a positive impact on program outcomes.

However, filtering may not have impacts on the task coordination since its aim is to make sure the program have minimum disturbance from the outside. Therefore we propose that

H3. The extent of IS program's ambassadorial activities is positively related to the extent of the program's task coordination activities.

Ambassadorial activities are viewed essential activities by top managers (Ancona & Caldwell, 1992). The issue selling of middle managers help to top management to set priority and facilitate the strategy implementation process (Dutton & Ashford, 1993) . Ambassadorial activities facilitate the development of a shared understanding with top managers and other business managers of the emerging issues in internal and external environment. Decisions are made based upon the common understanding and supported by the organization. These shared understanding and joint-making decisions enable the program to meet the program goals and develop high quality products. The positive relationship between ambassadorial activity and performance has been evidenced in the literature (Ancona & Caldwell, 1992; Fisk, et al., 2010). Therefore it is proposed that

H4. The extent of IS program's ambassadorial activities is positively related to program performance and product quality.

Task coordination activity involves coordinating and negating. An appropriate boundary between the program and business functions helps creating clarity and good cooperative relationship. Programs collect information from the related business departments through task coordination activity and ensure that the product designs are feasible and compatible with existing business processes and infrastructure. Successful management of interfaces with other business functions and departments build a collaborative relationship (Hoegl & Weinkauf, 2005). Coordinating with other business units, collecting feedback, keeping the related stakeholders updated create a support and acceptance for the product under development. Therefore it is proposed that

H5. The extent of IS program's task coordination activities is positively related to program performance and product quality.

4. RESEARCH METHOD

A survey design was selected to collect data and test the proposed model. The following provides detail discussion about variable definition, data collection procedures, and sample information. The data collection unit was a "program". On average each program included 3-5 individual IS projects. The recruiting method for participants was snowballing. A marketing research firm was hired to look for qualified programs and participants at its convenient sample pool and collect surveys. Potential candidates were identified and interviewed to make sure the program associated with the potential candidate is qualified. Working defintions of program in the participating organizations include cost threshhold (e.g. over 1 million dollars) or strategic objectives (e.g. building a data testing center for a national-level bank system). For each program, a program manager was identified and invited to fill in the paper-based survey. All the constructs were adopted from the past studies. The measures of program external activities were adapted from Ancona and Caldwell (1992). 24 items were used and a sample item is "we preformed program communication to absorb outside pressures for the program so it can work free of interference." The measures of program performance and product quality were adopted from Nidumolu (1995).

114 surveys were completed and returned for data analysis. Among the 114 respondents, 73.7% is male. 43.9% of the participants are program managers and IT/IS managers other participants have the titles such as product manager and product director, etc. The average work experience is 9.27 years and the average current company experience is 5 years. 57.9% of respondents work in IT –industry and 71.9% of the companies are medium size organizations. Table 1 listed the descriptive data. Factor analysis was used to confirm the construct of external communication activities. The measure of ambassadorial activity had 12 items. These 12 items were further divided into three dimensions as filtering, molding and mapping, to be consistent with Ancona and Caldwell (1992) .

Variables	Mean	SD	M3	M4	Correlation Matrix						
					Fil	Mol	Map	Sco	Tas	PQ	PP
Filtering (Fil)	3.79	0.66	-0.08	-0.35	**.89**						
Molding (Mol)	3.79	0.75	-0.15	-0.68	0.19	**.77**					
Mapping (Map)	3.53	0.62	-0.30	-0.08	0.33	0.46	**.77**				
Scouting (Sco)	3.53	0.80	0.08	-0.84	0.43	0.49	0.32	**.82**			
Task Coordinator (Tas)	3.77	0.75	-0.11	-0.53	0.27	0.49	0.37	0.44	**.81**		
Product Quality (PQ)	4.02	0.57	-0.23	-0.06	0.24	0.24	0.06	0.22	0.22	**.91**	
Program Performance (PP)	3.93	0.54	-0.43	0.30	0.10	0.15	0.15	0.14	0.21	0.48	**.84**

Note: M3- Sknewness; M4 – Kurtosis

The diagonal line of correlation matrix (in bold) presents the square root of AVE.

Table 1. Descriptive Statistics

4.1 PLS analysis

Hypotheses were tested and verified by employing the method of Partial Least Squares (PLS) (Lo¨hmoller, 1989). PLS is a latent structural equation modeling technique that uses a component-based approach to estimation and it contains two steps. The first step is to examine the measurement model and the second step is to assess the structural model. In addition, while using PLS to test the hypothesized model, researchers should pay attention to three major concerns: (1) the reliability and validity of measures; (2) the appropriate nature of the relationship between measures and constructs; and (3) path coefficient, model adequacy, and a final model from the available set of alternatives (Hulland, 1999). PLS-Graph version 3.00 was used in this study to test the hypotheses.

4.1.1 Measurement Model

Item reliability, convergent validity, and discriminant validity test are often used to test the measurement model in PLS. Individual item reliability can be examined by observing the factor loading of each item. High loading imply that the shared variance between constructs and its measurement is higher than error variance (Hulland, 1999). Factor loading higher than 0.7 can be viewed as high reliability and factor loading less than 0.5 should be dropped.

Convergent validity should be assured when multiple indicators were used to measure one construct. It can be examined by reliability of questions (Cronbach's alpha), composite reliability of constructs, and variance extracted by constructs (AVE) (Fornell & Larcker, 1981). For the convergent validity, the variance extracted for each construct is larger than 0.5, and the item-construct correlation are all more than 0.7. All the above evidences show that the measurement has high convergent validity.

Discriminant validity focuses on testing whether the measures of constructs are different from each other (Messick, 1980). It can be assessed by testing whether the square root of AVE is larger than correlation coefficients (W.W. Chin, 1998; Fornell & Larcker, 1981). The discriminant validity is also assured because the square root of AVE is larger than the correlation between constructs.

All indicators in this study have loading higher than 0.6, the minimum composite reliability is 0.84 for instrumentality, and the item-total correlation are all higher than 0.3. The square root of the AVE shown in the diagonal of the Correlation Matrix in Table 1, exceeded the threshold of 0.70. As indicated in Table 1, the AVEs are greater than the inter-construct correlations. The results exhibit strong construct reliability and validity.

4.1.2 Structural Model

Basic information about each variable used in this study was listed in Table 1, including means, standard deviation,

skewness, and kurtosis. Each examined variable's skewness value was less than 2 and kurtosis value was less than 5 indicated no significant violation of normal distribution (Ghiselli, Campbell, & Zedeck, 1981). The test of the structural model includes estimating the path coefficients, which indicate the strengths of the relationships between the dependent and independent variables. A bootstrap resampling procedure was used to generate **t** -statistics and standard errors (W.W. Chin, 1998). Table 2 shows the path analysis result. Mediating effect can be showed in two different parts. The first part is from independent variable to mediators and the second part is from mediators to dependent variable. The upper Table 2 indicates the first part and the test result shows that scouting has positive and significant effects on ambassadorial activities and task coordination activities. Mapping and molding activities have positive and significant impacts on task coordination activities. Filtering has a positive and significant effect on product quality only. Task coordination activity has a positive and significant effect on both program performance and product quality.

Coefficient (S.E.)	Filtering	Mapping	Molding	Task coordination	Dependent Variables:	
					Program Performance (PP)	Product Quality (PQ)
Scouting activity	0.44 (0.07)**	0.41 (0.08) **	0.50 (0.07) **	0.22 (0.09) **	-	-
Filtering activity	-	-	-	-	0.07 (0.17)	0.19 (0.09)*
Mapping activity	-	-	-	0.26 (0.10) **	-	-
Molding activity	-	-	-	0.29 (0.09) **	-	-
Task Coordination activity	-	-	-	-	0.23 (0.14) *	0.19(0.11)+

( ) indicated the standard error; *p < 0.05; **p < 0.01.

Table 2: Path analysis – Hypotheses testing results

5. CONCLUSION AND DISCUSSION

The objective of this research was to examine boundary spanning activities of the information system programs and explore the relationships of various boundary spanning activities and their performance implications at the program level. Scouting activity was found to have significant and positive effects on ambassadorial activities and task coordination activities. Mapping activity and molding activity had significant and positive effects on program outcomes both directly and through task coordination activities but filtering activity only had the positive and significant impact on program performance directly. Task coordination activity had positive on program outcomes in a significant way.

The significance of scouting activity for ambassadorial activities and task coordination activities is consistent with the need for alignment with organizational business strategies and the demand of responses to emergent changes in the environment. Ambassadorial activities of IS program management teams assure the re-alignment of program goals with the adapted business strategies and clarify the implications of performance measures and expectations from the related business functions (Artto, et al., 2004; Pellegrinelli, 2002). Technological changes resulted from scouting activities positively increased the amount of task coordination activities between the prorgram and related busienss functions.

The result indicated that there was a strong and significant relationship between ambassadorial activities and task coordination activities. Programs translate strategic objectives to operational level objectives and motivate the project teams to work effectively towards achieving the company's strategy. The results also revealed the unique performance implications of different boundary spanning activities. The ambassadorial activities were found to significantly impact the program outcomes through the mediation of task coordination activities. This result is consistent with the importance of successful strategy implementation for an organization's competitive advantage.

This study has several limitations. First, the sample used in this study is not random. A snowballing strategy was employed. Potential data bias may exist that restrain generalizability of the findings. Second, cross-sectional surveys used in this study have limitations in attributing and substantiating affirmative causality. This paper made several contributions. First, this study contributes to program management literature by studying the boundary spanning activities of program management teams. Although program management literature has stressed the importance of

program context, not many studies have examined the external oriented activities of programs. Second, this study pays particular attention to program management teams. Although the literature has well recognized the importance of program manager, the properties and functions of program management teams have not been well examined. Third, this research explored the linkage of ambassadorial activities and task coordination activities. This linkage emphasized the important of the translation process from strategic decisions to business operations in the program context.

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